Bank of Albania

ECONOMIC POLICIES IN SEE:
DESIGN, PERFORMANCE AND CHALLENGES

Editor Ardian Fullani

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CONTENT

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Mr. Kristo enjoys travelling and exploring foreign cultures. In 2007, he received recognition as an international ambassador of

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EDITORIAL

On 18-19 November 2010 the Bank of Albania held the 4th Southeastern European Economic Research Workshop. Organized for the first time in November 2007, the main objectives of this already consolidated regional workshop are to further economic research in Southeastern Europe (SEE) and extend knowledge of the country-specific features of the economies in the region. Moreover, it enhances regional cooperation by means of scientific knowledge sharing and the provision of opportunities for cooperative research. In 2009, the 3rd SEE Research Workshop was co-organized by the Bank of Greece, and held in Athens, Greece.

When we started this project we were convinced that the workshop would serve as a catalyst for a more intensified exchange of experiences in the field of economic research in our region. Indeed, after four years the workshop has contributed to higher economic research standards and enhancing our know-how in this area.

Timely and accurate economic research is undoubtedly vital for undertaking sound economic policies, in order to foster stable and non-inflationary growth and to cope successfully with various risks related to the large dynamics and rapid integration of our economies. From a central bank's point of view, economic research should aim at reaching an optimal balance between its relevance to monetary policy and financial stability, its quality and timely availability. When compared to academia, a central bank should conduct economic research that manifests the same quality, but is positioned on assisting the monetary policy and financial stability decision-making process.

The 4th SEE Economic Research Workshop placed special emphasis on three important topics to central banking in transition and SEE small/open economies: lessons drawn from the global crises and its effects on SEE economies; internal and external imbalances' adjustments – the need for new efforts with structural reforms to support sustainable growth, and; new anchors for economic policy.

I take this opportunity to express my gratitude to the contributors of the 4th Workshop, from Bank of Albania, Banca d'Italia, Österreichische Nationalbank, Bank of Greece, National Bank of the Republic of Macedonia, Bulgarian National Bank, and National Bank of Poland. Their valuable contributions engendered a lively quality debate among researchers and policy makers in the region and beyond. The purpose of this special workshop book is to make available to the wider public the proceedings of the 4th SEE Economic Research Workshop.

Sincerely,

Ardian FULLANI
Governor of the Bank of Albania

BANK CAPITAL AND RISK IN THE SOUTH EASTERN EUROPEAN REGION

*Panayiotis P. Athanasoglou**

ABSTRACT

This paper examines the simultaneous relationship between bank capital and risk. A model is set up which assumes that banks' decisions regarding capital and risk are made endogenously in a dynamic pattern. A simultaneous equation system was estimated using an unbalanced panel of SEE banks from 2001 to 2009. A key result for the whole sample of banks is the relationship between regulatory (equity) capital and risk which is positive (negative). However, a positive two-way relationship between regulatory capital and risk was found in less-than-adequately capitalized banks, which also increased substantially their risk in 2009. Thus, banks' decisions differentiate between equity capital and risk and regulatory capital and risk. A positive, significant and robust effect of liquidity on capital was identified. Both regulatory and equity capital exhibit procyclical behaviour,whilst the relationship between risk and rate of growth of GDP is positive.

Keywords: Banking, capital, risk, liquidity, regulation, panel estimation

JEL Classification: C33, G21, G32

* Bank of Greece

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1. INTRODUCTION

Over the past three years banks, in many advanced and emerging economies responded to the challenges posed by the crisis mainly by increasing their capital and lowering their risk exposures in order to pave the way for a sustained upturn in which credit supply would not be limited by poor capitalization. In theory, banks can be thought of as profit maximisers which jointly determine capital and risk. Since raising capital comes at some cost, the concern is whether capital provides compensating benefits to the bank mainly when it is in excess of the capital requirements. Empirical research provides evidence that banks in the US and Europe make simultaneous choices of capital and risk and in some cases the relationship between the two is positive (Rime, 2001 and Jokipii and Milne, 2010). However, both theoretical analysis and empirical research provide conflicting predictions for the relationship of capital and risk. This relationship has several important policy implications for the banking sector and the economy as a whole, since the observed in the last two years credit crunch associated to a stricter enforcement of bank regulation is more pervasive in countries with a bank-based credit system, as is the case with countries in the South-Eastern European (SEE) region.

In the present study we investigate the relationship between bank capital (regulatory and equity) and risk in SEE countries. We want to examine the behaviour of SEE banks in terms of choices on capital and risk over the last decade and mainly during the recent crisis. During this crisis almost all the banks in the SEE countries suffered heavy losses on their loan portfolios or their trading activities, in particular the non-traditional ones. Therefore they would attempt either to lower their exposures to relatively high-risk assets or to increase their capital in order to ensure compliance with requirements. More precisely, this paper uses a modified version of the simultaneous equations model developed by Shrieves and Dahl (1992) to analyze banks' choices of capital (both regulatory and equity) and risk in seven (7) SEE countries (Albania, Bulgaria, Bosnia and Herzegovina, FYROM, Serbia, Croatia and Romania) spanning the period 2001-2009.

The paper focuses on the following main directions: First, while a number of studies have examined the above relationship in the US and Europe, this is, to the best of our knowledge, the first attempt to estimate the relationship between bank capital and risk in the SEE region. Second, we investigate the relationship of both equity and regulatory capital with risk, assuming that banks differentiate in their decisions between equity capital and risk and between regulatory capital and risk. Third, we estimate our model in the full sample of banks and in sub-samples according to the large and small equity capital to assets and regulatory capital to risk-weighted assets ratios respectively. Fourth, we consider as a control variable the index of bank liquidity, which is rarely used in empirical research. We also account for the effect of the banking reform process in the SEE countries on bank capital and risk.

The empirical results suggest that the relationship between regulatory capital and risk is positive. Moreover, the significance and causation of this relation depends on the degree of capitalization. In less-than-adequately capitalized banks there is a two-way relation, while in well-capitalized banks this relation is not significant. The evidence confirms the assumption that banks differentiate in their decisions between equity capital and risk and regulatory capital and risk, since the former relation is negative.

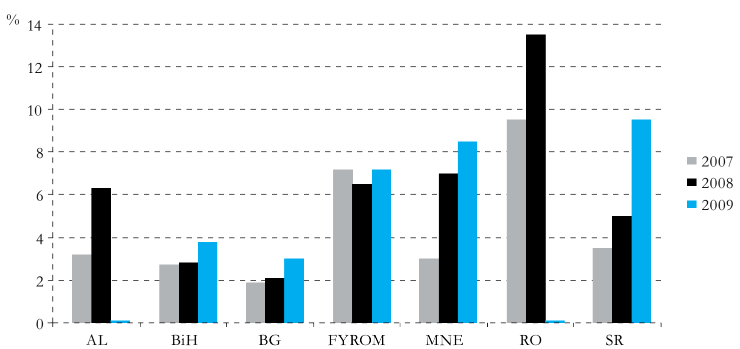
The rest of the paper is organized as follows: Section 2 reviews and evaluates the recent developments in the economies and the banking industries of SEE countries. Section 3 outlines the theoretical and empirical literature. Section 4 presents the specification of the model. Section 5 describes the data and the determinants of capital and risk, while Section 6 describes the econometric methodology. Section 7 reports and analyses the empirical results. Conclusions and some policy suggestions are offered in the final section.

2. ECONOMIC DEVELOPMENT IN THE SEE COUNTRIES AND THE BANKING INDUSTRY

During the last decade, SEE countries have made significant steps towards their main target to become full EU members. Their banking sectors have undergone profound changes during the past twenty years. The SEE countries progressed at a difference pace each and with considerable difficulties and setbacks, to the liberalization of their banking systems. The process included the privatization of state-owned banks, most of which were acquired by foreign banks, and the *de novo* entry of foreign banks (foreign ownership is high and ranges from 75% in Serbia to 93% in Albania). The credit system in these countries is still in the intermediate stages of development towards the depth and scope that would be consistent with their respective stage of economic development. However, financial intermediation in those countries is converging fast. Over the last five years, strong efforts have been made to bring the SEE countries' regulatory framework in line with EU directives and the Basel Core Principles. Before the crisis, the SEE banking sector was characterized by sufficient capitalization and benign levels of credit risk.

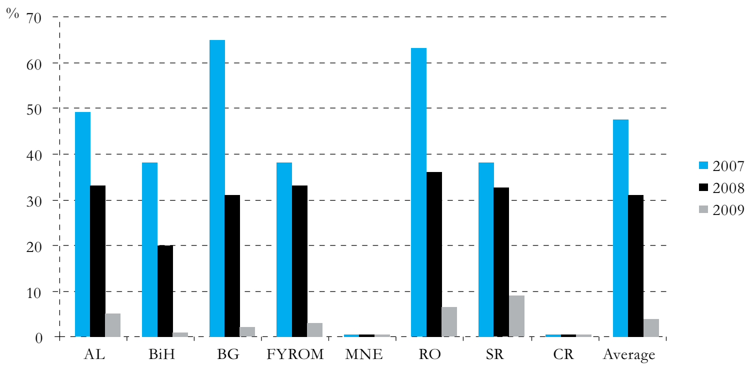
The recent financial crisis has hit these countries since the heightened risk aversion of investors towards the SEE region and 'flight to quality' frenzy led to a significant increase in risk premiums. The crisis affected the SEE countries' banking system in a rather severe way for the following reasons:

Figure 1. NPLs to Total Loans (%) in SEE



- The fall in GDP growth (Figure 1 in Appendix) has led to an increase in the ratio of non-performing loans (NPLs, Figure 1). In fact, the probability that a loan becomes non-performing is higher in these countries compared with advanced economies.
- NPLs also increased due to the fact that many loans were denominated in foreign currencies and the local currencies were depreciated.
- Financial disintermediation.
- High lending rates on the back of increasing risks, and
- Property prices plummeted, reducing banks' collateral value.

Figure 2. Total Credit Growth



The SEE countries were able to avoid the worst-case scenarios of a systemic crisis, due to the relative soundness of their banking sectors (Figure 2), the relatively low reversals in net capital flows and the support from international organizations (the Vienna Initiative, the World Bank, the EU and the IMF). Thanks to the above measures, their financial sector is in a better condition now than at the end of 2008 (Figure 2 and Appendix Figure 2), although, significant risk still lie ahead. It is worth noting that, although banks in the SEE countries increased their minimum capital adequacy ratio to 10.29% on average (Table 1) at the end of 2009, their actual ratio remained well above that, standing on average at almost 15% (Figure 3).

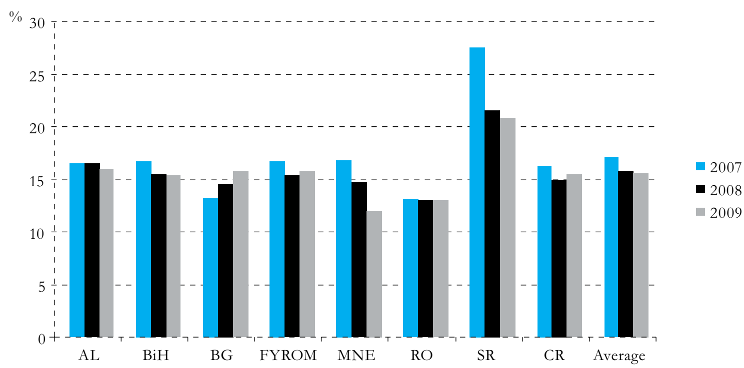
Table 1 Minimum Capital Adequacy Ratio (end of 2009)

Countries	Capital Adequacy Ratio (%)
Albania	12
Bosnia and Herzegovina	12
Bulgaria	12
Croatia	10
FYROM	8
Romania	10
Serbia	8
Average	10.29

Source: EBRD

This comfortable level of capitalization provided adequate protection against shocks originating in the domestic economy and the banking system.

Figure 3. Bank Regulatory Capital to RWA in SEE



3. LITERATURE REVIEW

3.1 THEORETICAL LITERATURE

The relationship between capital and risk has important implications for the implementation of the capital requirement regulation (Basel II). On a theoretical basis, the capital-risk relationship in the banking sector yields ambiguous results. A bank may choose to increase its risk alongside its capital levels, since increased risk leads to higher insolvency probability.

The theory of the bank as a mean-variance portfolio manager demonstrates a positive relationship between capital requirements and risk (Koehn and Santomero, 1980, Kim and Santomero, 1988)[1]. However, increased capital regulation can reduce portfolio risk if risk weights are chosen proportional e.g. to the systemic risks of the assets (market-based risk weights).

The theory of the deposit insurance has shown that when deposit insurance underprices risk, banks seeking to increase capital will increase risk as well (Merton, 1977, Sharpe, 1978, and Dothan and Williams, 1980). Moreover, if the marginal value of deposit insurance option with respect to risk is increasing, then more regulatory capital will reduce risk (Furlong and Keeley, 1989).

Studies based on the charter (or franchise) value[2] theory argue that an increase in bank capital is unambiguously associated with a reduction in the level of bank asset risk (Markus, 1984, Matutes and Vives, 2000).

The capital buffer theory demonstrates that a bank will choose to hold capital above the minimum capital requirements since there are (implicit and explicit) costs of falling below them. Therefore banks with capital levels close to (or below) the minimum capital requirements will choose to increase their capital and lower their risk levels, while banks with sizeable capital buffers will increase their levels of risk along with their capital buffer level (Milne and Whaley, 2001, and VanHoose, 2007).

Finally, the industrial organization approach argues that holding capital is more costly than the risk-free interest rate, thus increasing capital (by capital regulation) induces a bank to become more risk-averse and vice versa (Saunders et al., 1990).

1 However, Keeley and Frulong, 1991, show that the mean-variance portfolio model is inappropriate to analyze the effect of capital regulation on the risk of bank failure, because of the model's assumption of constant borrowing rates and that costs are independent of portfolio risk. They suggest that increased capital will not cause banks to increase risk.

2 The charter value is the present value of expected future rents.

3.2 EMPIRICAL LITERATURE

The capital-risk relationship in the banking industry has been examined for various countries by several empirical papers. For US banks, Jokipii and Milne (2010) find a negative capital-buffer-risk relationship for banks with marginal capital adequacy and a positive one for highly capitalized banks. Similarly, a negative relationship was found by Aggarwal and Jacques (2001). However, Berger et al. (2008) and Shrieves and Dahl (1992) find a positive one, indicating that banks that have increased their target capital have also increased their risk exposure. However, this relationship is not strictly the result of regulatory influence since it holds fine even in banks with capital in excess of the minimum regulatory capital requirement. For six G10 countries (Canada, France, Italy, Japan, UK and the USA) Van Roy (2008) finds that weakly capitalized banks did not modify the ratio of risk-weighted assets to total assets differently from well-capitalized banks. Lindguist (2004) argues for a negative capital buffer-risk relationship for Norwegian banks. Finally, for Swiss banks, Rime (2001) shows that regulatory pressure affects the level of capital, but not the level of risk, and finds a positive relationship between capital ratio and risk.

4. MODEL SPECIFICATION AND SAMPLE SEPARATION

4.1 MODEL SPECIFICATION

In this analysis, we assume that bank capital and risk decisions are taken simultaneously. Observed bank's capital and risk *levels* consist of two components: one which is managed internally by the bank and a second which is an exogenous random shock. Hence, the present study deviates from previous literature (e.g. Shrieves and Dahl, 1992, Jacques and Nigro, 1997) which assume that banks decide on *changes* in capital and risk. However, we preserve the core of this literature and we assume that actual bank capital and risk adjust to their long-run target levels. In turn, due to exogenous shocks this adjustment is costly (or sometimes infeasible), preventing banks from a fully contemporaneous adjustment of capital and risk. Thus, our model assumes that actual capital and risk follow a partial adjustment process, defined by:

$$\Delta CAP_{i,t} = \lambda_1 (CAP_{i,t}^{*} - CAP_{i,t-1}) + \varepsilon_{i,t} \qquad (1)$$

$$\Delta RISK_{i,t} = \lambda_2 (RISK_{i,t}^{*} - RISK_{i,t-1}) + e_{i,t} \qquad (2)$$

Where Δ represents first differences, $CAP_{i,t}$ and $Risk_{i,t}$ are observed capital and risk levels respectively for bank i in period t, $CAP_{i,t}^{*}$ and $RISK_{i,t}^{*}$ are the target levels of capital and risk respectively, $\varepsilon_{i,t}$ and $e_{i,t}$ are random shocks and $0 \leq \lambda_1 \leq 1$ and $0 \leq \lambda_2 \leq 1$ are the speeds of adjustment of the capital and risk respectively.

The model further assumes that the long-term target level of capital and risk is determined by a set of explanatory control variables, Z and H respectively, which include bank specific determinants (including $CAP_{i,t}$ in the risk equation and $RISK_{i,t}$ in the capital equation) as well as industry specific and macroeconomic determinants :

$$CAP_{i,t}^{*} = \lambda_j Z_{i,t} + \varepsilon'_{i,t} \qquad (3)$$

$$RISK_{i,t}^{*} = \lambda_h H_{i,t} + e'_{i,t} \qquad (4)$$

where λ_j and λ_h are the vectors of coefficients of the $Z_{i,t}$ and $H_{i,t}$ vectors of variables respectively.

Therefore, the final dynamic system of equations to be estimated takes the form:

$$CAP_{i,t} = \alpha_o + \alpha_1 CAP_{i,t-1} + \sum_{i=2}^{j} \alpha_i Z_{i,t} + \eta_{i,t} \qquad (5)$$

$$RISK_{i,t} = \beta_o + \beta_1 RISK_{i,t-1} + \sum_{i=2}^{k} \beta_i H_{i,t} + w_{i,t} \qquad (6)$$

where $\alpha_1 = 1 - \lambda_1$, $\alpha_i = \beta_i \lambda_j$, $\beta_1 = 1 - \lambda_2$ and $\beta_i = \beta_i \lambda_h$

4.2 SAMPLE SEPARATION

The system of equations (5) and (6) will be estimated for the full sample and for sub-samples according to the following two criteria: First, applying the average equity to assets ratio (EA), we obtain the high and the low equity capital banks respectively. Secondly, applying the average regulatory capital ratio (CAR), we obtain the following two sub-samples: the high and low regulatory capital banks respectively.

Therefore, the system of equations (5) and (6) will be estimated for the full sample and for the above four (4) sub-samples.

5. SAMPLE DESCRIPTIONS AND DETERMINANTS OF CAPITAL AND RISK IN THE SEE REGION

5.1 THE DATA

We use annual bank-level and macroeconomic data for seven SEE countries (Albania, Bosnia-Herzegovina, Bulgaria, Croatia, FYROM, Romania and Serbia) over the period 2001-2009. The dataset is unbalanced and covers approximately 85% of the industry's total assets (including 70 banks in 2001 up to 115 banks in 2009, representing a total of 895 observations).

The bank variables are obtained from the BankScope database. We chose to focus on banks with unconsolidated accounts using the International Financial Reporting Standards (IFRS) for the whole period. The macroeconomic variables are obtained from the IMF's International Financial Statistics (IFS) and the banking reform index from the European Bank for Reconstruction and Development (EBRD). Table 2 lists the variables used to proxy capital and risk and their determinants as well as variables notation and the expected effect of the determinants according to the literature.

Table 2 Definitions, notation and expected effects of the explanatory variables of bank capital and risk

	Variable	Measure	Notation	Expected Value	
Dependent variables	Capital (CAP)	Equity/Assets	EA	Capital	Risk
		Total Regulatory Capital Ratio	CAR		
	Risk	Impaired Loans /Gross Loans	NPL		
Determinants	Liquidity	Liquid Assets/deposits and s-t funding	LIQ	Negative/ Positive	Positive/ Negative
	Profitability	Net Profits (before taxes) /Average Assets	ROA	Positive	-
	Size	Ln(real assets) Ln(real assets)2	S S2	Negative	Positive
	Loan Losses	Loan Loss Provisions /Gross Loans	LLP	Positive	Negative
	Banking reforms	EBRD index	EBRD	Negative	Negative
	Economic activity	Rate of growth of GDP	GDPR	Negative	Negative

Table 3 presents country and region averages. For the whole region, the period-average capital is 18.6 and 25.6 for EA and CAR respectively, while the average LLP and NPL are 2.89 and 4.72 respectively.

5.2 BANK-SPECIFIC DETERMINANTS

Capital: Two alternative measures are used to proxy this variable (CAP). First, the total capital adequacy ratio (CAR) and second, the equity to assets (EA) ratio. CAR has been used by Shrieve and Dahl (1992), Jacques and Nigro (1997) and Aggarwal and Jacques (1998). While CAR is the definition of capital used by regulators, the one used by banks might be different, such as the market value of capital, the book equity or the economic capital.

Risk: There is no consensus in the literature about the appropriate measure of bank risk[3]. In the present study, in order to capture the asset risk of banks, we use the non-performing loans to gross loans (NPL) ratio[4]. This measure captures those bank loans that are

3 See Beck, 2008, for a survey of alternative measures of bank risk.

4 See also Shrieves and Dahl, 1992 and Aggrarwal and Jaques, 1998, among others, who proxy risk by this variable.

actually in default. In addition, it is not much influenced by changes in accounting standards. However, it should be noted that since this proxy is an *ex post* measure, risk will be reflected in past due and non-accruals in the following period. Also, this proxy is used in theoretical models that consider loan defaults as the main source of bank instability (Martines-Miera and Repullo, 2010).

Size: One of the most important questions underlying bank policy is which size optimizes bank capital and risk. Generally, it is expected that the effect of a growing size on risk is negative (safer bank), since larger banks can diversify their asset portfolios, enhance their investment opportunities and can have lower levels of capital since they can raise funds from the markets. This diversification effect could reduce credit and liquidity risk.

Table 3 Descriptive Statistics

		Albania	Bulgaria	Bosnia-Herzegovina	Croatia	FYROM	Romania	Serbia
EA*	MEAN	9,37	12,96	11,85	11,84	21,51	0,13	18,94
	S.DV.	1,14	1,67	2,27	1,93	9,63	0,03	4,50
CAR*	MEAN	17,34	23,25	24,36	22,49	24,38	31,64	25,88
	S.DV.	4,43	7,95	4,11	2,33	12,46	16,43	8,54
ROA*	MEAN	0,85	1,14	1,27	1,10	1,07	1,22	1,20
	S.DV.	0,50	0,09	0,39	0,07	0,35	0,27	0,18
LLPs*	MEAN	0,97	0,80	2,04	0,59	2,40	1,06	6,04
	S.DV.	0,48	0,66	1,17	0,16	3,84	1,20	4,04
NPL*	MEAN	4,26	8,50	5,00	6,37	1,59	2,60	2,89
	S.DV.	4,29	7,64	3,22	3,04	1,67	3,22	4,62
LIQ*	MEAN	50,66	62,98	59,81	50,34	57,91	58,09	56,23
	S.DV.	19,72	21,57	19,94	13,46	16,10	18,50	13,26
S	MEAN	9,77	7,04	6,10	9,00	8,23	8,34	10,06
	S.DV.	0,52	0,85	0,76	0,25	0,73	0,55	0,82
S^2	MEAN	95,47	49,55	37,20	80,94	67,76	69,61	101,14
	S.DV.	0,27	0,72	0,57	0,06	0,54	0,30	0,68
GDPR	MEAN	5,62	4,28	4,44	4,36	2,40	4,42	4,51
	S.DV.	1,45	3,57	3,14	0,93	3,30	4,48	3,23
EBRD	MEAN	2,70	3,70	5,30	4,35	4,00	3,00	5,40
	S.DV.	0,28	0,26	3,14	0,93	3,30	0,26	3,23

Note: For the notation of the variables see Table 2. Variables with an asterisk are percentages. EA=Equity/Assets ratio , CAR=Total Regulatory Capital ratio , ROA= Return over Assets, LLP=Loan Loss Provisions over Gross Loans, NPL=Impaired Loans to Gross Loans ratio, LIQ=liquid assets/deposits and s-t funding, S=ln(real assets), GDPR=rate of growth of GDP, EBRD=banking reform index.

However, for larger banks, the effect of size could be negative due to bureaucratic and other reasons (diseconomies of scale). Hence, the size-capital and risk relationship may be expected to be non-linear (Athanasoglou et al., 2008). The (logarithm of) real bank's assets and their square is used in order to capture the above possible linear and non-linear relationship respectively. Overall, the SEE banking sector includes small financial institutions with limited country coverage.

Profitability: Profitability may have a positive effect on bank target capital if banks increase capital through retained earnings rather than through equity issues. The former increases the banks' value in the market, while the latter, if interpreted as ''a signal of weakness", may reduce it. The relation between equity capital and profitability is considered as systemic and positive, since higher profits may lead to an increase in capital (Athanasoglou, et al., 2006, Berger, 1995). However, the relation between profitability and regulated capital may not be significant or positive if capital requirements are binding, since in this case banks will hold more economic capital and will be less profitable. Thus, the expected sign on the coefficient of this variable can be either positive or negative. The bank's returns on assets (ROA)[5] are included in the equity capital equation with an expected positive coefficient and in the regulatory capital equation with an ambiguous one.

Liquidity: An important role of a bank in the economy is to create liquidity (Berger and Bowman, 2009). Indeed, as the last crisis shows, illiquidity and poor asset quality were the main causes of bank failures. Despite the importance of bank liquidity, there is disagreement in the literature about its measurement. An often used measure of liquidity is the ratio of loans to deposits. In the present study, we measure liquidity as the ratio of liquid assets to customer deposits and short-term funding. Liquid assets include: 1) trading securities at fair value through income, 2) loans and advances to banks, and 3) cash and due from banks. Also, in the denominator the following items are included: 1) customer deposits (sight and term): 2) deposits from banks, and 3) other deposits and short-term borrowing. There are surprisingly few empirical studies that focus

5 For the calculation of this ratio, we use the average values of assets of two consecutive years and not the end-year values, since profits are a flow variable generated during the year.

on the effect of liquidity on capital and risk. Jokipii and Milne (2010) argue that banks with higher liquidity can decrease their capital and increase their levels of risk. However, banks may hold liquidity as self-insurance against liquidity shocks. In turn, high levels of liquidity expose banks, mainly small ones, to risk-taking (Allen and Gale, 2003) leading to increasing levels of capital in order to control risk-taking. Therefore, in this case, the effect of liquidity on capital will be positive. In some cases liquidity requirements can be as effective as capital requirements.

Loan losses: Loan losses affect capital positively, since banks with expected increased loses will raise their capital (regulatory and equity) in order to reduce risk. The effect of loan losses on risk is expected to be negative, since increased loan losses will induce banks to lower their risk exposure. These losses are approximated by the loan-loss provisions to gross loans (LLP) ratio.

5.3 INDUSTRY-SPECIFIC DETERMINANTS

The EBRD index: This index represents banking system reform in the SEE countries and identifies the progress in areas such as: 1) the adoption of regulation according to international standards and practices, 2) the implementation of tighter and more efficient supervision, 3) the privatization of state-owned banks, and 4) the write-off of non-performing loans and the closure of insolvent banks.

5.4 MACROECONOMIC DETERMINANTS

GDPR: The annual growth rate of gross domestic product of each SEE country is included in both capital and risk equations to capture the effect of the macroeconomic environment.

6. ECONOMETRIC METHODOLOGY

We assume a one-way error component model. Thus, in (5) and (6) the error terms $\eta_{i,t}$ and $w_{i,t}$, include the unobserved bank-specific effect and the idiosyncratic error respectively. Moreover, due to the differences that exist in the banking system of the SEE countries and also the detrimental effects of the last crisis, we should test for potential cross-country and time effects. We test for these effects by including in equations (5) and (6) country- and time-specific dummies respectively. Thus, the econometric system is expanded as follows:

$$\mathrm{CAP}_{is,t} = \alpha_o + \alpha_1 \mathrm{CAP}_{is,t-1} + \sum_{i=2}^{J} a_i Z_{is,t} + \sum_{i=1}^{s-1} \gamma_{1i} \mathrm{D}_{s-1} + \eta_{is,t} \tag{7}$$

$$\mathrm{RISK}_{is,\,t} = \beta_o + \beta_1 \mathrm{RISK}_{is,t-1} + \sum_{i=2}^{k} \beta_i H_{is,t} + \sum_{i=1}^{s-1} \gamma_{2i} \mathrm{D}_{s-1} + \mathrm{w}_{is,t} \tag{8}$$

$$\eta_{is,t} = \mu_{is} + \mathrm{v}_{is,\,t} + \lambda_t$$

$$\mathrm{w}_{is,t} = \mathrm{u}_{is} + \varphi_{is,\,t} + \lambda_t$$

where D_{s-1} stands for the country-specific dummy variables, s stands for countries with s=1,…,S and λ_t accounts for the unobservable time effect.

The significance of the time effects is tested with the relevant LM test which implies that we should include a year-specific dummy variable to account for λt. It turns out that the dummy variables for the year 2009 (D_9) in some cases are significant. Therefore, equations (7) and (8) are expanded as follows:

$$\mathrm{CAP}_{is,t} = \alpha_o + \alpha_1 \mathrm{CAP}_{is,t-1} + \sum_{i=2}^{J} a_i Z_{is,t} + \sum_{i=1}^{s-1} \gamma_{1i} D_{s-1} + \delta_1 \mathrm{D}_9 + \eta_{is,t} \tag{9}$$

$$\mathrm{RISK}_{is,\,t} = \beta_o + \beta_1 \mathrm{RISK}_{is,t-1} + \sum_{i=2}^{k} \beta_i H_{is,t} + \sum_{i=1}^{s-1} \gamma_{2i} D_{s-1} + \delta_2 \mathrm{D}_{9+} \mathrm{w}_{is,t} \tag{10}$$

The dynamic system of equations (9) and (10) will be estimated by the one-step and the two-step system GMM estimates (Blundell and Bond, 1998). We use the one-step robust estimates unless the Sargan test rejects the null hypothesis that the moment conditions are valid. Since in this case standard errors are downward biased, the robust estimator suggested by Windmeijier (2005) is used. However, in case that the lagged dependent variable is estimated as insignificant, the two stages least squares instrumental variables with random effects (2SLS-RE) method[6] will be used with the Baltagi-Chang (1994) estimators of the variance components. We also test

6 The Hausman test, for the whole sample, provides evidence in favour of a RE model ($x^2(11)=15.68$, with p-value=0.49)

for the endogeneity of risk in the capital equation and capital in the risk equation using the Wu-Hausman test statistic. Thus, we do not follow the literature by including shift parameters for the four sub-samples and using a fixed effects method, but rather we allow the slope coefficients to vary across the four sub-samples.

7. RESULTS

7.1 FULL SAMPLE RESULTS

All the variables of our model are defined in Table 2. Table 4 presents correlations of our main variables in levels. The correlation between regulatory capital and risk appears to be positive but small in size, while the relationship between equity capital and risk is negative. Table 5 reports the results obtained from the estimation of the simultaneous equations model (9) and (10) for the full sample.

Table 4 Correlation matrix of the variables

	EA	**CAR**	**ROA**	**NPL**	**LLP**	**LIQ**	**GDPR**	**EBRD**	**S**	**S^2**	**D_9**
EA	1.00										
CAR	0.58	1.00									
ROA	0.08	-0.06	1.00								
NPL	-0.09	0.04	-0.09	1.00							
LLP	0.14	0.09	-0.64	0.00	1.00						
LIQ	0.30	0.53	0.12	-0.03	0.01	1.00					
GDPR	0.50	0.02	0.11	-0.21	0.15	0.04	1.00				
EBRD	-0.06	-0.08	0.01	0.02	0.03	-0.05	-0.001	1.00			
S	-0.24	-0.17	0.06	-0.02	0.04	-0.19	-0.08	0.06	1.00		
S2	-0.21	-0.15	0.06	-0.01	0.05	-0.17	-0.08	0.05	0.99	1.00	
D9	-0.55	0.02	-0.10	0.22	-0.11	-0.03	-0.93	0.008	0.11	0.11	1.00

Our findings indicate a static regulatory capital equation and a positive but statistically insignificant relation between risk and capital. Also, the Wu-Hausman test confirms that the two variables are endogenous. It seems that in the 2001-2009 period banks lessened their risk to reduce the probability of a significant reduction in their capital. Even during the last crisis, banks in the SEE countries managed to absorb the increased risk by reducing their equity capital but with an (insignificant) increase in the regulatory capital. The above result is in accordance with previous findings by Aggarwal and Jacques

(2000), Rime (2000), Van Roy (2004) and Jokipii and Milne (2010).

Table 5 Estimation results for the simultaneous equation model (Full sample)

	Dependent variables							
	Capital				Risk			
	CAP(=CAR)		CAP(=EA)		NPL(CAP=CAR)		NPL(CAP=EA)	
Methods	2SLS-RE		System GMM		2SLS-RE		System GMM	
Explanatory variables	coefficient	t-stat.	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.
CAP_t					0.08**	1.91	-0.01	-0.11
CAP_{t-1}			0.75***	5.02				
NPL_t	0.28	0.53	-0.46***	-2.27				
NPL_{t-1}							0.23**	2.04
ROA	0.85	1.40	0.80*	1.79				
LIQ	0.12***	3.59	-0.01	-0.29	-0.03*	-1.68	0.01	0.39
LLP	0.45	1.41	0.46	1.21	-0.01	-0.16	0.12	0.33
S	4.52	0.99	5.02	0.69	-4.18***	-2.66	-7.03	-1.28
S^2	-0.35	-1.24	-0.38	-0.76	0.25***	2.58	0.48	1.33
GDPR	-0.23	-0.70	-0.05	-0.24	0.39**	1.91	0.07	0.35
EBRD	-0.02	-0.19	0.17	1.42	0.03	0.31	0.10*	1.81
D_9	-0.50	-0.13	1.85	0.80	5.29***	2.47	3.19*	1.66
Wu-Hausman-test[1]	3.09 (0.08)		0.92 (0.24)		2.21 (0.12)		2.31 (0.11)	
Wald-test	73		166		53		275	
Sargan-test[2]			44.74 (0.36)				35.77 (0.73)	
AR(1)[3]			-3.01 (0.00)				-1.20 (0.22)	
AR(2)[3]			-0.19 (0.84)				0.60 (0.54)	
R^2(overall)	0.19				0.27			

Note: For the notation of the variables see Table 2.

*, **, *** Significance at the 10, 5 and 1% levels of significance respectively.

The country dummies (D_{s-1}) and the constant are not reported.

1. Test for the endogeneity of risk in the capital equation and vice versa, with p-values in parentheses.

2. Test for over-identifying restrictions, with p-values in parentheses.

3. First and second order autocovariance in residuals, with p-values in parentheses.

The empirical results show that liquidity causes banks to hold more capital. The explanation may be that initially higher capital creates more liquidity, which in turn it reinforces capital. Loan loss provisions have a positive, as expected, but insignificant impact on capital, indicating that banks will cover their loan losses by increasing their regulatory capital in order to comply with their capital requirements.

Although not being significant the negative coefficient of the growth rate of GDP is a robust result in all the estimated samples. Berger et al. (1995) explain this relationship with the argument that banks hold high levels of capital to be able to exploit unexpected investment opportunities. The estimated coefficients of the remaining variables have the correct signs but are all insignificant.

In the equity capital (EA) equation, the coefficient of the lagged dependent variable $CAP_{i,t-1}$ is highly significant and denotes a fast speed of capital adjustment of 75% per year[7]. The impact of risk on equity capital appears to be negative and significant. The relationship between profitability and capital is positive, as in the case of regulatory capital, but here is significant. This finding is not suprising in light of previous research regarding the SEE countries (Athanasoglou et al., 2006) and implies that the benefits associated with increasing profits are offset by costs of increasing regulatory capital, while the opposite is true for the equity capital. The coefficients of the remaining variables are insignificant. It is worth noting that the coefficients of the NPL an LLP variables in this equation are opposite in sign than those in the CAR equation, indicating that banks' capital and risk decisions differentiate between regulatory and equity capital.

The risk equation with regulatory capital is static. However, the impact of regulatory capital on risk is positive and significant, indicating that banks with higher levels of capital will engage in higher risk-taking. The coefficient of loans losses is, as expected, negative but insignificant. The negative and significant coefficient of liquidity appears to suggest that this variable is associated with lower risk. The effect of size on risk is significant, suggesting that to a certain extent increasing size reduces risk although for extremely large banks it is associated with increasing risk. The estimated coefficient of the growth rate of GDP reflects, contrary to expectations, a counter-cyclical behaviour of risk. Finally, the adverse conditions that banks faced in 2009 increased risk significantly.

In contrast to the previous case the risk equation with equity capital is dynamic. The estimated coefficient of the lagged dependent variable indicates a rather slow speed of risk adjustment, in fact substantially slower than in the equity capital equation[8]. The estimated coefficient

7 This is higher than reported for large USA banks by Berger et al. (2008).

8 See also Jokipii and Milner (2010), for similar results.

of capital is negative but highly insignificant. The EBRD index has a positive and significant impact on risk, suggesting that improvement in reforms induce banks to take higher risks.

7.2 RESULTS FOR HIGH EQUITY CAPITAL BANKS

Results for estimating equations (11) and (12) for the sub-sample of high equity banks are presented in Table 6. The estimated equations of capital appear to be dynamic, while those of risk appear to be static. In the CAR equation the impact of risk on capital is positive but is not significant. The coefficient of the lagged dependent variable is significant, indicating a fast speed of adjustment. Liquidity has a positive and significant impact on capital. The negative and significant coefficient

Table 6 Estimation results for the simultaneous equation model (High equity capital banks)

	Dependent variables							
	Capital				Risk			
	CAP(=CAR)		CAP(=EA)		NLP(CAP=CAR)		NLP(CAP=EA)	
Methods	System GMM		System GMM		2SLS-RE		2SLS-RE	
Explanatory variables	coefficients	t-stat.	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.
CAP_t					-0.02	-0.38	-0.12*	-1.72
CAP_{t-1}	0.57***	3.09	0.45*	1.71				
NPL_t	0.92	1.64	-0.21	-0.06				
NPL_{t-1}								
ROA	-0.87	-0.49	1.21	0.53				
LIQ	0.07*	1.74	0.01	0.16	-0.02	-1.06	-0.01	-0.57
LLP	0.58	0.37	0.66	1.00	-0.01	-0.17	0.01	0.13
S	17.9	0.68	30.75	0.44	-5.01***	-2.25	-4.4**	-1.99
S^2	-0.85	-0.43	-2.19	-0.45	0.33***	2.23	0.28**	1.90
GDPR	-2.7*	-1.77	-0.71	-0.30	0.19	0.60	0.02	0.08
EBRD	-0.21	-1.15	0.35***	2.40	-0.11	-0.87	-0.07	-0.56
D_9	-26.2	-1.48	-4.05	-0.16	4.37	1.37	2.98	0.91
Wu-Hausman-test[1]	0.88 (0.35)		0.76 (0.31)		0.15 (0.70)		0.11 (0.73)	
Wald-test	168		107		16		19	
Sargan-test[2]	42.7 (0.40)		9.98 (1.00)					
AR(1)[3]	-1.96 (0.04)		-1.03 (0.30)					
AR(2)[3]	0.20 (0.25)		-0.29 (0.77)					
R^2(overall)					0.17		0.14	

Note: For the notation of the variables see Table 2.

*, **, *** Significance at the 10, 5 and 1% levels of significance respectively.

The country dummies (D_{s-1}) and the constant are not reported.

1. Test for the endogeneity of risk in the capital equation and vice versa, with p-values in parentheses.

2. Test for over-identifying restrictions, with p-values in parentheses.

3. First and second order autocovariance in residuals, with p-values in parentheses.

0 of the rate of growth of GDP appears to reflect the procyclical nature of bank regulatory capital in this sub-sample.

In the equity capital equation, the impact of risk is negative but statistically insignificant. The speed of capital adjustment is lower than in the regulatory capital case. Among the remaining variables, only the EBRD index takes a significant and contrary to expectations-positive coefficient.

In the risk equation, the coefficient of regulatory capital is negative but insignificant. In fact, size is the only significant determinant of risk among all the explanatory variables in this equation. This result suggests that larger banks maintain up to a point a lower level of risk. Equity capital has a negative and marginally significant impact on risk, in line with the negative relation in the equity capital equation. From the remaining control variables, only size has a negative and non-linear impact on risk, indicating that higher equity banks engage in lower levels of risk.

7.3 RESULTS FOR LOW EQUITY CAPITAL BANKS

Our (static) estimates for the low equity banks sub-sample show that the relationship between risk and regulatory capital is positive and significant but quite lower than with that of high equity banks. This finding indicates that in the SEE region low equity banks with higher levels of risk would increase regulatory capital in compliance with existing compulsory capital requirements or even above them. The estimated coefficient of liquidity, as in the last two cases, is positive and significant. Both coefficients of the size variables are significant, suggesting that low equity banks, probably due to high cost, should reduce regulatory capital in the initial stages of their development and increase it when they reach a certain size. The relationship between equity capital and risk is negative but insignificant. In this equation, profitability and reforms are associated with higher and lower equity capital respectively, with significant coefficients as opposed to the regulatory capital case.

In the risk equation, the impact of regulatory capital appears to be positive and significant. Thus, up to now this is the only case where the estimations indicate a two-way positive relation between capital and risk. However, the estimated coefficients of the remaining variables are insignificant. The relationship between risk and equity capital in this sub-sample appears to be negative and insignificant. The estimated coefficient of loan losses is positive and highly significant, suggesting that banks with higher loan losses increase risk-taking. The rate of growth of GDP, contrary to expectations, has a positive and significant coefficient. An interesting finding is the coefficient of the time dummy variable, which suggests that in 2009 low capital banks' risk-taking was affected more than in high equity banks.

Table 7 Estimation results for the simultaneous equation model (low equity capital banks)

	Dependent variables							
	Capital				Risk			
	CAP(=CAR)		CAP(=EA)		NPL(CAP=CAR)		NPL(CAP=EA)	
Methods	2SLS-RE		System GMM		2SLS-RE		2SLS-RE	
Explanatory variables	coefficients	t-stat.	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.
CAP_t					0.38*	1.73	-0.01	-0.04
CAP_{t-1}			0.44**	1.91				
NPL_t	0.35**	1.96	-0.01	-0.12				
NPL_{t-1}								
ROA	-0.03	-0.08	0.52***	2.22				
LIQ	0.04**	1.81	-0.00	-0.01	-0.03	-1.28	0.02	1.18
LLP	-0.10	-0.46	0.00	0.02	0.14	0.58	0.78***	3.55
S	-6.40***	-2.38	1.39	0.53	-1.95	-0.63	3.49	1.11
S^2	0.41***	2.49	-0.08	-0.45	0.12	0.62	-0.22	-1.14
GDPR	-0.19	-0.78	-0.05	-0.31	0.32	1.18	0.64***	2.99
EBRD	-0.07	-0.97	-0.04***	-2.49	0.05	0.58	0.03	0.51
D_9	-1.83	-0.65	0.58	0.33	4.44	1.49	8.43***	3.62
Wu-Hausman-test[1]	3.35 (0.07)		2.14 (0.11)		6.08 (0.02)		0.04 (0.83)	
Wald-test	31		162		29		40	
Sargan-test[2]			26.5 (0.97)					
AR(1)[3]			-2.05 (0.03)					
AR(2)[3]			1.00 (0.31)					
R^2(overall)	0.36				0.36		0.21	

Note: For the notation of the variables see Table 2.

*, **, *** Significance at the 10, 5 and 1% levels of significance respectively.

The country dummies (D_{s-1}) and the constant are not reported.

1. Test for the endogeneity of risk in the capital equation and vice versa, with p-values in parentheses.

2. Test for over-identifying restrictions, with p-values in parentheses.

3. First and second order autocovariance in residuals, with p-values in parentheses.

7.4 RESULTS FOR HIGH AND LOW REGULATORY CAPITAL BANKS

As shown in Table 8, it is clear that in the sub-sample of banks with relatively high CAR risk coefficient, although positive, is not significant. In addition, increased profitability and loan losses increase capital but they are also insignificant. In fact, the positive coefficient of liquidity is the only significant one in this equation. However, risk is affected positively and significantly by capital but with a low size coefficient, while it is determined negatively and significantly by liquidity and size. In the sub-sample of banks with low CAR, the empirical estimations indicate that there is a positive and significant one-way relationship between regulatory capital and risk.[9] One possible explanation of these findings is that, while well-capitalized banks have completed their adjustments in the target levels of capital, those banks with relatively lower capitalization continue to adjust their target levels of capital either to satisfy minimum capital requirements or to create an adequate buffer above them[10]. However, the opposite holds for risk. High CAR banks can increase their risk-taking after increasing their regulatory capital but not the low CAR ones. We further find that, in the low CAR sub-sample, an increase in loan loss provisions decreases regulatory capital and increases risk. This is the first case where a significant relationship between this variable and regulatory capital and risk is observed.

Table 8 Estimation results for the simultaneous equation model (Banks with high and low regulatory capital)

	Banks with high CAR				Banks with low CAR			
	Dependent variables				Dependent variables			
	Capital(CAR)		Risk(CAR)		Capital(CAR)		Risk(CAR)	
Methods	2SLS-RE		2SLS-RE		2SLS-RE		2SLS-RE	
Explanatory variables	coefficient	t-stat.	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.
CAP_t			0.09**	1.81			0.00	-0.01
CAP_{t-1}								
NPL_t	0.10	0.10			0.44**	1.92		
NPL_{t-1}								

9 This result is consistent with that of Rime (2001) for Swiss banks.

10 This finding is in line with studies by Jacques and Nigro (1997), Rime (2001) and Roy (2008) which find that weakly capitalized banks increase their capital faster than well-capitalized banks.

ROA	0.54	0.50			0.13	0.32		
LIQ	0.33***	2.98	-0.09	-1.55	0.03	1.30	0.01	0.47
LLP	0.41	0.85	-0.32***	-2.18	-0.83**	-1.95	0.88***	3.38
S	-3.52	-0.41	-7.52*	4.56	-2.70	-1.11	-2.03	-0.91
S^2	0.13	0.25	0.41	1.27	0.14	0.96	0.10	0.78
GDPR	-0.55	-0.33	0.99*	1.75	-0.06	-0.26	0.20	1.28
EBRD	1.94	0.18	-5.80	-1.06	0.00	0.04	0.05	0.87
D_9	-1.46	-0.89	7.44	1.22	-0.11	-0.04	4.02***	2.33
Wu-Hausman-test[1]	2.98 (0.09)		2.78 (0.10)		3.35 (0.07)		8.62 (0.00)	
Wald-test	28		46		18		50	
R^2(overall)	0.35		0.30		0.17		0.36	

Note: For the notation of the variables see Table 2.

*, **, *** Significance at the 1, 5 and 10% levels of significance respectively.

The country-dummies (D_{s-1}) and the constant are not reported.

1. Test for the endogeneity of risk in the capital equation and vice versa, with p- values in parentheses.

8. CONCLUSIONS

This paper analyzed the relationship between bank capital and risk in the SEE region. To examine the impact of micro-and macroeconomic environment and mainly of the last crisis on banks' choices of capital and risk, we estimated a dynamic equations system assuming that choices of capital and risk are made simultaneously within each bank.

The empirical results show that the SEE countries need a stable, healthy and efficient banking system in order to finance private and public investment and consumption. As shown in the analysis, the increasing levels of financial reform and the improvement in the structure of banks in the SEE countries over the last decade have contributed to high levels of equity and regulatory capital without altering systematically their behaviour towards risk.

The results for the whole sample of banks show that there is a one-way relatively weak but significant relationship between capital adequacy ratio and risk-taking but not vice versa. This finding can be explained by the fact that on average banks in the SEE region keep their target level of capital above the regulation requirements and is in line with the charter value theory. In the equity capital equation, the coefficient on the lagged dependent variable implies a relatively quick adjustment to target, while risk has a negative and significant impact on equity capital.

In contrast, the estimation results for the low equity capital and low CAR sub-sample banks identify a positive and significant two-way and one-way relationship respectively between regulatory capital and risk. In the remaining two sub-samples this relation is positive but insignificant. Also, in the four sub-samples the empirical results suggest that there is a negative relationship between equity capital and risk, which is marginally significant in the risk equation of high equity capital banks case only. These results show that: first, less-than-adequately capitalized banks raise their target regulatory capital after an increase in risk in order to cover potential losses while in turn engage in riskier activities. Second, banks differentiate in their choices of equity capital, regulatory capital and risk.

We find a significant and positive (negative) influence of liquidity (liquidity risk) on regulatory capital in the whole sample of banks and in the four sub-samples with the exception of the low CAR sub-sample banks, indicating that high levels of liquidity lead to increasing CAR in order to control for risk. This is confirmed by the negative impact of this variable on risk which is significant in the whole sample case only. Hence, in cases where regulatory capital and risk are not related (high CAR banks), liquidity has a strong positive impact on capital. This seems to suggest that in the case of high capitalized banks with target capital higher than the regulatory one, an increase in the liquidity risk will reduce credit risk by decreasing capital. Also, liquidity has a negative (positive), albeit insignificant, effect on equity capital and risk.

Profitability seems to have a significant positive influence on equity capital only in the case of small equity capital banks, but it does not have any significant effect on regulatory capital in all the cases considered.

Banks with higher loan losses appear to raise CAR and reduce risk in the whole sample and in the high equity capital and high CAR (significantly) sub-sample cases, but they decrease regulatory capital and raise risk in the low equity and CAR (significantly) sub-samples. The estimated coefficient of this variable on equity capital and risk equations is positive but insignificant, with the exception of its impact on risk in the low equity sub-sample. It seems that larger (in both equity and CAR) banks have the capacity to raise capital and reduce risk whenever loan losses occur. With regard to size, larger banks will hold less regulatory capital in the low equity sub-sample banks and reduce risk taking in the whole sample and in the high equity banks sub-sample. On the other hand, size does not have a significant influence on equity capital. The influence of GDP growth on capital (both regulatory and equity) appears to be negative in all the cases but significant only in the CAR equation in the high equity sub-sample of banks. This finding indicates the procyclical nature of economic activity, although it is important in high equity banks only. On the contrary, the impact of this variable on risk is positive. Finally, reforms in the banking sector seem to affect significantly equity capital only. This influence is positive (negative) in the high (low) equity sub-sample of banks.

Figure 1. Real GDP Growth in SEE

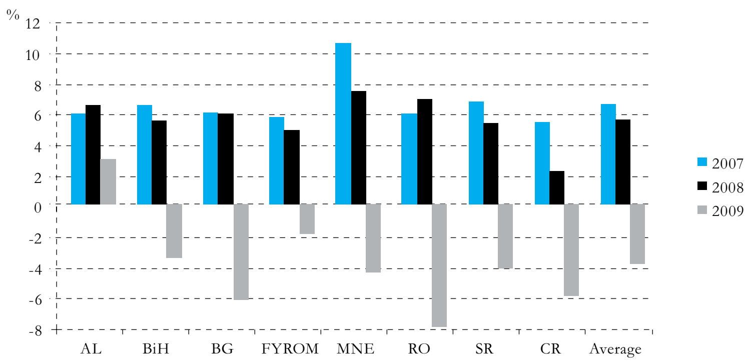
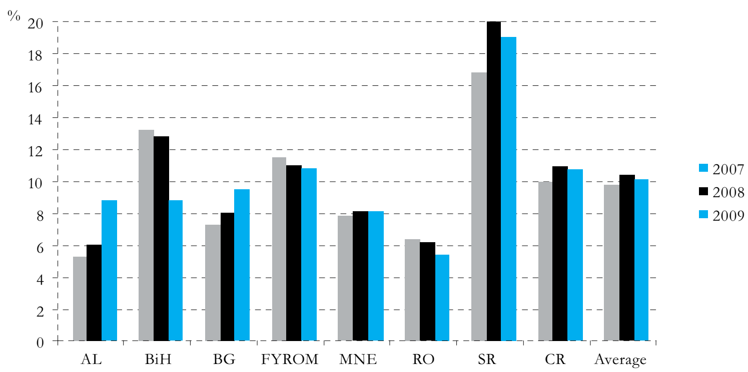


Figure 2. Bank Capital to Assets (Leverage) in SEE



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A MODEL FOR THE CREDIT RISK IN ALBANIA USING BANKS' PANEL DATA

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1. INTRODUCTION

The recent financial crisis showed that the credit risk is an important source of risk of the financial system (Thoraval 2006, Moretti et al. (2008). Thoraval (2006) notes that credit risk associated to firms' failures and macroeconomic uncertainties amounts to 85% of bank's risks, and is considered as the key risk faced by banks. To defend against this risk, banks employ a large amount of capital and create provisions for which the opportunity cost is significant. According to Segoviano and Padilla (2006), to withstand the unexpected losses that its portfolio could experience, a bank holds economic capital. Basel Committee on Banking Supervision, 2001, defines unexpected losses as the 99.5 Value at Risk (VaR) of the probability loss distribution. The difference between the actual capital base of a financial institution and the economic capital calculated on the basis of the riskiness of its portfolio under different macroeconomic scenarios provides a measure of the solvency of the institution. In this context, stress tests are developed to assess the impact of the occurrence of a given scenario in the probability of default of the assets portfolio. Further refining the issues addressed by stress tests, the latter can be designed to identify potential vulnerabilities at the

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institution level or at the system level. In this paper we discuss the latter, and develop a framework for the banking system in Albania.

Moretti et al. (2008) summarise the mainstream approaches to stress testing and distinguish between sensitivity analysis, which addresses the impact of shocks to single risk factors, and scenario analysis, in which multiple risk factors are shocked in a way that provides internal consistency between them. Though historically prevailing among the macroprudential tools used by central banks, sensitivity analysis is nowadays seen as complementary to scenario analysis, for instance, as a means of obtaining some sense of the partial derivatives that may be associated with a broader, multi-factor scenario (Moretti et al., 2008). Sorge and Virolainen (2006) make a distinction between two classes of stress-testing models. In the "piecewise approach", a direct relationship between macroeconomic variables and indicators of financial soundness is estimated (balance sheet models). The estimated parameters of these models can be used later to simulate the impact of severe scenarios on the financial system. Balance sheet models can be either structural or reduced-form. The other class of models is the "integrated approach", in which multiple risk factors (credit, market risk etc.) are combined to estimate a probability distribution of aggregate losses that could arise in a stress scenario.

In this paper, we devise a macro stress test for Albania assessing the impact of the direct and indirect credit risk channels using aggregated banks data. We model the quality of the banks portfolio as a function of macroeconomic and financial variables to identify the systematic credit risk factors, which the central bank should consider in its function of preserving the financial stability. We extend the previous findings in this area in two directions. First, we test whether the relationship between loan quality and its determinants has been altered during the last two years of financial turmoil. Second, given the relatively high concentration in the Albanian banking system, we test if there are significant differences in credit quality responses to changes in financial and macroeconomic variables according bank specific characteristics. This stress test could be used as a satellite to the existing macroeconomic model in the Bank of Albania (BoA), to examine the macroeconomic implications of the scenarios derived by the latter or alternatively, the estimated parameters can be employed in sensitivity analysis.

The paper is structured as follows: In section 2, we conduct a review of the existing literature on macro stress tests in order to identify a suitable strategy for our investigation. In section 3, we discuss previous findings for Albania, identify areas for improvement and present our approach and research hypothesis. In section 4, we explain the empirical estimation and discuss the results. In the section 5, we present our conclusions, limitations of the research and future areas for possible improvement.

2. LITERATURE REVIEW ON CREDIT RISK MODELS

This section looks at the modelling strategies used for stress testing credit risk. By critically reviewing the various stages of the analysis, we identify the advantages and disadvantages of each of the choices made, in order to select a strategy for our own model and acknowledge the possible limitations. The section builds largely on Shijaku and Ceca (2010), in which a more extensive review of the literature is conducted; however, in order to make a direct link to the model and variable selection presented further in the paper, we summarise the main issues.

In a survey of stress tests practices, Cihak (2007) and Foglia (2009) distinguish the following steps in the process: (i) identification of main risk factors and channels in which shocks are transmitted; (ii) the construction of a scenario; (iii) identification of changes that the outputs of the scenarios cause on the institutions' balance sheets and income statements; (iv) performing the numerical analysis; (v) considering any second-round effects; and (vi) summarizing and interpreting the results.

Following the above discussion for the identification in the first stage, a stress event arising from exogenous factors is identified. The stress event can be thought as a shock which affects the domestic economy and which is very large, but still possible. The production of a scenario for the macroeconomic environment may be possible either by using historical information (Blavy, 2006), by using macroeconometric models, which is often the preferred approach of FSAPs or by using VARs and a set of AR equations which explain the joint evolution of macroeconomic and financial variables (Wong, 2006, Van den End et al., 2006 Castren et al., 2009) and/or (iii) pure statistical approaches (OENB).

In cases when macroeconometric models do not include financial sector variables, the stress testing framework is extended to include separate "satellite" models, which transmit the effects of macroeconomic variables to "key" financial intermediation responses (such as credit growth) and, in a third stage, link the latter together with macroeconomic variables to financial sector measures of asset quality and potential credit losses. The losses are then used to derive the buffers of profit and capital under various scenarios. Several studies have modelled default probabilities as non-linear functions of macro variables following Wilson (1997). The main advantage in using structural macroeconomic models lies in the fact that they impose consistency across the predicted values in the stress scenario. Moreover, they may allow for endogenous policy reactions to the initial shock. Scenarios cover a set of macro variables such as GDP, interest rates, and exchange rates, and range from less severe to crisis-type scenarios. In some cases, as reported by Moretti et al. (2008), variables accounting for cross-border lending, foreign currency lending, country exposure, or loan concentrations in general are also included. A major problem of these modelling strategies is that they are primarily devised for "normal business" times and the linearity embedded in them may fail to adequately represent the nonlinear behaviour characteristic of times of stress. Moreover, it is difficult to determine the likelihood of a specific scenario to implement in a stress test (Shijaku and Ceca 2010).

Vector Autoregressions (VARs) or Vector Error Correction models (VECMs) jointly combine the effects of exogenous shocks into various macroeconomic variables, which are then used in the scenario. These can also be extended to include some financial variables and allow for feedback effects (Babouček and Jančar 2005, Chan-Lau, 2006). Usually these models are used as an alternative to macroeconomic models; besides being substitutes for them, they are relatively flexible and produce a set of mutually consistent shocks, although they do not include the economic structure that is incorporated in the macroeconomic modelling approach. Allowing feedback effects between financial distress and the business cycle conforms the financial accelerator theory, which suggests that a decline in net worth in the corporate sector raises funding costs and leads to lower aggregate investment, and in turn, to lower future output. Agency theory also indicates that the incentive for corporations to invest in riskier projects increases as their credit quality deteriorates. In turn, this risk-shifting behaviour leads to higher output volatility (Chan-Lau, 2006). Once the VAR system is estimated, the sensitivity of default probabilities to shocks to the different economic variables can be quantified using impulse response analysis. Since IR analysis will depend on the restrictions used in the contemporaneous effects matrix, the ordering should reflect the speed of adjustment of the different variables to the shocks, which can be determined either from theory or empirical analysis (Hoggarth, Sorensen, and Zicchino, 2005).

A third approach is a purely statistical approach in which macroeconomic and financial variables are modelled through a multivariate t-copula to devise a scenario. This approach has the advantage of identifying the marginal distributions, which can be different from the multivariate distribution that characterizes the joint behaviour of the variables. In addition, the relationship between the macroeconomic variables and the financial variables displays tail dependence (i.e., "correlation" increases when the system is under stress). The main disadvantage lies in the fact that a purely statistical approach does not identify the key transmission channels that link the shock with its effect on the degree of credit risk.

In a second stage, macroeconomic scenarios are mapped into the financial variable proxing the credit quality or the probability of default. Typically this variable is the NPL ratio or the LLP, in absence of the former. These regression models include loan performance measures such as non-performing loans (NPL) or loan loss provisions (LLP) as dependent variables; explanatory variables typically include a set of macroeconomic indicators, sometimes bank/industry specific variables such as measures of indebtedness or market-based indicators of credit risk depending on the level of aggregation. Variables such as economic growth, unemployment, interest rates, equity prices and corporate bond spreads contribute to explaining default risk. Two points are worth stressing: first, the estimation regards different degrees of disaggregation such as by industry, type of borrower (sector), bank or individual borrower. Large concentration of the total portfolio hence calls for a careful selection of the determinants, favouring the group/industry specific ones over the usual broader macroeconomic aggregates. Second, to capture the credit crunch phenomena, or in more general terms the functioning of the credit channel, there should be some feedback effects, which link the credit quality with the supply of loans and as a final result endogenise economic/industry growth. Alternatively to historical NPL or LLP data, micro-level data related to the default risk of the household and/or the corporate sector can be used (Cihak, 2007).

Blaschke et al. (2001) models unexpected credit losses arising from external shocks by empirically estimating the determinants of observed default frequencies as captured by NPL ratios, which can be interpreted as a default frequency ratio. He proposes regressing NPL/total assets on a set of macroeconomic variables, including the nominal interest rate, inflation, GDP growth and percentage change in terms of trade. In addition, he proposes estimating this equation disaggregated NPL data across homogenous groups of borrowers. If we assume linearity in the risk exposures, the volatility of the ratio of NPLs to total assets can be expressed as a function of the variances of the regressors and the correlations between them; however, he recommends using Monte Carlo simulation techniques when this assumption is relaxed.

Hoggarth, Sorensen, and Zicchino (2005) use a VAR system to analyze the impact of macroeconomic factors on UK banks' loan write-offs, both at the aggregate and at the sectoral level. The economic variables included in their model are the output gap, the annual rate of retail price inflation, and the nominal bank short-term interest rate. They show that the write-off ratio to aggregate loans declines in response to positive output gaps or unexpected increases of the short-term interest rate. Positive inflation surprises, however, reduce the write-off ratio, as it is associated with positive economic growth surprises. The authors also report forecasting equations for write-off ratios for non-financial corporate and household loans. These equations include as additional variables the annual house price inflation and the real income of the household sector. In the case of the non-financial corporate sector, the debt-to-market value of equity is also included. In the case of the household sector, mortgage arrears are included as a financial distress indicator.

Castren et al. (2009) study the effects of macroeconomic shocks on VaR for different banks through two steps. First, they estimate a GVAR (Global Vector Autoregression) model to obtain impulse responses for real Gross Domestic Product (GDP), real stock prices, inflation, short-term and long-term interest rates and the EUR-USD exchange rate. In the second step, the results of these macroeconomic shocks are regressed on the sector-specific probability of default (PD) values.

Van den End et al. (2006) develop reduced-form balance sheet models to estimate the impact of macro variables on LLPs using data for the 5 largest Dutch banks. In modelling credit risk, they use two basic equations. First, they estimate the relationship between borrower defaults and real GDP growth, long-term interest rates, short-term interest rates and the term spread. In a second step, they develop a fixed effects regression model explaining LLPs using the default rate together with some macro variables. By using different constant terms, the structural differences in the level of provisions for each bank are taken into account. In the equations, nonlinear functions of the default rate and the ratio of LLPs to total credit – the logit – are used to extend the domain of the dependent variable to negative values and to take into account possible non-linear relationships between the macro variables and LLPs.

Gerlach et al. (2004) estimate a panel data model, which relates the NPLs for each bank with a number of macroeconomic and financial factors as well as the individual bank's characteristics. The set of macroeconomic variables includes growth and inflation, while that of the financial variables includes interest rates and changes in property prices, together with bank-specific variables, such as the asset size and sectoral concentration in lending. To test whether macroeconomic and financial variables have the same impact on all banks, they allow for interaction terms of macroeconomic and financial variables across small, medium and large banks.

For the simulations, Van den End et al. (2006) use the version in Sorge and Virolainen (2006), who simulate default rates over time by generating macroeconomic shocks to the system. The evolution of the related macroeconomic shocks is given by a set of univariate autoregressive equations of order 2 (AR(2)) or, alternatively, by a VAR model. The latter model takes into account the correlations between the macro variables. Van den End et al. (2006) use the vector of innovations, and a variance-covariance matrix of errors, in the equations governing the macroeconomic variables and in the default rate and LLP/credit equations. By using a Cholesky decomposition of the variance-covariance matrix, they are able to obtain correlated innovations in the macroeconomic factors, default rate and LLP/CRED and obtain future paths of the macroeconomic variables, default rate and LLP/CRED by simulation with a Monte Carlo method. With these outcomes and the information on outstanding exposures of the banking sector, the distributions of credit losses are determined. The simulated distributions of losses are skewed to the right, due to the correlation structure of the innovations.

Wong (2006) studies the effects of macro variables on total credit risk and mortgage credit risk in Hong Kong. The model involves the construction of two macroeconomic credit risk models, each consisting of a multiple regression model and a set of autoregressive models, which include feedback effects from the default rate on bank loans to different macroeconomic values estimated by the method of seemingly unrelated regression. The stress testing framework uses Wilson (1997a, 1997b), Boss (2002) and Virolainen (2004) and allows for a more realistic dynamic process, in which the macroeconomic variables are mutually dependent and, most importantly, explicitly captures the feedback effects of bank performances on the economy by letting the macroeconomic variables depend on past values of the financial variables. The set of equations define a system of equations governing the joint evolution of macroeconomic performance, associated default rates and their error terms. By taking non-zero error terms in the default rate equation and allowing for randomness in the behaviour of the macroeconomic variables with the various stochastic components being correlated, he takes into account the probabilistic elements and uses Monte-Carlo simulation to obtain frequency distributions for the default ratios in various scenarios. The default rate is hypothesised to depend on the real GDP growth of Hong Kong, the real GDP growth of mainland China, real interest rates in Hong Kong and real property prices in Hong Kong. Nonlinearities are taken into account by using a logit transformation of the NPL ratio and first differences are used to avoid spurious regression in the presence of nonstationarity in the variables.

Though there is an extensive use of loan performance data to measure credit quality in the literature, several considerations apply (Foglia, 2009). Loan performance as measured by NPLs or LLPs is a "retrospective" indicator of asset quality, in that it reflects past defaults. Provisioning rules, in addition to varying across countries, may also pose a problem for "within country" estimation as they may vary with changes in credit risk in time, bank-specific factors or the use of income-smoothing policies.

One caveat in applying macroeconomic-based models is the necessity for the data series span to contain at least one business cycle, otherwise the model would not capture completely the impact of the business cycle on default probabilities (Chan Lau, 2006). There is empirical evidence of 2 business cycles in Albania between 2004-2009 in Kota (2007).

Another frequent problem in interpreting macroeconomic models of credit risk concerns the use of linear statistical models: in the majority of cases, this is taken into account by using nonlinear specifications, such as the logit and probit transformation to model the default rate. These transformations extend the domain of the dependent variable to negative values and take into account possible nonlinear relationships between macroeconomic variables and the default rate that are likely in stress situations. Several other studies on stress-testing models take nonlinearities into account by including squares and cubes of the macroeconomic variables (Drehmann et al. 2005).

Finally, aggregate economic data are usually reported at substantial lags and subject to revision rendering macroeconomic-based models unsuitable for tracking rapidly deteriorating conditions of a firm or sector.

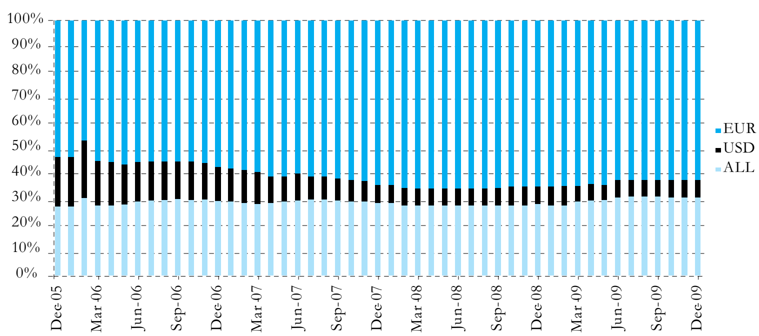
3. THE MODEL AND DATA SELECTION

A previous study for the macroeconomic determinants of the probability of default of a loan for Albania was done by Shijaku and Ceca (2010). By using the Wilson (1997) framework, they find that the nonperforming loans rate, proxing the probability of default, is determined by the real growth rate, the foreign interest rates, and the exchange rate versus the euro. The reason that the nonperforming loan rate is influenced by the "foreign" variables is the large foreign currency share of loans in the Albanian banking system.

We extend the model in Shijaku and Ceca (2010) to consider the following issues:

First, different factors may be relevant for different currency denominated loan portfolios, hence they should be investigated separately. The introduction of the new regulation for the credit risk management by the Bank of Albania increases the opportunity cost for a bank which invests in foreign currency loans; hence, a gradual shift towards the ALL denominated portfolio is to be expected. In terms of transmission channels, this would reinforce the central bank's policy shocks transmission, and on the other hand influence the credit quality more significantly. In this context, it would be interesting to test if the domestic interest rate shocks affect the credit quality. Figure 1 below shows that a large percentage of credit is in fact in Euro, while ALL and USD constitute a smaller part.

Figure 1: Currency composition of the loan portfolio



Source: J P Morgan, 10 July, 2009

Second, in the last two years, there has been an apparent break in the relationship between the foreign money market rates and the interest rates that banks charge on foreign currency loans. Thus, differently from Shijaku and Ceca (2010), we test if the relevant interest rate is the rate charged on loans rather than the reference rate.

Third, banks are likely to react differently to extreme developments in the scenarios, dependent on a number of individual characteristics such as size, risk aversion, type of business etc. To account for these differences and following Van den End (2006), we use a fixed effects model, which captures the bank specific factors in the constant term.

Fourth, the last two years of financial turmoil have seen both a quite large increase in the nonperforming loans rate, as well as an increased role of the financial intermediation. We test if the framework proposed in Shijaku and Ceca (2010) still captures nonlinearities in the relationships between variables and provide a consistency check on the parameters. In particular we are interested in the exchange rate behaviour, which for the period examined by Shijaku and Ceca (2010) has been quite stable. Cihak (2007) argues that in an extreme case when considering a scenario that involves de-pegging in a country with a currency board regime, models estimated on past data cannot capture the impact of the exchange rate change on credit risk, hence other approaches, such as calibration may be more appropriate. Though this is not exactly the case for Albania, large devaluations have not yet been experienced.

3.1 THE DATA

The period considered in this study is 2005Q1-2009Q4, which is 6 years shorter than in Shijaku and Ceca (2010). The reason for that is that the major bank of the banking system was allowed to give loans only in 2004, action which changed the behaviour of other banks as well. We include a balanced panel of 10 banks excluding the small banks which are not active in the credit market. Moretti et al., (2008) argue that including all banks rather than a subsample has the obvious advantage of being more comprehensive, hence, the approach is more adapted to supervisors, who aim the supervision of all institutions. However, when the interest is in macroprudential issues it may be sufficient to include only the systemically important institutions. In our case, the exclusion of the other institutions is also practical for reasons of computational complexity, since the smaller banks have a limited lending activity.

The model follows Shijaku and Ceca (2010) and considers the relationship between the NPL ratio, proxing the probability of default, as the dependent variable, and the real growth, the exchange rates of ALL versus the USD and the EUR, and interest rates as explanatory variables. Explanatory variables are entered with a lag structure selected by the data. We consider the logit transformation of the NPLR separately for ALL and FC portfolios as the dependent variable. This is done in order to extend the range of the dependent variable from [0,1] to R and also to capture nonlinearities in the relationship between NPL ratio and the explanatory variables. The exchange rates considered are both the USD and EUR exchange rates versus the ALL. Interest rates are the banks' weighted average new loan rates for each quarter in ALL, USD and EUR respectively. Money market rates such as the Treasury Bills rate, Euribor and Libor are also considered. Dummy variables for the first years for some of the banks are included to capture the high fluctuations in the NPL rate as a result of an initial small number of borrowers.

3.2 METHOD OF ESTIMATION AND SOME TECHNICAL ISSUES

Following Van den end (2006) and Gerlach et al. (2004) for our estimation, we have selected a fixed effects model in the form of

$$dy_{it} = a_i + bx_{it} + \gamma D + e_{it}$$

where dy is the first difference of the logit transformation of the NPL ratio (separately for the ALLand FC credit portfolio), and X is the set of the explanatory variables, all of them in first difference with the exception of real growth, and D includes dummy variables. For the exchange rates, we take the first difference of the logarithm. Previous studies for Albania have concluded that the variables transformed as such are I(0). Formal unit root tests are not carried out because of the short estimation sample.

This formulation allows heterogeneity over cross section units via the intercepts while treating slopes as identical over all units. The term e_{it} captures general ignorance of determinates of dy_{it}, while the a_i captures specific ignorance about bank i. Differently from Shijaku and Ceca (2010) is this first specification: we do not include a lagged dependent variable as it would make the fixed effects estimators biased. We prefer to choose a FE model over a RE model since our results apply only to the units in the study and we do not want to generalise outside the sample. Thus, since N is fixed, FE is more suitable.

Differencing the data minimises autocorrelation and heteroskedasticity, thus improving the chances of correct statistical inference, but it also reduces the absolute size of inter-group variability causing fixed effects to disappear. Thus, we also estimate the model in levels. Richard and Sollis (2003) argue that the unit root problems can be less severe in panel data and recommend the use of a FE in the levels subject to a time trend or a lagged dependent variable to alleviate autocorrelation. Wooldrige (2009) argues that when T is large, when dealing with unit root processes with first differencing, we can apply the central limit theorem. Normality in the idiosyncratic shocks is not needed, and heteroskedasticity and serial correlation can be dealt with by adjusting standard errors for serial correlation and heteroskedasticity. Inference with the fixed effects estimator is potentially more sensitive to nonnormality, heteroskedasticity and serial correlation in the idiosyncratic errors. On the possibility that one of the explanatory variables is not strictly exogenous, for example when a lagged dependent variable is included, the FE estimator likely has substantially less bias than the first difference estimator. The resulting bias in the first difference estimator does not depend on T while the bias in the FE estimator tends to zero at the rate 1/T. In conclusion, Wooldrige (2009) advises to report both results and, when they differ substantially, to try to determine why they differ. In our case, the time series dimension is not very small relative to the cross sectional dimension (N=10 T =20). The bias arising from the inclusion of a lagged dependent variable could be sizeable as argued by Judson and Owen (1999). Various methods have been developed to address this issue, including the use of instrumental variables leading to consistent estimates (Anderson and Hsiao, 1981), a GMM procedure that is more efficient than that of Anderson and Hsiao

(1981) proposed by Arellano and Bond (1991) and Arellano and Bover (1995). In future work, we intend to explore whether these techniques improve our estimation.

4. ESTIMATED RESULTS

Our estimations did not find evidence of a satisfactory economic and statistical model for the portfolio in ALL neither in the first differenced model nor in the levels model. We think that a possible explanation for that is its limited use (only 30% of the total portfolio in 2008-2010), as well as the high concentration of it in some of the banks. The investigation of this issue perhaps requires a further disaggregation according to the use of loan, i.e. industry or economic sector, and a further reduction in the number of banks included in the study.

The results for the first differenced model are presented in Box 1. We have excluded insignificant variables from our specification[1]. The coefficients have the correct (expected) sign and we note that the real growth coefficient, although small, is much more important than in previous findings of Shijaku and Ceca (2010). This can be considered as in line with our expectations: the data included in Shijaku and Ceca (2010) displayed very little variation as regards real growth. Other statistically significant variables are the interest rate for loans in USD and the exchange rate versus the USD both current and lagged once. The Euro-denominated loans related variables surprisingly were not significant though this was a finding in Shijaku and Ceca (2010) and is somehow suggested by the last developments in the credit quality. We suspect that perhaps the variability in this explanatory variable is reduced by overdifferencing. Data inspection shows that after the transformations the USD exchange rate displayed much more variability than the Euro exchange rate. However, the NPLs in USD accounted only for about 5% of the total NPLs in 2009, while the NPL in Euro amounted to nearly 60%. Another point worth stressing is that the $\boldsymbol{\alpha i}$ do not vary significantly, hence evidence of banks reacting differently to economic shocks as a result of their specific characteristics could not be found.

1 Plots of residuals indicated nonnormality in the residuals, however OLS-based estimators are still unbiased and relatively the most efficient. White corrected standard errors were used to overcome the problem of heteroskedasticity.

BOX 1 First differenced model

Dependent Variable: DYVAL
Sample: 2005Q2-2009Q4 *Periods included: 19*
Cross-sections included: 10 *Total panel (balanced) observations: 190*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.506	0.138	-3.667	0.000
RGDP(-2)	0.057	0.020	2.880	0.005
DUM	-7.564	0.499	-15.158	0.000
DUMRB	5.071	0.497	10.199	0.000
DLNUSD	-2.201	0.918	-2.399	0.018
DLNUSD(-1)	-2.221	0.917	-2.422	0.017
DKRUSD	-0.029	0.013	-2.144	0.033
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.696		Mean dependent var	-0.128
Adjusted R-squared	0.670		S.D. dependent var	0.839
S.E. of regression	0.482		Akaike info criterion	1.459
Sum squared resid	40.444		Schwarz criterion	1.733
Log likelihood	-122.624		F-statistic	26.547
Durbin-Watson stat	2.273		Prob(F-statistic)	0.000

DYVAL is the first difference of the logit transformed NPL ratio, RGDP is the real growth rate, DUM and DUMRB are two dummies capturing the starting period for two of the banks, DLNUSD is the first differenced logarithm of the exchange rate versus the USD. And DKRUSD is the first diffrerenced loan interest rate for USD loans for each bank.

bank	1	2	3	4	5	6	7	8	9	10
αi	0.09	0.142	0.012	-0.242	-0.027	0.021	-0.108	0.045	0.117	-0.051

The ai are bank specific constant terms.

In Box 2 we report the estimates using levels. A lagged dependent variable is also included.

BOX 2 Levels model
Dependent Variable: YVAL
Sample: 2005Q3-2009Q4 *Periods included: 18*
Cross-sections included: 10 *Total panel (balanced) observations: 180*

Variable	Coefficient		Std. Error	t-Statistic	Prob.
C	51.310	12.035	4.263	0.000	51.310
YVAL(-1)	0.532	0.038	13.943	0.000	0.532
LNEUR(-1)	-10.266	2.464	-4.166	0.000	-10.266
EURIB(-2)	-0.102	0.051	-2.024	0.045	-0.102
Effects Specification					
Cross-section fixed (dummy variables)					
R-squared		0.728	Mean dependent var		3.363
Adjusted R-squared		0.708	S.D. dependent var		1.041
S.E. of regression		0.562	Akaike info criterion		1.756
Sum squared resid		52.794	Schwarz criterion		1.986
Log likelihood		-145.019	F-statistic		37.235
			Prob(F-statistic)		0.000

YVAL is the the logit transformed NPL ratio, RGDP is the real growth rate, LNEUR is the logarithm of the exchange rate versus the EUR. and EURIB is the 12 months EURIBOR interest rate.

bank	1	2	3	4	5	6	7	8	9	10
αi	-0.122	0.5	0.214	-0.01	-0.103	0.219	-0.298	-0.426	0.07	-0.044

The ai are bank specific constant terms.

The estimation in levels yielded significant response of the dependent variable to EURO-related variables, namely the exchange rate and the 12 months Euribor rate. The real growth however was not significant.

5. CONCLUSIONS AND POSSIBLE FURTHER AREAS OF RESEARCH

The analysis so far has concentrated on detecting a model of the response of credit quality to macroeconomic shocks, using banks panel data. Though acknowledging the shortcomings related to lack of robustness in the results, some important findings emerge, which can be further investigated using more sophisticated estimation techniques and longer data series.

First, there is evidence of a stronger response of the credit quality to GDP shocks. Second, no evidence could be found on the response of the ALL portfolio, suggesting that the credit channel may still be weak for transmitting monetary policy if no effects on the exchange rate are assumed. Third, the exchange rates and reference rates in foreign currency lending were found to be important determinants of credit quality. Fourth, no significant differences were found among banks responses; hence, the assumption of a similar response of the credit portfolio to macroeconomic shocks assumed until present by the stress testing practices could be grounded.

Further issues still remain to be considered. One of them is the disaggregation of the credit portfolio by industry or economic sector rather than by banks. A second one is the use of more sophisticated techniques which could avoid the bias and improve the efficiency of the parameter estimates.

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MACROECONOMIC DETERMINANTS OF CREDIT RISK: THE CASE OF ALBANIA

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ABSTRACT

This study aims to examine the determinants of nonperforming loans in the Albanian banking system, both for total loans and their respective subcategories (loans to businesses and to individuals). The paper is motivated by the hypothesis that there are several macroeconomic factors affecting loan portfolio quality and that these effects may vary for different loan types. Nonperforming loans of businesses are affected by factors that differ from those affecting loans to individuals. Meanwhile, there are common factors that affect the portfolio of total loans as well as specific loan categories, although the intensity of that impact varies by category.

Keywords: credit risk, macroeconomic determinants, Albanian banking system

JEL classifications codes: G21

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I. INTRODUCTION

In recent years, the Albanian banking system has been oriented towards a combination of high risk-high return activities. In the first few years following the year 2000, Albanian banks were more inclined to invest in low-risk activities - e.g. investments in treasury bills – while currently they have already committed about 50% of their assets to loans. The favourable macroeconomic conditions that characterized the Albanian economy during the years prior to the global financial crisis, positively affected lending to entities that needed loans, and were associated with low levels of nonperforming loans (NPL). However, this situation shifted in 2008 when lending began to slow down, while the growth rate of nonperforming loans accelerated.

In the circumstances where banks have nearly stopped granting new loans, it is natural that the nonperforming loans ratio to total outstanding loans increases. But, the increase in this ratio is not only due to slower growth of total credit portfolio, but it is rather caused by the faster pace of growth in NPLs (see Figure 1).

The recent financial crisis confirmed the importance of the actions taken by policymakers to preserve financial stability. In Albania, the crisis was more evident in the deterioration of macroeconomic indicators rather than in financial ones. It is worthwhile mentioning that despite the problems that some of the indicators in the banking system displayed, none of the banks approached the default threshold. This was not only due to the measures taken by the banks, but also due to a prudent policy by the Bank of Albania, which preceded the crisis and continued to become stronger in the course of it.

Since an increase in credit risk was observed from the beginning of the financial crisis, it was necessary for the Bank of Albania to be more vigilant of potential weaknesses of our banking system. In this context, we were motivated to undertake this study in order to identify the economic macro-variables that are statistically important in determining credit risk that banks face during their activity. By use of econometric evaluations, the goal was to measure the impact that each indicator has over the solvency of borrowers in the Albanian banking system. It is believed that the evaluation of this relation is important in terms of macroeconomic policies' decision-making and also in terms of using the results for stress-testing in order to prevent unfavourable situations and to reduce credit risk.

Out of all risks that banks face, credit risk is considered as the most prominent and important. Usually, it is believed that banks set aside at least half of their capital to protect against losses arising from credit risk[1]. According to Moretti et al. (2008), focusing on credit risk during the Financial Sector Assessment Programs (FSAP) has been a key element, because in most countries it still remains the main source of risk for banks, which is also confirmed by the stress tests performed. According to a banking survey made by Bozdo and Kalluci (2006), credit risk accounts for about 45% of all risks faced by Albanian banks. This further reinforces the importance of the study of credit risk and it strongly motivates us to identify the impact of different variables over this type of risk. Thereby, it is possible for this risk to be predicted and managed better.

Blaschke et al. (2001), in a discussion paper of the IMF, proposed a method for measuring credit risk through nonperforming loans to total assets ratio. This ratio is then regressed against some macroeconomic factors such as interest rates, inflation and the growth rate of the real GDP or changes in commercial terms. The obtained coefficients represent the elasticities and the semi-elasticities, and can be used later for performing stress-tests, while giving an assessment of the sensitivity of borrowers towards key macroeconomic indicators.

Following the model of the above authors, Kalirai and Scheicher (2002) and Boss (2002) have identified the link between credit risk and a range of indicators in the Austrian economy, which are grouped into six categories. Kalirai and Scheicher (2002) found significant links between provisions (which are used to measure credit risk) and industrial production, M1 monetary aggregate, the business climate index, short-term nominal and real interest rates, stock markets indices and exports.

Keeton and Morris (1987) have found that the local economic conditions affected the volatility of loan losses. Fuentes and Maquieira

1 According to Financial Stability Institute. Look at www.fsiconnect.org.

(2003) show that interest rates have a higher effect than the business cycle on the NPLs. In a study conducted by IMF for Spain (2006), it is shown that the exchange rate, the unemployment rate and the housing prices are important in determining the level of nonperforming loans.

For Albania, Shijaku and Ceca (2011), find significant correlations between changes in the lek/euro exchange rate, the euribor rate, and a small effect of economic growth over the NPL ratio.

II. METHODOLOGY AND DATA ANALYSIS

II. 1 CREDIT RISK IN THE ALBANIAN BANKING SYSTEM

Since 2005, lending in the Albanian economy has started to grow at a very rapid pace. However, in the past two years, as a result of the financial crisis that affected the entire world's economy, the banks operating in Albania slackened the lending pace. During this period, another phenomenon noticed was the increase in nonperforming loans[2] (in credit risk – the risk that the borrower or the counterparty fails to meet its obligations).

Thus, through this study we will try to model the factors that affect this kind of risk more, looking it as a whole, as well as within two main sub-categories of borrowers: businesses and individuals. The amount of loans granted to the first category has decreased from 83% (December 2001) to 63% (December 2009), meanwhile during the same time period, the share of loans granted to individuals has increased from 15% to 32% of outstanding loans. The loans granted to the public sector have been almost trivial.

There are several ways to measure credit risk: through the ratio of nonperforming loans (e.g. Blasche et al. (2001)), provisions that banks set aside to cover loan losses (e.g. Kalirai and Scheicher, 2002)), the probability of default (e.g. Boss, 2002), etc. Depending on the availability of these indicators, different authors have used different methods to measure credit risk.

2 According to the definition of the "Bank Accounting Manual" (1998), the concept "Non-performing loans", includes the loan categories "Substandard", "Doubtful" and "Loss".

One form of measure for credit risk is the ratio of nonperforming loans. It should be noted that in recent years, this ratio has been increasing in line with increased lending (see Figure 2). A rapid growth has also been noticed in the portfolio of nonperforming loans, especially during the last two years, which have been affected by the financial crisis and the deterioration of macroeconomic indicators. The problems that borrowers display in their solvency may be caused by various factors, which can be related to client's personal characteristics, as well as to macroeconomic factors that affect the whole economy.

II. 2 DATA AND METHODOLOGY

Our study covers quarterly data for the 2002Q2-2009Q4 period. The equations estimations are based on OLS and, as the dependent variable, we have considered the credit risk, measured by the ratio of nonperforming loans to total outstanding loans. The interest rates, the inflation rate, the unemployment rate, the lek/euro exchange rate and the indices are used in nominal terms; while the growth rate of exports, of the monetary aggregates M1 and M3, of real effective exchange rate, of the remittances and of GDP, have been expressed in real terms. Table 1 displays the descriptive statistics of the variables.

After performing the stationarity tests[3], we observe that the time series of the data included in the equations need to be integrated in the first order to lose their unit root. For this reason, variables in the equation are differenced one time. The coefficients for log[4] indicators will be interpreted as semi-elasticities, or as a reaction of the change of nonperforming loans compared to the percentage change in the explanatory variables.

We will rely on the study conducted by Kalirai and Scheicher (2002) for the modelling of macroeconomic factors that affect credit risk; it is comprehensible that there will also be some differences, which reflect the characteristics of the Albanian economy. These authors have modelled the relation between a measure of credit risk and the macroeconomic factors via an OLS regression. They use

3 See Table 2 for Unit Root Tests.

4 See Table 3 to understand which variables are in logarithms.

the total loan loss provisions to total loans ratio as the dependent variable, as data on NPLs are not available on quarterly basis. In our case, the data is available, so we have used the NPL ratio as the dependent variable. In this study, the specific conditions of borrowers will not be taken into account, but we will assume that the credit risk that threatens banks is associated with the macroeconomic environment where they and their clients operate. In this context, without intending to enter into specific elements of the individual characteristics of borrowers (also due to the lack of such data), there is great interest in identifying the macroeconomic factors that may affect the growth level of nonperforming loans.

In order to distinguish the explanatory variables that will be included in the equation, we group them into six categories:

1) Cyclical Indicators

This category includes general macroeconomic indicators that are thought to affect the solvency of borrowers. Thus, the gross domestic product and the output gap[5] are expected to be negatively related to nonperforming loans. During periods of economic growth, borrowers are financially better off and tend to be paying the loan instalments regularly. Consequently, the level of nonperforming loans decreases.

2) Price Stability Indicators

Inflation, as an indicator of price stability, is expected to be negatively related to nonperforming loans. This happens because during periods of high inflation, the real value of borrower's payments starts to decrease, which helps them repay their obligations. This is accompanied by the improvement of loan portfolio quality. In the case of Albania, in the course of the years taken into consideration in this study, the inflation rate has been stable and within the bands defined by the monetary authority. Its low variability near the 3% level makes borrowers' solvency to be more affected by the nominal interest rate than by the real interest and/or inflation rate. Furthermore, referring to the fact that the largest share of loans is denominated in foreign currency, we do not expect a considerable effect of domestic inflation on the quality of total loans. Credit risk is

5 Calculated as actual GDP – potential GDP.

also thought to be negatively affected by the growth rate of M1 and M3 monetary aggregates, because the higher the amount of money in circulation, the better the macroeconomic situation becomes and the level of nonperforming loans is expected to decrease.

3) Household Indicators

Despite the variables involved in Kalirai and Scheicher (2002), due to the absence of most variables included in this category for the case of Albania, we included four indicators that are available and are expected to affect credit risk. A higher level of unemployment means more people will have solvency difficulties, which will result in an increase in nonperforming loans, so a positive correlation would be expected between the unemployment rate and nonperforming loans. Two new variables included in our study are house price index and rental price index[6], which we think will affect nonperforming loans. Financial and real estate assets are considered as a buffer of unexpected shocks. Although real estate assets are not as liquid as financial assets, they can still help overcome problems in repaying loans. For this reason, an increase in the house prices is associated with an increase in the loan repayment ratio due to the wealth effect. Even if the borrowers are having troubles making payments, they will prefer to sell their property rather than default (Havrylchyk, 2010). On the other hand, an increase in rental prices may cause an adverse effect compared to the increase in house prices. If rental costs rise, this will cause damage to the household budget, leaving less money available for repayment of loan instalments (that may be a consumer loan). In this case, it is expected that the level of unpaid loans will increase.

Remittances are another indicator that is supposed to have an impact on the ability of borrowers to repay credit loans. Financial flows from emigrants abroad make up about 10% of the country's GDP, and they represent an important source of income for Albanian households. Thus, the inclusion of this indicator is of particular importance in the equations to be evaluated. Normally, it is expected that an increase in remittances will reduce the level of nonperforming loans, since borrowers will have more money available, and this will help them make regular payments on their credit instalments. According to Frashëri (2007), nearly 6.6% of remittances are destined for intermediate

6 These two indices are calculated by the Bank of Albania.

consumption, which includes expenditures for loan repayments. This is a significant indicator for the way remittances are channelled, but its low value may not give statistically significant results in our equations. On the other hand, according to de Zwager and Gëdeshi (2009), only 2.7% of Albanian emigrants have been granted a loan in Albania, compared to 31% who have been granted a loan in the country of migration. With this evidence, we understand that the largest share of emigrants' remittances that are channelled for loan repayments goes for the settlement of loans of their relatives, rather than for the repayment of emigrants' loans.

4) Business Indicators

Kalirai and Scheicher (2002) have used several indicators related to business, for instance: investment expenditures, index of business climate, productivity per employee, the growth rate of bankruptcies, etc. In Albania's case, these data either do not exist, or are extended in a short time frame, which forces us to exclude them from the analysis. For this reason, we consider the industry confidence indicator, an index calculated by the Bank of Albania, based on data taken from the periodical surveys carried out with businesses of this group. An increase in the index indicates higher expectations for future business activities, thus resulting in better solvency for the repayment of obligations. As a result, we expect a negative correlation with the variable that measures credit risk.

5) Interest Rate Indicators

Interest rates, as direct costs of borrowing, are very important factors that affect the borrowers' solvency. Since 3, 6 and 12-month T-bill rates and also 12-month interest rates of Euribor and Libor are used by Albanian banks as the base rates for calculating the interest rate of loans granted in Albanian lek, euros and US dollars (a profit margin is added and is specific to each bank), these indicators will be included in the equations to be tested. An increase in interest rates means higher instalments to be paid and higher chances for borrowers (either businesses or individuals) to encounter difficulties in repaying their loans. Therefore, we expect a positive sign for the relation between interest rates and nonperforming loans.

6) External Indicators

This category includes external indicators that affect the economy in general, and the banking system in particular. These variables are related to international trade. A drop in exports for a business, whose main activity is based precisely on exports, means difficulties in making scheduled payments, thus resulting in more nonperforming loans. Consequently, the link between credit risk and exports will be negative.

The link between nonperforming loans and the exchange rate is ambiguous. On the one hand, a devaluation of domestic currency will increase the level of exports and businesses will be more capable of paying off credit. On the other hand, if loans are denominated in foreign currency[7] and borrower's income is in lek, a devaluation of domestic currency will result in a higher amount to be paid in lek, leading to a deterioration of the credit portfolio's quality. Thus, the relation with the exchange rate may be positive or negative. In this study, we will include the lek/euro exchange rate (since the majority of foreign currency loans are denominated in euro) and the real effective exchange rate (REER).

III. RESULTS

In this study, we estimated not only the relation between total nonperforming loans ratio and macroeconomic indicators, but also the relation between these variables and the performance of solvency of two main subgroups of borrowers: businesses and individuals.

III. 1 THE RELATION BETWEEN TOTAL CREDIT RISK AND MACROECONOMIC FACTORS

Initially, we estimated through 18 univariate equations[8] the impact of each explanatory variable on nonperforming loans. We used the NPL to total loans ratio as a dependent variable in our equations. The results derived from the equation are presented in Table 5. After identifying the statistically significant indicators that affect the dependent variable in the individual equations, we included additional

7 It is worth mentioning that 70% of the loan portfolio of the Albanian banking system is in foreign currency.

8 See Table 3.

indicators that are considered significant for their possible impact on nonperforming loans. These steps are also pursued by the authors to whom we are referred. Hereby, the following multivariate equation was derived:

$$\Delta NPL_t = \alpha_1 + \alpha_2 \cdot \Delta NPL_{t-1} + \alpha_3 \cdot \Delta TB\_3_{t-2} + \alpha_4 \cdot \Delta TB\_12_t + \alpha_5 \cdot \Delta \log(M3)_t + \alpha_6 \cdot \Delta \log(RENT)_t + \alpha_7 \cdot \Delta \log(EX)_t + \alpha_8 \cdot \Delta \log(REER)_{t-4} + \alpha_9 \cdot \Delta \log(HOUSE)_t + \varepsilon_t \quad (1)$$

Where:

- NPL – onperforming loans to total outstanding loans ratio;
- TB_3 – 3-month T-bill interest rate;
- TB_12 –12-month T-bill interest rate;
- M3 – monetary aggregate M3;
- RENT rental price index;
- EX – exports;
- REER - real effective exchange rate;
- S HOUSE - house price index;
- ε_t - error term;
- (t-n); where *n* (which takes values between 0 and 4) is the number of lags of variables entered in the equation.

The results generated from equation (1) are presented in Table 5.

What can be observed is that some variables that do not show significant correlation with the dependent variable in the individual equations become significant when interacting with other variables in the multivariate equation.

The results of the equation show that the increase in the nonperforming loans ratio is caused by a range of macroeconomic indicators. These are factors that are expected to affect credit risk. On the right hand side of the equation, we included the lagged dependent variable as well, as it is thought that the behavior of an indicator in a certain moment is also affected by its past behavior. It may be viewed that the lagged dependent variable is significant in explaining credit risk. Interest rates of 3 and 12-months T-bills have considerable effects in the increase of the nonperforming loans ratio, correlated (as predicted) with a positive sign. While the first affects the dependent variable after two periods, the second one acts simultaneously on bad loans. We intentionally included in the equation these two types of T-bill interest rates, as both serve as base rate for determining the credit interest rates by banks, according to their specific internal policies. An increase by 1 pp in the 3-months T-bills interest rate will cause an increase by 0.37 pp in the NPL ratio after 6 months. A considerable positive effect has the growth rate of the broader money aggregate M3, which for each nt increase, induces a decrease by 0.15 pp in the nonperforming loans ratio. The sign on REER[9] in relation to loan portfolio quality is positive, which means that a nt depreciation of domestic currency in real relative terms, increases the NPL ratio by 0.11 pp after four quarters. Even though the effect of exports in improving portfolio quality is statistically significant and has the expected sign, their impact on the dependent variable is less than the one caused by the variables discussed above. A nt increase in exports decreases the nonperforming loans ratio by 0.02 pp. Trivial but statistically significant effects have the indices of house and rental prices in the NPL ratio, as well. As foreseen, the increase in house prices pulls down the level of unpaid loans, so long as the borrowers are economically better off and able trepay back their loans. The opposite is observed with rental prices, where an increase in rent appears to affect loan portfolio quality negatively.

III. 2 RELATION BETWEEN CREDIT RISK OF BUSINESSES AND MACROECONOMIC FACTORS

As was presented above, the loans granted to businesses make up over 60% of total loans portfolio. Considering this structure of loans portfolio, we generated the ratio of businesses' nonperforming loans to total loans granted to this group. This new ratio acts as the dependent variable in equation (2). Table 5 presents the results of this equation, where we may identify the variables that affect credit risk of the business sector.

$$\Delta NPL\_B_t = \beta_1 + \beta_2 \cdot \Delta NPL\_B_{t-1} + \beta_3 \cdot \Delta TB\_3_{t-2} + \beta_4 \cdot \Delta \log(M3)_t + \beta_5 \cdot \Delta \log(EX)_t + \beta_6 \cdot \Delta \log(REER)_{t-4} + \beta_7 \cdot \Delta GDP\_G_{t-2} + \varepsilon_t \qquad (2)$$

9 An increase in REER implies a depreciation of the domestic currency. For a detailed explanation of REER indicator, see Vika (2006).

Where:

- NPL_B – the ratio of businesses' nonperforming loans to outstanding loans of this sector;
- GDP_G – the real GDP growth rate.

As may be seen from Table 5, the increase in the NPL ratio of businesses is also affected by the majority of factors that affected total nonperforming loans. In this case, we follow a similar procedure as done for total NPL. In equation (2), we include the indicators that proved to be significant in individual equations and those that were expected to affect businesses' loan quality. The economic factor that affects the loan repayment of businesses more is the 3-month T-bill rate. Banks mainly rely on this interest rate when defining the cost of credit, revising it on a quarterly basis. Our results show that for each percentage point increase in 3-month T-bill rate, the dependent variable reacts with an increase of nearly 0.59 pp. In the case of the private sector, included in the estimation was the real effective exchange rate (REER). Since for the calculation of this index are taken into account the trade terms of five main partners, we thought this indicator measures better the effect of the exchange rate on business activities and, indirectly, their payment ability. Through this equation, we reach the conclusion that a devaluation of the domestic currency by 1% increases the NPL ratio of businesses by nearly 0.15 pp after four quarters. This delayed reaction by one year may be explained by the fact that the terms of business contracts usually are revised every six to twelve months. For this reason, we think that businesses start to feel the exchange rate effect only after the changes in the terms of contract that arrange their activity materialize. Another factor that affects the quality of business loans is economic growth. While for the total portfolio of nonperforming loans this variable was not significant, loans granted to businesses have a countercyclical behavior, because in times of economic growth there is an improvement of this sector's loan quality. For an increase by 1 pp in GDP growth, credit risk for businesses declines by 0.07 pp after six months. Other factors that affect the NPLs of businesses are the M3 aggregate and exports, which have a negative relation with the dependent variable, thus an increase in these factors would cause nonperforming loans to go down.

III. 3 RELATION BETWEEN NONPERFORMING LOANS OF INDIVIDUALS AND MACROECONOMIC FACTORS

In the banks' loan portfolio, loans granted to individuals play an important role (their share to total loans accounts for more than 30% of the total). For this reason, in this section we discuss the results of equation (3), in which are identified those macroeconomic factors that affect payment ability of individuals. The ratio of nonperforming loans to individuals over total loans granted to this category acts as the dependent variable in this equation.

$$\Delta NPL\_I_t = \gamma_1 + \gamma_2 \cdot \Delta NPL\_I_{t-1} + \gamma_3 \cdot \Delta TB\_12_{t-2} + \gamma_4 \cdot \Delta \log(RENT)_{t-3} + \gamma_5 \cdot \Delta \log(LEK\_EUR)_t + \gamma_6 \cdot \Delta \log(HOUSE)_{t-1} + \varepsilon_t \qquad (3)$$

Where:

- NPL_I – the ratio of nonperforming loans of individuals to outstanding loans of this sector;
- LEK_EUR – the lek/euro exchange rate.

As expected individuals' nonperforming loans are affected by a range of macroeconomic factors, which have a more direct effect over them. Thus, an increase by 1 pp in the 2 months T-bills rate (that serves as the base rate for defining the cost of credit in lk, for the loans granted to individuals), will raise the NPL ratio of individuals by nearly 0.23 pp (after to 2 quarters). Also, the lek/ euro exchange rate directly affects individuals, notably those that have loans denominated in euro, while their income is denominated in lek. A 1% appreciation of the euro, deteriorates the quality of loans to individuals by 0.06 pp. On the other hand, a boost in house prices by *t*, decreases the NPL ratio by 0.01 pp, which could be a consequence of the improvement of individuals' wealth. This effect is visible after one quarter. On the contrary, an increase in rental prices by 1% increases non-paid loans by nearly 0.007 pp. The effect on rental increase is seen after around 9 months, when the solvency of individual borrowers deteriorates and they begin to display the first problems in loan payment.

As mentioned earlier, a similar study is carried out for the Albanian banking system by Shijaku and Ceca (2011). For some of the variables the results match, while for other variables our results tend to differ. However, it should be mentioned that to test our hypothesis, we include a larger number of indicators in our study, compared to the paper mentioned above. Moreover, the time horizon involved in both studies is different. Another distinction consists in the sorting of loans: in our study we have considered not only total nonperforming loans, but we alse distinguisy between two main sectors – businesses and individuals – in order to recognize the effect of macroeconomic variables in this indicator. Shijaku and Ceca (2011) distinguish between NL-s according to the currency in which the loans are denominated.

IV. CONCLUSIONS

This study aimed to identify the macroeconomic factors that affect credit risk in the Albanian banking system. This was achieved through a simple linear regression with the ordinary least squares method. After taking into account a range of macro indicators, they were classified into six main categories according to their nature.

Starting from *univariate* equations, initially, we identified the variables that affect credit risk, and in a further stage, we established a model that explains this risk via interest rates of T-bills, the real effective exchange rate, the rate of exports growth, the growth of M3 aggregate and the indices of house and rental prices.

Subsequently, to add to the work done by Kalirai and Scheicher (2002) on whom we relied for the methodology in this paper, we follow our analysis with an additional step. Thus, we split loan portfolio in two main categories: loans granted to businesses and to individuals.

Loan quality for the first category is affected by the T-bills rate, the real effective exchange rate, the M3 and exports' growth rate and GDP growth. Apparently Albanian businesses are more sensitive to changes in the interest rate than in the exchange rates. This is evident in the coefficients taken from equation (2), where an increase in the 3-month T-Bills rate has an effect of nearly four times bigger than the change in REER, on the NPL ratio.

Loans to individuals are found to be statistically significant related with the T-bills rate, the lek/euro exchange rate and the house and rental price indices. Even for this borrowers' category, the effect of changes in interest rates (of T-Bills) is considerably larger than the effect of changes in other variables, on their insolvency. This borrowers' behavior makes us think that the policymakers, during the monetary policn decision-making, maybe should also take into consideration the effect of changes in the base rate on credit portfolio quality of the banking system.

In the future, other studies may rely on this working paper in order to perform stress tests for the banking sector as a whole or for individual banks specifically, making use of the coefficients generated by this study. Moreover, this study may be extended by identifying banks specific factors that affect credit risk.

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APPENDIX

Table1 Descriptive statistics of the variables (2002 II – 2009 IV)

	Mean	Standard Deviation	Maximum	Minimum	Kurtosis	Skewness
Cyclical indicators						
GDP	0.05	0.02	0.11	-0.01	1.6	-0.11
Output gap	0	2.17	4.48	-3.84	-0.53	-0.03
Price stability indicators						
Inflation	0.03	0.01	0.05	0.01	0.53	0.46
M1 aggregate (in million leks)	198,668	48,191	284,624	135,420	-1.19	0.16
M3 aggregate (in million leks)	600,016	155,277	860,650	392,830	-1.41	0.23
Household indicators						
Unemployment rate	0.14	0.01	0.16	0.13	-0.82	0.28
House price index	115.55	29.88	173	76	-1.22	0.24
Rental price index	95.61	18.22	129	68	-1.06	0.17
Remittances (in million leks)	27,610	5,202	41,306	16,602	0.90	0.03
Business indicators						
Industry Confidence Index (ICI)	-2	6.4	6.18	-17.7	-0.01	-0.79
Interest rates indicators						
3month T-bill interest rate	0.07	0.02	0.11	0.05	1.57	1.55
6-month T-bill interest rate	0.08	0.02	0.12	0.05	0.73	1.2
12-month T-bill interest rate	0.09	0.02	0.13	0.06	0.3	0.77
Euribor interest rate	0.03	0.01	0.05	0.01	-0.95	0.4
Libor interest rate	0.03	0.02	0.06	0.01	-1.42	0.32
External indicators						
Exports (in million leks)	19,497	5,754	31,830	10,374	-0.9	0.38
Lek/euro exchange rate	128.01	5.84	139.74	121.69	-0.91	0.74
Real effective exchange rate (REER)	103.72	4.44	112.8	98.73	-0.72	0.88
Dependent variable – Nonperforming loans to total loans ratio	0.05	0.02	0.1	0.02	0.91	1.16

Source: Bank of Albania, INSTAT (authors' own calculations)

Table 2 Results of stationarity tests

	Null Hypothesis	ADF Test
Real GDP	I(1)	-6.42765
Output Gap	I(1)	-7.17055
Inflation	I(0)	-3.8599
Log of real M1 aggregate	I(1)	-3.11592
Log of real M3 aggregate	I(1)	-6.14756
Unemployment rate	I(0)	-2.02533
Log of house price index	I(1)	-5.28333
Log of rental price index	I(1)	-8.46997
Log of real remittances	I(0)	-5.63057
Industry confidence index	I(0)	-2.72316
Nominal 3-month T-bill rate	I(1)	-3.58227
Nominal 6-month T-bill rate	I(1)	-3.86932
Nominal 12-month T-bill rate	I(1)	-4.5524
Nominal 12-month Euribor rate	I(1)	-2.91384
Nominal 12-month Libor rate	I(0)	-3.63453
Log of real exports	I(1)	-2.59323
Log of lek/euro exchange rate	I(1)	-3.64716
Log of REER	I(1)	-4.37064

Source: Authors' own calculations

Table 3 Results of univariate equations

		Expected sign	Coefficient	t-statistic	Adjusted R^2
Cyclical indicators	Real GDP growth rate	(-)	-0.0551	-1.0898	0.0064
	Output Gap	(-)	-0.0003	-0.6205	-0.0217
Price stability indicators	Inflation	(-)	-0.2019	-1.4560	0.0372
	Real growth in M1 aggregate (Δlog)	(-)	0.0165	0.6916	-0.0183
	Real growth in M3 aggregate (Δlog)	(-)	-0.0852	-1.7191	0.0632
Household indicators	Unemployment rate	(+)	-0.4509	-4.8619	0.4384
	House price index (Δlog)	(-)	-0.0125	-0.6824	-0.0188
	Rental price index (Δlog)	(+)	0.0034	0.3957	-0.0300
	Real remittances (log)	(-)	0.0001	0.0119	-0.0357
Business indicators	Industry confidence index (ICI)	(-)	-0.0005	-2.8917	0.2025
Interest rate indicators	Nominal 3-month T-bill rate (dif, lag(-2))	(+)	0.3394	1.7069	0.0662
	Nominal 6-month T-bill rate (dif, lag(-2))	(+)	0.3607	1.7396	0.0698
	Nominal 12-month T-bill rate (dif, lag(-2))	(+)	0.3294	1.8441	0.0816
	Nominal 12-month Euribor rate (dif)	(+)	-0.6248	-2.9976	0.2159
	Nominal 12-month Libor rate	(+)	-0.0299	-0.3773	-0.0305
External indicators	Real exports (Δlog, lag(-1))	(-)	-0.0214	-1.7908	0.0731
	Lek/euro exchange rate (Δlog)	(+/-)	0.1638	2.8139	0.1926
	REER (Δlog)	(+/-)	0.0855	1.2797	0.0215

Table 4 Ratio of Non-Performing Loans to Total Loans (in per cent)

Countries	2004	2005	2006	2007	2008	2009
Bosnia and Herzegovina	6.1	5.3	4	3	3.1	5.9
Bulgaria	2	2.2	2.2	2.1	2.5	6.4
Greece	7	6.3	5.4	4.5	5.0	7.7
Italy	6.6	5.3	4.9	4.6	4.9	7.0
Croatia	7.5	6.2	5.2	4.8	4.9	7.8
Montenegro	5.2	5.3	2.9	3.2	7.2	13.5
FYROM	17	15	11.2	7.5	6.8	8.9
Romania	8.1	2.6	2.8	4	6.5	15.3
Albania	4.2	2.3	3.1	3.4	6.6	10.5
Turkey	6.5	5.1	3.9	3.6	3.8	5.6

Source: Global Financial Stability Report (IMF), October 2010.

Table5 Results of multivariate equations (1), (2) and (3)

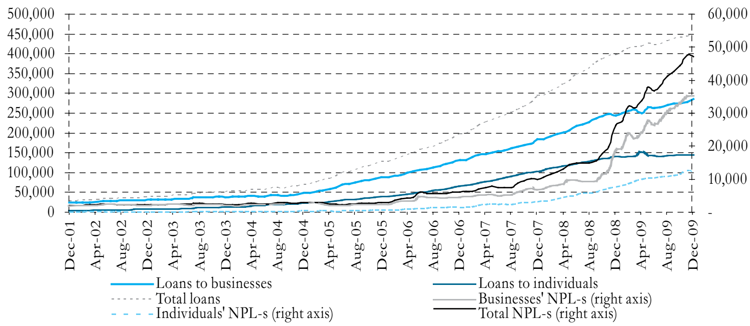
	Eq. (1) - Total	Eq. (2) -Businesses	Eq. (3) - Individuals
NPL (-1)	0.5340**	0.3914***	0.3468**
3-month T-bill rate	0.3703***	0.5864***	
12-month T-bill rate	0.2018**		0.2268***
M3 growth rate	-0.1462***	-0.1843***	
Rental prices index	0.0172***		0.0068*
Exports growth rate	-0.0182***	-0.0396***	
REER	0.1097***	0.1489**	
House prices index	-0.015**		-0.0140*
GDP growth rate		-0.0714*	
Lek/euro exchange rate			0.0640*
Constant	0.0064***	0.0078***	0.0025***
Adjusted R^2	0.90	0.72	0.53
No. observations (after adjustments)	26	26	26
DW	1.60	2.12	1.87
F-statistic	28.55	11.91	6.96

Dependent variable: Nonperforming loans to total loans ratio.
***, ** , * correspond to 1, 5, and 10 significance levels, respectively.

Table 6 Diagnostic tests – residuals

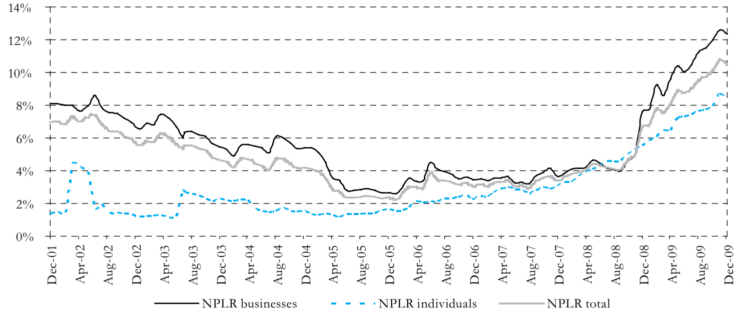
Equations	(1) - Total	(2) - Businesses	(3) - Individuals
Serial correlation (LM test) (4 lags)			
F-statistic	0.50	0.62	0.33
p-value	0.74	0.66	0.85
White Heteroskedasticity Test			
F-statistic	0.59	1.17	0.82
p-value	0.83	0.39	0.61
Normality			
J. Bera	0.10	1.36	0.77
p-value	0.95	0.51	0.68

Figure 1: Outstanding loans and nonperforming loans in total, to businesses and to individuals.



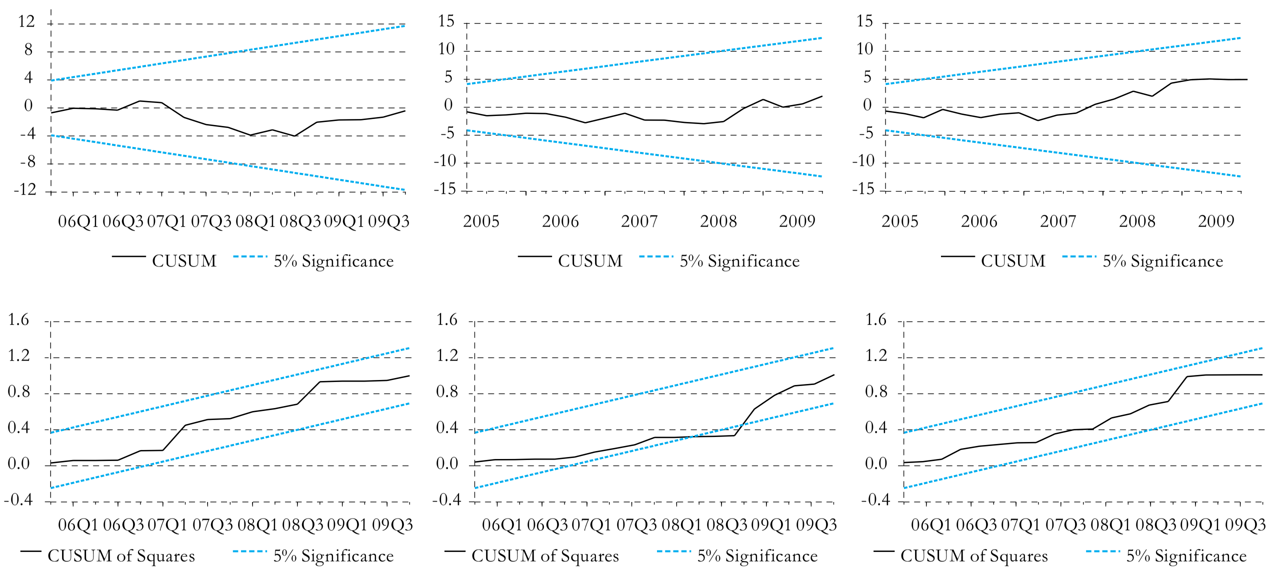
Source: Bank of Albania

Figure 2: The NPL ratio for total, businesses' and individuals' loans.



Source: Bank of Albania

The results of diagnostic tests: Stability of coefficients.



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HOUSEHOLDS' EXPOSURE TO FOREIGN CURRENCY LOANS IN CESEE EU MEMBER STATES AND CROATIA

*Katharina Steiner**

ABSTRACT

Most Central, Eastern and Southeastern European (CESEE) countries saw a substantial rise in foreign currency lending to households during the last decade. This involved risks to macro-financial stability, in particular because most of these borrowers were unhedged. This paper provides evidence on eleven CESEE countries regarding (1) the extent of foreign currency lending to households from 1995 to 2009, (2) the supply and demand factors at work in the period before the crisis and (3) the regulatory responses to address the situation. Panel data estimates covering the period from 1996 to 2007 reveal that, on the demand side, foreign currency borrowing was attractive because interest rates for foreign currency loans were lower than those on domestic currency loans, and private sector consumption as well as housing prices were on the rise. Mitigating factors on the supply side were higher interest margins on domestic currency loans than on foreign currency loans and banking sector reforms. Regulatory measures account at least partly for the different patterns of currency structures according to descriptive evidence

JEL classification: C23, E41, F31, G19, P20

Keywords: Financial development in transition, foreign currency loan, supply and demand, currency substitution, emerging markets

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1. INTRODUCTION

The catching-up process of emerging economies is usually accompanied by credit growth; however, not every size and kind of credit expansion is beneficial. This paper focuses on foreign currency lending to households, which has become widespread in many Central, Eastern and Southeastern European (CESEE) countries. The household market segment is of particular interest: Households are typically not hedged against a weakening of the local currency relative to the loan currency, which increases the risk of loan defaults given unfavorable developments. International institutions (e.g. IMF, EBRD) and the OeNB had drawn attention to the risks involved in this type of lending well before the financial crisis and had called for a constant monitoring of the growing share of foreign currency loans in total domestic lending (OeNB, 2005)

It is important to understand the driving forces behind the developments in foreign currency lending in order to take well-targeted regulatory and supervisory measures in this area. While the earliest publications on the determinants of foreign currency lending to households focused on Austria, a large number of empirical analyses covering the CESEE region followed[1]. Some studies use bank survey data and focus on foreign currency lending to firms (e.g. Brown, Kirschenmann and Ongena, 2009), whereas other empirical papers draw on macroeconomic data (e.g. Luca and Petrova, 2008) and consider foreign currency borrowing by households (e.g. Csajbók, Hudecz and Tamási, 2010).

This paper contributes to the empirical research by explicitly concentrating on loans to households and providing additional evidence of supply- and demand-side factors related to the popularity of this type of loan in the years leading up to the financial crisis at the macroeconomic level. Moreover, it provides a detailed over-view of regulatory attempts to limit risks arising from this development

1 Publications with a focus on Austria: Epstein and Tzanninis (2005) and Beer, Ongena and Peter (2008); publications with a focus on the CESEE region: Basso, Calvo-Gonzalez and Jurgilas (2007), Dvorsky, Scheiber and Stix (2008), Luca and Petrova (2008), Rosenberg and Tirpak (2008), Brown, Kirschenmann and Ongena (2009), Haiss, Paulhart and Rainer (2009), Neanidis and Savva (2009), Bakker and Gulde (2010), Brzoza-Brzezina, Chmielewski and Nied wiedzi ska (2010), Csajbók, Hudecz and Tamási (2010), and Zettelmeyer, Nagy and Jeffrey (2010)

in eleven CESEE countries (CESEE-1[2]) and explicitly refers to their impact on the supply of, and demand for, foreign currency loans to households.

The remainder of the paper is structured as follows: Section 2 provides stylized facts on foreign currency lending to households in the CESEE-11. Section 3 presents the mechanisms underlying the estimating equation as described in the literature and indicates the data and the estimation method used. Section 4 summarizes the results and contains robustness checks, while section 5 outlines the regulatory and supervisory measures taken to tackle the issue with different speed and intensity in the CESEE-11. Section 6 concludes.

2. STYLIZED FACTS: DIVERSE PICTURE OF FOREIGN CURRENCY LENDING IN CESEE-11

While currency substitution of loans in the CESEE-11 as a whole had increased only slightly during the late 1990s, this section provides evidence that it has gained considerable momentum since then. In most of the region, foreign currency loans are typically denominated in euro, except in Hungary and Poland, where Swiss francs play an important role (Beckmann and Stix, 2010). Indexation of domestic currency loans to a foreign currency has been widespread in Croatia, but not in the other countries under review. In some CESEE-11 countries (e.g. Bulgaria), this practice is even prohibited[3].

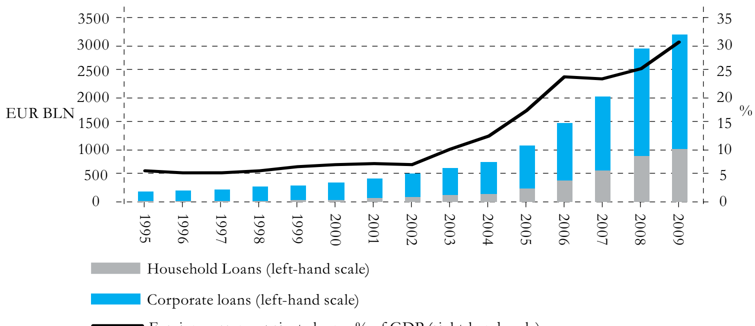
To capture the size of the foreign currency loan market in the CESEE-11, chart 1 shows the aggregated total volume of foreign

2 The country sample includes the ten CESEE EU Member States – the Czech Republic (CZ), Estonia (EE), Hungary (HU), Latvia (LV), Lithuania (LT), Poland (PL), Slovakia (SK), Slovenia (Sl), Bulgaria (BG) and Romania (RO) – as well as Croatia (HR), which was added to the sample as it is likely to join the EU in the near future.

3 Foreign currency-indexed loans are normally registered as domestic currency loans. This can lead to an underestimation of the full significance of instruments denominated in, or indexed to, a foreign currency (Backé and Walko, 2006). In Croatia, where foreign currency-indexed loans account for a large share of total loans, they are explicitly reported in the statistics of the Croatian National Bank.

currency loans to the nonbank private sector[4] in nominal terms and as a share of GDP. The data reflect two phenomena: overall credit growth and increasing currency substitution. The ratio of foreign currency loans to GDP came to 6% in 1995 and increased to 31% by 2009 (chart 1).

Chart 1. Domestic Foreign Currency Lending to the Nonbank Private Sector in the CESEE-11



Source: OeNB, IMF

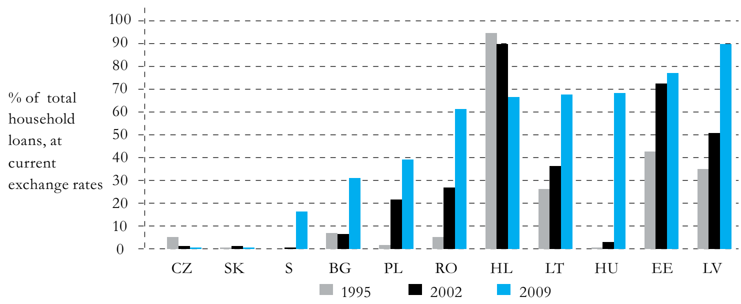
Note: CESEE-11 data on foreign currency loans are aggregated using current market exchange rates.

This rise was particularly pronounced from 2002 to 2006 and again from 2007 to 2009, but in 2009 it was largely attributable to the contraction of GDP in the face of the Great Recession. Aggregate developments were mainly driven by high growth of foreign currency lending in Estonia, Latvia, Lithuania, Hungary, Poland, Bulgaria and Romania. The rise in foreign currency lending to the household sector was much more pronounced than that of such loans to the corporate sector: The share of household loans in total foreign currency loans to the nonbank private sector soared from 8% in 1995 to 51% in 2009. In most countries, mortgage loans account for the bulk of loans to households, which implies that the respective households may be doubly exposed, namely to unfavorable developments in both exchange rates and housing prices

4 This sector includes households and nonprofit institutions serving households as well as non-financial corporations.

Besides the rise of currency substitution in the market segment of household loans in many countries of the region, chart 2 also shows considerable country differences in the timing and pace of developments. For the CESEE-11 region as a whole, the share of foreign currency lending in total household loans, as based on nominal data, increased from 4% in 1995 to 60% in 2009.

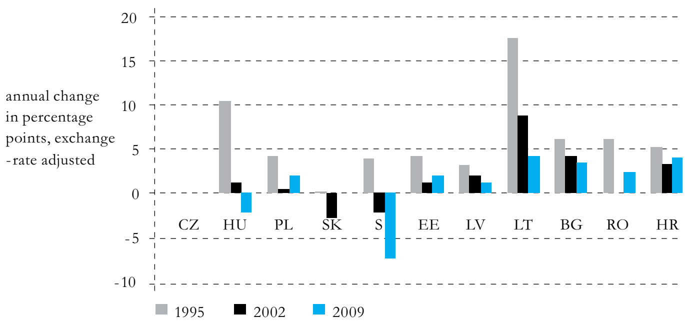
Chart 2. Foreign Currency Lending to Households in the CESEE-11



Source: National Central Bank, OeNB.

This increase in nominal terms is not only attributable to the granting of new loans, but also to exchange rate movements. The latter indicate increasing risks in terms of rising repayment burdens for households. A look at the individual countries shows that, in the Czech Republic and Slovakia, the share of foreign currency lending in total lending to households remained low. In the Czech Republic, the differential between interest rates for domestic and foreign currency loans remained very small throughout most of the sample period, which can be ascribed to the low level of households' foreign currency indebtedness. By contrast, Croatia, Latvia, Estonia, Hungary and Lithuania recorded high shares of foreign currency loans in total loans to households in 2009. In Croatia, the share of loans denominated in, or indexed to, a foreign currency was high throughout the sample period, as indexation of deposits and loans became widespread in the wake of the hyperinflation period of the early 1990s. In addition, households received sizeable income from tourism, which is often denominated in foreign currency and provides some natural hedge. The share of loans denominated in, or indexed to, a foreign currency decreased slightly over the review period, but is still very elevated. In the remaining countries, foreign currency lending to households increased to different degrees. It is note-worthy that the popularity of foreign currency loans to households in Hungary rose considerably only after the conditions for housing loan subsidies had tightened and the extent of the subsidy had been linked to the reference Treasury bond yield in 2003-04. When people had to pay higher interest for housing loans denominated in domestic currency than for foreign currency loans, the latter became more attractive (OECD, 2010). Slovenia experienced a sudden jump in foreign currency lending to households (from 4% in 2004 to 43% in 2006) in the run-up to the euro introduction in 2007 (Banka Slovenije, 2006), while in Slovakia, the respective rise before the adoption of the single currency in 2009 was also notable but less pronounced

Chart 3. Recent trends in the relative share of foreign currency loans to CESEE-11 Households



Source: National central banks, OeNB

Note: Annual change in percentage points refers to the share of foreign currency loans in total loans to households at constant exchange rates as of January 1, 2008, adjusted for changes in the exchange rate of the local currency against the Euro or the Swiss Franc. Due to a lack of detailed information, the data for Croatia on Euro loans include all foreign currency loans, and the adjustment is made using the EUR/HRK exchange rate.

The most recent developments in foreign currency loans to households in the CESEE-11 are depicted in chart 3, which provides data on the year-on-year change in the share of foreign currency lending in total household loans. The exchange rate adjustment is particularly relevant for the most recent period, as the financial crisis led to substantial exchange rate swings in CESEE countries with flexible exchange rates. The chart shows that, in some countries, the share of foreign currency loans to households rose even after correction for exchange rate changes, while it declined in others (in Slovakia mostly due to the euro introduction)

In the CESEE-11 region as a whole, the rise in the share of foreign currency loans in the household sector has moderated considerably and growth has declined during the course of the financial crisis, but it has not fully leveled off. Beckmann and Stix (2010) present additional results based on survey data, which show that the number of households planning to take out foreign currency loans declined during the crisis, but most recently seems to be rising again in some countries (e.g. Croatia and Romania). Thus, foreign currency lending to households remains a key feature of financial intermediation in the CESEE-11 region.

3. DERIVATION OF THE ECONOMETRIC MODEL AND EMPIRICAL SPECIFICATION

3.1 SUPPLY- AND DEMAND-SIDE DETERMINANTS OF FOREIGN CURRENCY LENDING

The aim of this section is to simultaneously identify the relationship between supply- and demand-side factors and foreign currency loan developments in the CESEE-11. In order to formulate the estimation equation, it is necessary to recapitulate the mechanisms underlying the supply of, and demand for, foreign currency loans to households based on the literature on credit growth and currency substitution

On the supply side, we have to consider how banks finance their foreign currency loan business. In early transition, banks basically financed loans with domestic deposits (Weller, 2000). Therefore, the empirical analysis of this paper tests whether there is a positive relationship between foreign currency deposits and loans.

Since the early 2000s, external funding sources have become increasingly important for financing rapid credit growth in many CESEE-11, as local currency funding in terms of domestic currency savings was insufficient (Walko, 2008; Lahnsteiner, 2010). Therefore, the margin between interbank rates and lending rates can be assumed to be an alternative and important supply-side factor deter-mining the currency denomination of loans. When interbank rates abroad are lower than the costs of refinancing in the domestic interbank market, banks in transition economies have an incentive to seek financing abroad and to grant foreign currency loans to their customers, as they have to keep their net open foreign currency positions below a certain limit (Basso, Calvo-Gonzales and Jurgilas, 2007). However, when interest margins on domestic currency loans are higher than those on foreign currency loans, this is assumed to serve as a disincentive to foreign currency lending to households.

The role of ownership in refinancing (domestic versus foreign and private versus state ownership) must be considered as well, given that different types of ownership may matter for banks' access to funding from abroad. Foreign banks' subsidiaries, for instance, can turn to their parent banks for funding. Bakker and Gulde (2010) find that foreign banks accounted for a substantial share of the growth in foreign currency lending to households. Residential deposits were not sufficient for funding domestic currency loans. During the financial crisis, parent banks continued to support their subsidiaries, and parent bank funding was even more stable than wholesale refinancing (Lahnsteiner, 2010). In addition, parent banks promote a more diversified range of lending products, because they have more experience and know-how in risk management compared to domestic banks (De Haas and Naaborg, 2006)

In most CESEE-11 countries, the banking sector is dominated by foreign ownership. The rising numbers of foreign entrants and financial sector consolidation have further fostered competition and, at the same time, have increased concentration in the banking market due to mergers and acquisitions among parent banks (e.g. the takeover of Bank Austria by the Italian UniCredit Group; Drakos, 2003). Therefore, banking concentration might be positively related to currency substitution of loans, too. In addition to these explanatory factors, increasing quality in banking sector regulation and banking sector reforms, and thus regulatory restric-tions on foreign currency loan markets, might dampen foreign currency lending On the demand side, income or consumption should enter empirical testing, following Brown, Kirschenmann and Ongena (2009). For example, Calvo and Vegh (1999) find that strong increases in consumption are related to credit booms. A positive relationship can be assumed, as increasing consumption and expectations of rising future income might imply that households are very optimistic about future developments in general. In turn, households might underestimate the risks of unfavorable exchange rate movements and thus of foreign currency borrowing.

As highlighted in section 2, foreign currency loans were mainly used for house purchases and consumption. The findings of Égert, Backé and Zumer (2006) further show a robust positive correlation of large increases in housing prices with total private loans. Therefore, rising housing prices may add to a rise in foreign currency borrowing by households and will be tested as an additional variable of interest

In addition to factors that are explicitly related to the supply of, or demand for, foreign currency loans to households, several variables are supposed to be related to both supply and demand, such as the interest rate. Households will be induced to take out a loan denominated in foreign currency as long as interest rates on such loans are below the price of domestic currency loans[5]. In transition economies, interest rates on domestic currency loans tend to be higher than those on foreign currency loans, which can be attributed to higher key interest rates compared to mature economies, also reflecting expectations of macroeconomic volatility. The theory of supply suggests that a higher price (interest rate) on domestic currency loans should serve as an incentive for banks to lend in domestic currency. But a positive relationship might indicate that banks are inclined to promote the new "cheaper" product in order to gain market share, despite possible risks that borrowers might default. Basso, Calvo-Gonzalez and Jurgilas (2007) present first evidence on supply and demand factors driving up the share of foreign currency lending in total private loans in 24 CESEE countries from 2000 to 2006. Their estimations show that the interest

5 In general, compared with domestic currency loans, higher additional fees are charged on foreign currency loans, thus adding to the cost of such loans. As no specific data are available on these administrative fees charged by banks in the CESEE-11, the analysis in this paper sticks to interest rates only.

differential is an important explanatory variable The exchange rate regime and the exchange rate itself are important factors that work both on the supply and the demand side. As the loan has to be repaid in foreign currency, the borrower bears the exchange rate risk. Therefore, borrowers who are sufficiently risk-averse and do not have any income in foreign currency should be less inclined to take out a foreign currency loan, if the domestic currency depreciates or is very volatile (ECB, 2006)[6]. On the supply side, banks which can be assumed to be risk-averse might also be less willing to lend in foreign currency, as the default risk of borrowers will increase if they are not hedged against ex-change rate changes. As concerns differences in exchange rate regimes, one may expect that in the presence of credible fixed exchange rate regimes, the supply of, and demand for, foreign currency loans will increase; the empirical literature on this issue is not clear-cut, however. Anticipation of a future accession to the euro area might also play an important role in the decision of CESEE-11 households to take out euro loans.

High and rising inflation is related to uncertainty about the ability of borrowers to repay their loans. Domestic inflation is therefore expected to be negatively related to borrowing denominated in domestic currency (Eller, Frömmel and Srzentic, 2010). But it can be expected to be positively related to foreign currency loans to households in the CESEE-11, because these loans can be seen as more stable products concerning the price than domestic currency loans.

It should be noted that the determinants set out in this subsection often relate to some "deeper" underlying factors. For example, the interest rate differential between domestic and foreign currency loans is linked to expected macroeconomic volatility, exchange rate depreciation and, possibly, a low level of domestic currency savings, and thus to the availability of local currency funding[7].

6 If the nominal exchange rate remained stable, an appreciation of the real effective exchange rate could induce an increase in the repayment amount. Besides the mere development of nominal and real exchange rates, the volatility of exchange rate movements could also be of importance. Basso, Calvo-Gonzales and Jurgilas (2007) analyze the relationship of the relative volatility of real exchange rates, inflation and foreign currency lending to the private sector in CESEE. I decided to use the nominal exchange rate, assuming that households take economic decisions primarily based on nominal figures.

7 I am grateful to one of the two anonymous referees for bringing up this point.

3.2. SPECIFICATION OF THE ECONOMETRIC MODEL

In general, supply and demand have to be viewed in a simultaneous equations context, because the observed volumes and interest rates of foreign currency loans are determined by the equilibrium condition that supply equals demand. The two structural equations can be written in the following way: quantity (the share of foreign currency loans in total loans to households) as a function of price (lending interest rate on domestic currency loans minus that on foreign currency loans), additional exogenous regressors related to supply and demand, and disturbance terms. The joint determination of quantity and price and the associated endogeneity call for identification of the simultaneous equations system.

The reduced-form specification estimating the determinants of foreign currency lending to households derived from such a system of simultaneous equations[8] is:

$$\begin{aligned} ln(fx\text{-}loans)_{it} = {} & \beta_{0,it} + \beta_1 ln(fx\text{-}depos)_{it} + \beta_2 ln(i\text{-}margin)_{it} + \beta_3 ln(consum)_{it} \\ & + \beta_4 ln(i\text{-}diff)_{i(t-1)} + \beta_5 ln(exr)_{it} + X_{it} + \mu_i + \tau_t + \omega_{it} \end{aligned} \tag{1}$$

where i = 1,…,N is the country index and t = 1,…,T the time index, β represents the parameters, μ_i are country-fixed effects, τ_t is a deterministic linear trend and ω_{it} is the disturbance term. In line with Luca and Petrova (2008), the dependent variable is specified as the share of foreign currency loans in total household loans (*fx-loans*). On the supply side, the share of foreign currency deposits in total household deposits (*fx-depos*), and the difference between the interest margins on domestic and foreign currency loans (*i-margin*) enter the equation specification, while private domestic consumption to GDP (*consum*[9]) is related to the demand side. The price, proxied by the differential between interest rates for domestic and foreign currency loans (i-diff) enters the reduced-form specification with a lag, following Basso, Calvo-Gonzales and Jurgilas (2007), to avoid

8 More details on the simultaneous equations system and related estimation specifications and techniques can be found in Steiner (2009).

9 Besides consumption, I tested households' disposable income and their expected income (proxied by the concept of adaptive expectations) as alternative explanatory variables. The results further support a positive relationship between higher expected income and foreign currency borrowing by households (see Steiner, 2009, for details).

problems of endogeneity because price and quantity are jointly determined in specifications considering supply and demand. Besides *i-diff*, also the exchange rate (*exr*) is related to both supply and demand. These five explanatory variables are tested as basic determinants of foreign currency lending to households given the discussion in section 3.1, and therefore enter each estimation equation. The variables enter the equations in logarithmic form to account for potentially nonlinear relationships in the data, such as between *i-diff* and *fx-loans*. Table 1 summarizes the variables and expected signs of the reduced-form estimations, which are based on the relationships identified in section 3.1.

The following variables of interest (*X*) also enter the equation: a dummy controlling for a surge in foreign currency loans in Hungary and Slovenia (*dummy_ HU,SI*) foreign ownership in banking (*fsfdi*) a proxy for banking sector concentration based on the total assets of the three largest banks as a share of the total assets of all commercial banks (*bconcentration*), an index for banking sector reform (*banking-reform*), a housing price index (*housing*), a dummy for EU membership (*dummy_EU*) to proxy expectations of future euro area accession, and inflation (*infl*). Table 2 presents descriptive statistics on the variables employed in the subsequent estimations (the number of observations refers to annual data from 1996 to 2007 for a total of eleven countries).

In view of the short time series available for the CESEE-11, and given that this analysis aims at detecting common supply- and demand-side factors despite cross- country differences in foreign currency lending to households over time, panel data analysis is applied. The feasible general least squares (FGLS) estimator with country-fixed effects and contemporaneous covariances (cross-section SUR) is used to estimate the reduced-form parameters of supply and demand simultaneously, as it shows the best fit.[10] This

10 The application of the ordinary least squares (OLS) estimator, both with cross-country fixed effects and robust variance specification, did not produce efficient results, as there are signs of autocorrelated and heteroscedastic residuals. In addition, the OLS estimation did not really deliver robust results, as the sign and significance of the estimated coefficients changed from one specification to the other. Therefore, another option of dealing with nonsphericalness of the disturbances is applied: the FGLS estimator, as described above

estimator should be applied if the residuals are both cross-sectional heteroscedastic and contemporaneously correlated. Basso, Calvo-Gonzales and Jurgilas (2007) also apply the FGLS estimator with panel heteroscedasticity and panel-specific autocorrelation in their estimations of the determinants of developments in foreign currency lending to households and firms in the CESEE-11. Country-fixed effects are included because there are persistent cross-country differences in the development of foreign currency loan markets. This should, for instance, account for differences in the households' perception of the risk inherent in such loans on the demand side or for differences in banks' marketing strategies on the supply side.

Table 1 Identification and Expected signs of the Reduced-Form Parameters

Expected sign/ variable	Definition	Related to supply or demand	Source
fx-loans	Share of foreign currency loans in total household loans		National central banks
fx-depos	share of foreign currency deposits in total household deposits	S	National central banks
i-margin	Interest margin between domestic and foreign currency loans (i-margin = m(dc) - m(fx) with m(dc) = i(dc) - ibr(dc), m(fx) = i(fx) - ibr(EUR) and ibr referring to the 3-month interbank rate)	S	National central banks
consum	Private domestic consumption as a share of GDP	D	AMECO and IMF
i-diff	Interest rate differential between domestic and foreign currency loans (idc - ifx)	S&D	National central banks
exr	Average nominal exchange rate (units of national currency per EUR)	S&D	IMF
dummy_HU,SI	Dummy with a value of 1 controlling for the strong increase in fx-loans over 2005-2007 in HU and SI	S&D	Author's compilation
fsfdi	Financial sector FDI as a share of GDP	S	EBRD
bconcentration	Share of the three largest banks in total bank assets	S	Beck et al. (2000) updated dataset
bankingreform	Index of banking sector reform	S	EBRD
housing	Index of housing prices (1995 = 100)	D	Euromonitor
dummy_EU	Dummy with a value of 1 after EU accession and 0 otherwise	S&D	Author's compilation
infl	Annual change of the consumer price index	S&D	IMF

Source: Author's compilation

These factors are difficult, or rather impossible, to measure; they remain persistent over time and vary across countries. Fixed country effects can account for these differences. In order to control for a trending behavior of the examined series, a deterministic linear trend (τ_t) is included in the regression specifications.[11]

Table 2 Descriptive Statistics

	Mean	Median	Maximum	Minimum	Standard Deviation
fx-loans	28.642	17.24	96.804	0.007	30.513
fx-depos	35.916	28.98	98.166	3.484	24.584
i-margin	–5.846	–1.86	15.634	–149.646	16.809
consum	60.433	58.929	75.894	47.769	6.35
i-diff	1.535	1.525	30.37	–20.214	5.395
exr	51.51	7.406	264.26	0.088	85.726
fsfdi	5.603	4.106	38.089	0	5.89
bconcentration	0.675	0.647	1	0.38	0.152
bankingreform	3.348	3.33	4	2	0.454
housing	873.727	209	7.458	100	1737.283
infl	8.542	5.65	59	–1.18	10.147

Source: Author's calculations

Note: Based on 132 observations

4. EMPIRICAL RESULTS

Table 3 shows the results of the relationship between supply- and demand-side factors and developments in foreign currency lending in the CESEE-11 in the period from 1996 to 2007 (i.e. before the crisis). Column 1 presents the baseline regression, and columns 2 to 7 show the results of level estimations using the explanatory factors identified in section 3. In addition, several robustness checks were conducted, which show that the results are sensitive to the chosen empirical proxy for specific variables. Instances when the use of different proxies produced different results are discussed in the following

On the supply side, the results do not show a robust impact of the share of foreign currency deposits (*fx-depos*) and its coefficients are rather small. When controlling for a sudden and strong increase in foreign currency lending in Hungary and Slovenia in 2005 (using a shift dummy with a value of 1 in these two countries in 2005–07, denoted

11 In light of the comparatively high R, in all regressions, tests for cointegration or the existence of unit roots were conducted for all variables. As there was no clear evidence of cointegration and unit roots, a model specified in levels including the linear deterministic trend is estimated

by *dummy_HU,SI*) the effect of the dummy remains relatively small compared to the other coefficients, and *fx-depos* shows mostly the expected positive sign. However, there are also specifications where *fx-depos* has a significant negative impact. This can be explained by the steady decrease of foreign currency deposits as a percentage of total household deposits over time (while at the same time, external sources of financing have become more important, see also section 3). When conducting experiments with a broader foreign currency deposit base that includes not only household deposits but also firm deposits to get a closer measure of foreign currency funds available for the bank to feed foreign currency lending, the results remain qualitatively unchanged.

Table 3 Reduced-Form Estimations for the CESEE-11, 1996-2007

Explanatory variables	Dependant variable: ln(fx-loans) it						
	Baseline	ln(fsfdi)	ln(bconcen-tration)	banking-reform	ln(housing)	dummy_EU	infl
Constant	−32.282	−36.537	−36.575	−28.467	−32.772	−28.813	−33.394
	(−18.643)***	(−27.858)***	(−44.659)***	(−12.996)***	(−19.832)***	(−98.867)***	(−17.431)***
ln(fx-depos) it	0.000	−0.095	0.068	0.106	0.014	−0.792	−0.018
	(−0.0157)	(−1.702)*	(1.788)**	−11.989	(0.173)	(−29.740)***	(−0.261)
ln(i-margin)it	−0.25	−0.300	−0.285	−0.215	−0.262	−0.371	−0.275
	(−10.930)***	(−15.179)***	(−31.658)***	(−7.431)***	(−11.179)***	(−67.915)***	(−13.003)***
ln(consum) it	7.792	9.054	8.836	7.306	7.688	7.335	8.386
	(19.746)***	(27.745)***	(49.195)***	(13.994)***	(20.153)***	(100.069)***	(18.980)***
ln(i-diff)(t-1)	0.327	0.230	0.320	0.129	0.340	0.586	0.359
	(7.328)***	(6.478)***	(13.362)***	(1.870)*	(7.394)***	(70.821)***	(11.039)***
ln(exr) it	−0.423	0.174	0.486	0.426	0.082	0.824	0.039
	(4.184)***	(2.007)**	(4.940)***	(4.893)***	(0.601)	(23.059)***	(0.353)
dummy_HU,SI it	2.959	3.312	2.940	2.814	3.053		2.939
	(12.468)***	(14.067)***	(17.648)***	(9.965)***	(12.485)***		(11.377)***
trendit	0.180	0.130	0.180	0.248	0.156	0.193	0.159
	(34.565)***	(22.028)***	(36.700)***	(28.000)***	(19.778)***	(70.780)***	(32.477)***
ln(fsfdi)it		0.240					
		(6.559)***					
ln(bconcen-tration)it			0.910				
			(18.568)***				
bankingreformit				−0.768			
				(−11.703)***			
ln(housing) it					0.317		
					(3.216)***		
dummy_EU it						0.113	
						(16.050)***	
inflt							−0.026
							(−8.701)***
Number of observations	132.000	132.000	132.000	132.000	132.000	132.000	132.000
Adjusted R-squared	0.989	0.994	0.996	0.987	0.989	0.998	0.990
F-Value	705.533***	1232.708***	1918.286***	532.802***	641.582***	5133.387***	760.073***

Source: Author's calculations

Note: Static variable-intercept panel data model. FGLS (cross-section SUR) with country-fixed effects including a linear trend. t-statistics are in parentheses. Asterisks indicate the significance of the coefficients at the 10% (*), 5%(**) and 1%(***) levels. The Hausman test on fixed effects confirms the reported estimation results at the 5% level. The Jarque-Bera test confirms normal distribution of the residuals. The time span ranges from 1996 to 2007.

When interest margins on domestic loans are higher than those on foreign currency loans (*i-margin*) banks have an incentive to strengthen their business in domestic currency. For instance, an increase in *i-margin* by 1% leads to a decline by 0.25% in the share of foreign currency loans to total loans to households (*fx-loans*) in the baseline regression. In addition, different proxy variables are tested: the difference between the interest spread on domestic and foreign currency loans (with the spread referring to the lending rate minus the deposit rate). One would expect banks to increase domestic lending with higher interest spreads in the domestic currency business. The results show the expected negative sign for higher interest spreads on loans denominated in foreign currency.

The results of the positive relationship between foreign ownership in banking (f*sfdi*) and foreign currency lending to households depend on the proxy used for foreign ownership. Using the share of foreign-owned assets in total banking assets as an alternative proxy produces results that are not significant and even have a negative sign

The analysis results also provide further evidence that rising concentration in banking (*bconcentration*) leads to more foreign currency lending to households. Regulatory restrictions might cause the negative relationship between the index of banking sector reform (*bankingreform*) and the share of foreign currency loans in total lending to households. Constructing a more detailed indicator of regulatory measures targeting foreign currency loans would help gain further insights into the relationship.[12]

On the demand side, the coefficient of consumption per GDP (*consum*) contributes the most to explaining developments in foreign currency lending to households in the CESEE-11 (see table 3). An increase in this coefficient by 1% leads to a rise by 7% in the share

12 The empirical research presented in this paper uses a panel data setting, which would not allow drawing country-specific conclusions about the effectiveness of these measures. In addition, the direction of causality is important and would call for the inclusion of lags, which would limit the degrees of freedom. An index with only little variation over time would be correlated with the country-fixed effects applied in the estimations. For these reasons, detailed future research on the effectiveness of regulatory measures at the country level using data with higher frequency over time would be warranted.

of foreign currency loans to total loans to households (*fx-loans*) in the baseline regression. Housing prices (*housing*) is considered as an additional variable of interest. The estimated coefficient shows the expected positive relationship.

The following results were obtained for factors related to both supply and demand: The differential between interest rates for domestic and foreign currency loans (*i-diff*) with a lag of one year enters the equation with a positive sign, which is supportive of the demand-side view, i.e. when interest rates on foreign currency loans are lower than those on domestic currency loans, foreign currency borrowing becomes more attractive to households. Moreover, from the supply-side point of view, the positive sign of the parameter suggests that banks also aim at maximizing their market share in transition economies and therefore promote the seemingly "cheaper" loan product.

In the baseline regression, an exchange rate depreciation is negatively related to the share of foreign currency lending in total lending to households. The estimated positive relationship between the exchange rate variable (*exr*)[13] and the share of foreign currency lending in other estimation specifications is, at first glance, counterintuitive. While this might indicate a mere mathematical effect, as the calculation of the foreign currency loan share is based on nominal values, the currency depreciation observed in some countries during the first two-thirds of the sample period and slowly growing foreign currency loan shares might offset the negative impact of appreciation on foreign currency borrowing in the last years of the sample period, and thus result in the estimated positive relationship.

13 As an alternative specification, I introduced an exchange rate regime dummy to control for periods of fixed exchange rate regimes. This dummy has a value of 1 in periods of fixed exchange rate regimes and 0 otherwise (following Markiewicz, 2006, and Mooslechner, 2008). However, the results are subject to the classification of de-jure versus de-facto exchange rate regimes. In addition, the dummy variable is correlated with the country-fixed effects included in the estimation specification, as there is only little variation in the dummy variable over time for some countries (e.g. Estonia and Latvia). Therefore, the impact of exchange rates is estimated only by using the average nominal exchange rate

The impact of EU membership (*dummy_EU*)[14] on foreign currency lending is positive and significant. Inflation (*infl*) turns out to be negatively related to foreign currency lending to households, but the reduced-form parameter is very small. The trend included in all estimation specifications is positive and significant To sum up, the development of foreign currency lending to households can be traced back to a mixture of demand and supply factors, highlighting the necessity that regulation addresses both sides. Important factors on the demand side are private consumption and housing prices, while on the supply side, it is the difference between the interest margins on domestic and foreign currency loans, the progress in banking sector reform as well as banking sector concentration. The interest rate differential, the years of EU membership and inflation turned out to be significant factors covering both demand- and supply-side aspects, whereas the results for the foreign currency deposit base, foreign ownership in banking and the exchange rate are not that robust.

5. MEASURES TAKEN TO CONTAIN CURRENCY SUBSTITUTION OF LOANS IN CESEE-11

Foreign currency borrowing can endanger financial stability, especially if it is concentrated in particular loan market segments (e.g. households), and if borrowers are not hedged, which is largely the case for households in the CESEE-11 (but also other countries where foreign currency lending to households has been observed). As laid out in section 2, the accumulation of large stocks of foreign currency loans in many CESEE-11 countries had begun well before the financial crisis. The policy response to this development has not been uniform in the region. Some countries took regulatory and supervisory measures to limit the excessive exposure to this type of loan already in the 1990s, while others were more reluctant to do so. At the current juncture, the challenge is to ensure the implementation of a regulatory framework that will prevent excessive borrowing in

14 To proxy also expectations of a future euro area accession, dummy_HU,Sl also controls for expectations of euro adoption in Slovenia in 2007 and shows a positive sign.

foreign currency by unhedged households in the future, in particular once the CESEE-11 economies take off and credit demand revives after the crisis. Policy options range from monetary policy to administrative measures and should address both supply and demand in order to be effective.

On the supply side, key prudential measures can either target credit growth in general or foreign currency lending in particular. The toolkit in this area includes (1) tightening the requirements on foreign currency liquidity and on capital adequacy, (2) using higher risk weights according to the currency denomination of loans, and (3) tightening the rules on loan concentration. Prudential measures directly targeting the supply of foreign currency loans have been implemented in several CESEE-11 before (or during) the crisis, in particular in Croatia, but also Poland, Romania and Bulgaria. Hungary also followed suit, but only more recently. The debate on further steps in this area is still on in several countries. Plans to ban foreign currency lending to unhedged borrowers and raise risk weighting on foreign currency mortgages from 75% to 100% are being discussed in Poland to limit risks stemming from both housing loans and foreign currency loans (IMF, 2010). Croatia, which had implemented a wide range of policy measures targeting foreign currency loans, opted for a relaxation of minimum reserve requirements and the easing of foreign currency liquidity regulations (to alleviate the government's financing needs), thus facilitating banks' access to foreign funding when the financial crisis struck (Gardò, 2010). While these measures targeted the public sector's borrowing needs, they might also have had an effect on foreign currency lending to households.

Supervisory measures included improving reporting and disclosure rules, conducting periodic stress tests of banks' balance sheets, strengthening off- and on-site inspections, and establishing an increased dialogue with home supervisors of foreign banks. In the CESEE-11, banking supervision has improved substantially since the beginning of the 1990s, which also contributed to strengthening trust in the local banking markets. Still, continued stress testing and monitoring of banks' capabilities and practices in the field of credit risk assessment remain key priorities for supervisors – particularly in the case of banks with substantial foreign currency lending. Other important measures are making headway toward higher transparency and more detailed disclosure of banking data, especially sectoral data on currency denomination or indexation as well as information about potential discrepancies between loan classification and the ultimate use of these loans (see Walko, 2008). Periodic surveys of banks' and borrowers' foreign exchange exposure can also be helpful to ensure that foreign currency lending to households remains under control and to identify indirect exchange rate risks for banks (e.g. Stix, 2008). Measures aimed at promoting a better understanding of risks, such as training of bank staff or moral suasion, can also have an effect on the supply of foreign currency loans. In addition, the establishment and increasing efficiency of credit registers can help dampen excessive foreign currency lending by improving market discipline and providing adequate reporting information to the supervisory bodies.

Majority foreign ownership in banking can make it more difficult to effectively implement prudential and supervisory measures targeting foreign currency lending. For example, local subsidiaries may shift part of their loan portfolio to the parent bank as a reaction to measures which try to limit the volume of foreign currency lending (this happened e.g. in Bulgaria and Romania in the mid-2000s). Parent bank supervisors should also help contain foreign currency lending by subsidiaries. For example, the EBRD points out that the Swedish supervisory authorities insisted that Swedish banks' subsidiaries abroad (in particular in the Baltic countries) tighten their lending standards in 2007 (EBRD, 2008). However, with hindsight, this case can also be seen as an instructive example of belated action, given that the foreign currency lending boom had already started years earlier in the Baltic countries and that it had gone very far by 2007, also compared to other CESEE countries. In January 2009, the "Vienna Initiative Plus" was established to strengthen cooperation and cross-border coordination of regulation and supervision in order to meet financial and economic challenges in CESEE (Nitsche, 2010).

The empirical estimations in section 4 also revealed the importance of demand. Public awareness campaigns, particularly among households, and other tools to warn borrowers of the risks entailed in foreign currency loans should promote a better understanding of these risks and thus dampen excessive demand for such loans. Above all Romania and Poland took decisive measures in this field. The OECD most recently recommended promoting financial literacy programs for all age groups and especially for vulnerable groups, such as the elderly and the less educated (OECD, 2010). In addition, increased transparency of loan contracts is key to enhancing borrowers' understanding of the costs and risks involved. For example, in Hungary, a code of conduct was signed in 2009 to limit instances where banks can transfer increased loan costs to households (OECD, 2010). Poland introduced "Recommendation S" in 2006, which aimed at improving the banks' practices concerning credit exposure. Banks had to provide customers with sufficient and better information to raise awareness of the risks associated with foreign currency lending

Besides these soft policy tools, also fiscal measures (such as abolishing or reducing existing incentives for foreign currency loans) can dampen demand for such financial products. Prudential measures that directly target demand include explicitly linking loan-to-value and payment-to-income ratios to foreign currency borrowing by households. Poland imposed an obligation on banks to require higher creditworthiness of customers applying for foreign currency housing loans than of those applying for złoty loans of an equivalent amount. As a result, banks offer their customers lower amounts of loans in foreign currencies than in złoty, so that the customers have a "buffer" in case of złoty depreciation and increased principal and interest installments. Hungary introduced different loan-to-value ratios and payment-to-income ratios according to currency denomination (forint, euro or other foreign currency) for household loans in 2010.

In addition to these instruments that directly target demand, several supply-related measures have an indirect impact on demand and vice versa. For example, market and financial institutional development in a credible macroeconomic environment are important instruments to strengthen the options banks have in terms of domestic refinancing and hedging, and to increase households' trust in the domestic banking system. The EBRD indicates that these measures are important for expanding the sources of domestic funding available and making it easier to price domestic currency loans at longer maturities (EBRD, 2009). Indeed, developing local currency capital markets would be an important measure for medium-sized CESEE countries with floating exchange rate regimes that do not intend to adopt the euro in the near future. The cost-benefit equation, however, appears to be less obvious for very small CESEE EU Member States with hard

Administrative measures, such as direct credit controls or limits on the availability of this type of loan for households, also impact both supply and demand. Such measures were temporarily implemented e.g. in Croatia in 2003 and in Romania from 2005 to 2006. More recently, in August 2010, mortgage-backed foreign currency lending was banned altogether in Hungary. Before that, in the last quarter of 2008, leading Hungarian commercial banks had made a voluntary commitment to reduce or stop lending in foreign currencies other than the euro. In the first half of 2010, currency-specific limits on loan-to-value and payment-to-income ratios had been introduced. However, EU membership and, in particular, participation in the internal market might limit the use of such administrative.

Monetary policy can use interest rate and exchange rate policies to impact foreign currency loan markets and address the related risks. Both the interest rate and the exchange rate are significant demand- and supply-side variables and thus have an impact on both. If, however, currency substitution of loans (and deposits) is already at a high level, the effects monetary policy can achieve are limited, as it can only impact the domestic interest rate, and foreign funding may be available at low rates in open capital account regimes (Brzoza-Brzezina, Chmielewski and Niedzwiedzinska, 2010). As concerns exchange rate policy, increased exchange rate flexibility and, with it, volatility might increase direct exchange rate risk and thus the risk of default of foreign currency debtors who are not hedged against the exchange rate risk (Backé, Ritzberger-Grünwald and Stix, 2007)

Besides Croatia and Poland, Romania is another country where the combined impact of prudential, supervisory and administrative measures targeting supply and demand helped to dampen foreign currency lending at least temporarily (namely in 2006). In Romania, monthly debt service payments were not allowed to exceed 40% of the borrower's net monthly income. The exposure of a credit institution to foreign currency loans granted to natural and legal persons had to be below 300% of the bank's own funds or of the endowment capital of foreign branches of banks. These measures were combined with other measures, such as raising reserve requirements for liabilities denominated in foreign currency from 30% to 35% in the fourth quarter of 2005 and to 40% in 2006 (Standard and Poor's, 2008). Loan classification was refined, too. However, several of these measures were discontinued when Romania entered the EU in 2007.

Future research should empirically analyze the effectiveness of regulatory measures that target the supply of, and demand for, foreign currency loans to households at the country level. As laid out earlier, regulatory restrictions might be responsible for the negative relationship between the index of banking sector reform and foreign currency lending to households shown in table 3. However, the panel data setting presented in this paper does not allow drawing country-specific conclusions.

6. SUMMARY AND CONCLUSIONS

Foreign currency lending to households surged in many CESEE-11 countries during the last decade, which induced several international institutions, supervisory bodies and central banks (including the OeNB) to advise caution. The financial crisis revealed the risks involved in foreign currency borrowing by households, thus providing a window of opportunity to strengthen prudential regulation and supervision of this loan market segment.

This paper contributes to the empirical research by providing evidence at the macroeconomic level that developments of foreign currency lending to households in the CESEE-11 in the period 1996 to 2007 were driven by a variety of demand and supply factors. Important factors on the supply side are the difference between the interest margins (lending rate minus interbank interest rate) on domestic and foreign currency loans, the quality of banking sector regulation (and thus regulatory restrictions on foreign currency loan markets), and banking sector concentration. On the demand side, private consumption and housing prices are significantly related to foreign currency lending to households. Important factors for both supply and demand are the interest rate differential, EU membership, and inflation. The results for the foreign currency deposit base, foreign ownership in banking and the exchange rate are not that robust.

In view of these results, it seems only logical that regulation and other policy measures should target both the supply and the demand side of foreign currency lending to households. This paper contributes to the literature by discussing these measures in detail and by explicitly referring to their impact on supply and demand. Before the financial crisis, some CESEE-11 countries had taken a range of measures to limit foreign currency lending to households, while other countries had been less active in this field.

Measures that primarily target demand include soft policy tools, such as aware-ness campaigns, but also prudential measures. Eligibility requirements for foreign currency loans, for example in terms of stricter loan-to-value and payment-to-in-come ratios depending on the loan denomination, were implemented and should prove particularly effective if applicable to both banks and nonbank financial intermediaries. In particular, Croatia, Poland and, more recently, Hungary have been active in this respect in view of the large foreign currency exposure of household loans. Bulgaria and Romania at least temporarily applied similar prudential measures. On the supply side, special emphasis was put on higher risk weights and capital adequacy rules related to foreign currency loans, as well as supervisory measures. Administrative measures targeting both supply and demand, such as bans on foreign currency lending to households, are more difficult to implement but were temporarily applied, too. Given the possible conflict of such measures with internal market rules, this was mostly before EU accession, though. Most recently, an increase in risk weighting on foreign currency mortgages has been discussed, for example in Poland. The EBRD has called for stricter regulation of foreign currency loans since 2009, a call that has received further support from the "Vienna Initiative Plus" (Nitsche, 2010). However, governments have to consider that overregulation can be counterproductive as long as macroeconomic stability is (still) a concern and local currency funding is not available (Zettel-meyer, Nagy and Jeffrey, 2010). In its most recent Transition Report, the EBRD (2010) calls for a deepening of local currency capital markets to foster domestic sources not only for corporate but also for bank financing.

Although growth of these loans has declined in the wake of the financial crisis, the remaining stock of foreign currency loans to households, and thus their exposure to vulnerabilities, remains large in some CESEE-11 countries. There-fore, it is important to put in place a framework that will promote new household borrowing in domestic currency or at least limit excessive exposure of unhedged borrowers. Measures should address the quantity and the quality of loans to correct existing vulnerabilities and avoid new ones. Other factors that will have an effect on future developments are the degree of openness of the capital account, the set of monetary instruments, the effectiveness of monetary transmission channels and regulatory implementation, fiscal incentives and regulatory loopholes. Given the variety of demand and supply factors that drive foreign currency lending to households, individual measures will not be enough to help keep such lending below reasonable limits. Rather, a mix of policy and regulatory measures is called for, and it should be put in place before the CESEE-11 economies take off again in terms of faster economic growth and financial sector development.

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OPTIMAL LEVEL OF RESERVE HOLDINGS: AN EMPIRICAL INVESTIGATION IN THE CASE OF ALBANIA

*Gerti Shijaku**

ABSTRACT

This working paper makes an attempt to test the importance of the relative precautionary and mercantilist motives that seek to explain the reserve holdings, namely variation payments and receipts, financial costs and reserve holdings in the case of Albania. First, the aim is to evaluate the impact of changes in international transactions on reserve holdings. Second, I intend to evaluate reserve holdings from a cost opportunity perspective. The material is based on the Buffer Stock model. This model assumes that reserve holdings are affected by changes of payments and receipts in the balance of payments. Reserves serve as a buffer stock to accommodate fluctuations of external transactions, while the initial stock is the optimal level. The focus of the model is to estimate the optimal level of reserves against possible exogenous shocks or a crisis, particularly fluctuations of foreign capital inflows, mainly remittances. The volatility of reserve holdings is generated by Autoregressive Conditional Heteroskedasticity (ARCH) estimation, while the Buffer Stock model is estimated with an ARDL approach. Results indicate a negative relationship of reserve holdings with opportunity cost, volatility and deviation of exchange rate from the trend and positive relationship with imports. The approach estimation suggests that the level of optimal reserve holdings is more sensitive to precautionary rather than mercantilist motives.

Keywords: International Reserve Holdings, Buffer Stock Model, EGARCH(p,q)-AR(q), ARDL Approach.

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I. INTRODUCTION

The stock of reserve holdings of a country is a component of all liquid assets in foreign currency held by central banks as a guarantee to ensure the payment of obligations that may arise in the context of trade and financial transactions obligations. It is a public asset that could and should be used to guarantee the continuation of economic activity and financial stability in case of crises. Thus, reserves are a tool in the form of guarantee to the economy, but used only in extreme cases. Generally, reserve holding (held in the form of hard currencies or metals in a monetary or monetarised form) have the ability to generate profits when used in the money and capital markets. But, by definition, it can be understood that the security motive predominates income motive and therefore reserve assets are invested in safer investments with a low rate of return. Consequently, raising the level of reserve holdings has a high opportunity cost.

However, the overall definition fits and varies depending on the choices that countries make in term of economic model and degree of openness, external sector characteristics and the exchange rate regime. In general, reserve holdings would play a more active role in countries with fixed exchange rate regime or in economies that use this mechanism as a tool to maintain comparative advantages in exporting industries, or to accommodate the negative effects of unstable foreign capital inflows as in the case of remittances and portfolio investments. In such cases, reserve holdings may serve first, as a mean to achieve monetary policy in terms of restrictions on capital mobility; second, to support external trade policy and to avoid any difficulties in international transactions as a result of lack of liquidity in foreign currency; third, to be self-insured against the fluctuations of foreign capital inflows, mainly remittances and foreign direct investment and to accommodate the negative seasonality effects, speculative shocks and current account deficit effects caused by both public and private sector.

However, beyond the outlined reasons, in recent years there has been a tendency of investing reserves in riskier instruments, in exchange for higher rates of return. Generally, in cases where reserves have been the product of economic policies or rising prices in commodities and raw materials markets, they are also used as a proper investment form. In extreme cases, the funds used for such investments are segregated from the total stock of reserves and are treated as proper public investment assets of the sovereign government. In this case, the funds used are not part of the reserve holdings managed by the central bank. However, reserves are used to accommodate fluctuations of the national income and expenditure in the form of smoothing consumption for different categories of consumption: government, current account deficit, pension funds, etc.

Generally speaking, globalization has brought some new tendencies relating to the stock of reserve holdings. Beyond fixed exchange rate regime policy, the rapid expansion of globalisation process originally appeared through the reallocation of production to developing and transition countries. This promoted substantial foreign investment inflows and was followed by the growth of trade from developing countries to developed ones. These phenomena led to a substantial raise of trade surpluses and reserve holdings of the developing countries. Reserve holdings also increased in transition economies, which have experienced high current account deficits driven by higher foreign direct investment inflows. These tendencies are also noted in small economies in Eastern Europe, which have accumulated large reserve stocks compared to the relative size of their economy. In contrast to these countries, Albania has accumulated reserves at a lower speed. Compared to other countries in the region, the level of reserve holdings is the lowest. These reserves are accumulated in a framework of a floating exchange rate regime and a capital account virtually liberalised for non-resident and persistent current account deficit compared to the region.

In this case questions coming up are related to the analysis of why the level of reserve holdings is relatively lower than in other countries in the region. Is the level of reserve holdings sufficient to ensure macroeconomic and financial stability in the long term? How should reserves be managed in the future? This discussion paper tries to provide a general opinion on these questions and to determine tendencies of reserve holdings in the future.

Albania started the economic transition process with a very low level of reserve holdings. Socialist state used reserves to provide the means of consumption in the presence of collapsing planned economy. The transition began with a stock of reserves of only about $2million. Thus, the accumulation of reserves has been an integral part of the monetary program carried out in light of the IMF agreements, specified in the monetary program as a bottom level sufficient to cover up four months of imports. This level is achieved almost throughout the program enforcement period and remains so today.

However, the concept of determining reserve holdings outlined above faces two main challenges. First, in the recent years monetary policy, meaning design and implementation, has gone through significant changes. It moved from monetary targeting forms towards inflation targeting regime [Fullani, (2009)]. Referring to the monetary policy strategy of the Bank of Albania, as in the case of European Central Bank (ECB), money will continue to play an important indicative role on monetary policy in the long-run but inflation forecasting and expectation have already the leading role in setting policy in the short-run. Hence, the role of the monetary program is waning and its indicative targets are already subordinate compared to inflation developments. Recently, operational policy moved from targeting money circulation to targeting the short-term interest rates. Thus the determination of optimal level of reserve holdings as before is no longer a simultaneous part of the monetary policy.

On the other hand, unlike different successful transition economies, Albania has not received high foreign investment inflows similar to the ratios observed in Central and East European economies. Still, Albania offers great potentials in certain areas like tourism, infrastructure, energy, agribusiness, etc., which, for capital markets, is a good investment opportunity. The entry of one or more major projects, comparable to those of Central Europe, comprises a significant amount of foreign currency for the Albanian small economy. In terms of floating exchange rate policy, such investment could cause a significant appreciation of the national currency and hence a loss of competitiveness. The question is how should the Bank of Albania operate in such an environment?

The Bank of Albania will have to manage these development influxes and their effects on the economy in two different approaches. First, from the macroeconomic perspective: mainly focusing on inflation and less in production. Second, from the financial stability perspective: mainly in current account deficits, under a floating exchange rate regime and inflation targeting regime and a fully liberalised capital account. So the question is whether to intervene in order to increase the level of reserve holdings? Or to what extent should reserve holdings increase without dictating the exchange rate?

From another perspective, rapid growth of fiscal deficit in the last three years has increased public debt of Albania economy beyond the ratio of 60 percent of GDP. The decision of the government to move towards commercial debt during a bad period (post crises) in financial markets has boosted the cost of borrowing. Consequently, reserve holdings should also consider the external borrowing costs.

This discussion paper attempts to apply an empirical approach in evaluating the optimal level of reserve holdings in the case of Albania. Empirical evaluation is important to understand the optimal level of reserve holdings in the case of Albania. Is there a need to increase reserve holdings and to what extent? At the same time, efforts are made to better understand the nature of the link between the dynamics of developments in the current and capital accounts, expressed through the volatility of international transactions, and financial costs of reserve holdings. The first aim is to examine the impact of international transaction dynamics on reserve holdings and the second is to assess the optimal level in terms of opportunity cost.

The material is organised as follows: section 2 explains the Buffer Stock model for assessing reserve holdings. The next section applies the methodology of estimation and the ARDL approach, and analyses results in the case of Albania. The material concludes with preliminary recommendations and conclusions.

II. MODELING INTERNATIONAL RESERVE HOLDINGS

Reserve holdings are necessary as a guarantee to balance external sector shocks. The higher the reserve stock level, the more protected is the economy. On the other hand, reserve holdings have a financial and economic cost expressed as forgone earnings from investment and in the growth of the external government debt. Thus, it is necessary to evaluate the optimal level of reserve that satisfies both outlined criteria. Estimating the optimal level is a task faced by the monetary authority of a country. Frenkel and Jovanovic (1981) developed a theoretical Buffer Stock model of the demand for reserve. This model describes reserves as a continuous exogenous Wiener process of the following form:

$$dR(t) = -\mu dt + \sigma dW(t) \qquad (1)$$

Where, $R(t)$ is the level of reserves at time t and $W(t)$ is a standard Wiener process, based on a simple random walk, with mean μ and with variance σ. The change in the level of reserves in a small time interval dt is a normal distribution variety. At each point in time the distribution of reserve holdings $R(t)$ is characterised by:

$$R(t) = R^* - \mu t + \sigma W(t) \qquad (2)$$

Where, R^* is the optimal level of reserves, μ denotes the deterministic part of the instantaneous change in reserves and σ represents the standard deviation of the change in reserves that comes from the Wiener process. In this model, reserves are a stochastic process governing the inflows of payments and receipts in the balance of payment. Thus, changes in reserves are a normal variety process with mean $-\mu dt$ and variance $\sigma dW(t)$. Assuming that the balance of payment is balanced, Frenkel and Javanovic (1981) suppose that μ is zero. If for developing countries μ is a determining variable then it is a special case that requires further discussion. However, it is worth noting that many authors, who are based in this model, have adopted this assumption. I will have a discussion on this later. The actual stock of reserves R(t), in time t, is a random variable characterized by:

$$R(t) = R0 - \mu t + \sigma W(t) \tag{3}$$

And

$$R(t) \sim N\ (R0 - \mu t; + \sigma 2(t) \tag{4}$$

In the above case, according to Frenkel and Jovanovic (1981), R_0 is the initial stock of reserve (assumed to be the optimal level). If we also assume that overall reserves are at their optimum level, in other words on average each year stocks are close to the optimal level, the displacement constant μ is zero and thus the product μt is zero. So the stochastic process that governs changes in reserves is without a drift.

Under the above assumption, Frenkel and Jovanovic (1981) assume that the optimal level is the stock of reserves that minimises the cost of adjustment (which itself means a cost that can be derived by adjusting the current level of reserves to the optimal level and the opportunity cost of holding reserves). In the case of the first cost, it can be considered as the level of money that should be withdrawn from the economy, so as to yield the desired balance of payments surplus that is necessary to accumulate reserves. Thus, this cost measures the cost of pursuing reserves in the case when it is below the optimal level (in other words the cost of real adjustment necessary to enable a positive balance of foreign payments. The second cost represents the opportunity cost (forgone earnings) of reserve holdings. So it is the amount of forgone earnings from not investing the reserves, or the amount of forgone earnings lost in the form of interest in case of borrowing. It measures the cost of society whenever the level of reserves is above the optimum level and should be adjusted down. The optimal stock serves to simultaneously minimise both costs, so that it minimises the loss function.

Using a second order approximation suggested by Taylor (2002) and then the log linearization of the obtained expression, the optimal stock of reserves can be expressed by:

$$\log(R_t) = b_0 + b_1 \log(\sigma_t) + b_2 \log(r_t) + u_t \qquad (5)$$

Where, r is the opportunity cost of reserve holdings. Frenkel and Jovanovic (1981) evaluated equation (5) in order to calculate the corresponding value of the coefficients, which later can be used to estimate the optimal level of reserve holdings. The priorities of the Buffer Stock model relate to the appearance as a time continuous approach and to the possibility to evaluate easily generated variables. I will try to evaluate, in order to find the approximate values of the respective coefficients, the same equation. Thus, variables included in equation (5) are expressed in nominal value.

III. APPLYING BUFFER STOCK MODEL: THE CASE OF ALBANIA

Most studies on the subject have assumed that the optimal level of reserve holdings is a stable function of a small number of variables [Prabheesh (2009), Ramachandran (2006) Edwards (1985)]. Hence, in order to evaluate the Buffer Stock model from the financial cost concept and given that in the case of Albania reserves are held in terms of months of imports covered, I found it more appropriate to estimate reserve holdings by the following equation presented by Frenkel and Jovanovic (1981):

$$\log(R_t) = b_0 + b_1 \log(\sigma_t) + b_2 \log(r_t) + b_3 \log(IM_t) + u_t \qquad (6)$$

Where, IMt is the monthly import volume of goods and services of a given country. The use of imports is also justified because imports are a factor of pressure of the balance of payments and it serves as a scale factor for a country [Silva and Silva (2004)]. So equation (6) is the starting point of reserve holdings estimation. The sample period in the case of Albania is 1996M1-2010M12. Furthermore, our aim is first, to find a suitable model for assessing the volatility of payments and receipts in the balance of payment based on equation (5); second, to evaluate the Buffer Stock model by ARDL approach, and third, to analyse empirically the results of the estimated model.

A. ESTIMATING THE VOLATILITY OF RESERVE HOLDINGS AND NOMINAL AND REAL EXCHANGE RATE, OPPORTUNITY COST AND THE DINAMICS OF CURRENT ACCOUNT

The change in the stock of reserve holdings is adapted as a proxy for the volatility of payments and receipts in the balance of payment [Ramachandran (2006), Silva and Silva (2004)]. The adjusted time series presents the stock of reserve holdings and is the sum of gold, stock Special Drawing Rights (SDR), foreign exchange. The data are in millions of euro and are taken from the Monetary Operations Department at the Bank of Albania. The volatility of changes in reserves is estimated covering the period 1996M01-2010M12, since the evaluation of Buffer Stock model through the ARDL approach requires the use of longer time series.

The volatility of reserve holdings, which captures the precautionary motive, is estimated through the Autoregressive Conditional Heteroskedasticity approach (ARCH estimation) because the diagnostic ARCH-LM test indicates that the time series suffers from the ARCH effects. In this case, in order to generate a suitable variable to measure the volatility of reserve holdings, I tested different specifications of ARCH, GARCH, EGARCH, TGARCH, by adjusting the model specification used by Ramachandran (2006) and Silva and Silva (2004):

$$\Delta R_t = \delta_t + \sqrt{h_t} * \upsilon \tag{7}$$

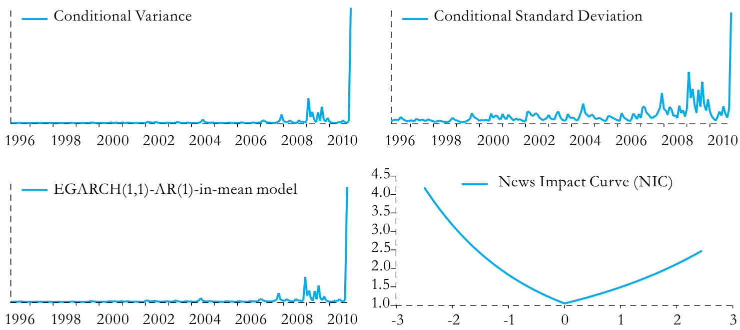
Where, δ_t is a country specific factor, which is a function of fixed costs of adjusting payments and receipts in the balance of payment; h_t is the square root conditional variance and υ_t is a random variable. The usage of alternative ARCH approach aims to explain the volatility of reserve holdings especially during the period of economic crisis that swept in Albania in the late 2008 and early 2009.

The best suitable model, among the specifications outlined above, is selected based on the Akaike Info Criterion (AIC) criterion and on the diagnostic test of Q-statistic and ARCH LM-test. Thus, EGARCH(1,1)-AR(1)-in-mean model specification is selected as the best arrangement to measure the volatility of changes in reserve holdings. The model disagnostics do not indicate problems with serial correlation in the standardized squared residuals or ARCH effect on residuals. EGARCH models are best suited to capture the volatility of financial data [Brooks (2008) and Enders (2010)]. Moreover, the indicator of measuring the changes in the balance of payment transactions (σ) on one hand reflects the volume of foreign capital inflows and on the other hand, appears as a characteristic of the possibility of free capital mobility in a country [Flood and Nancy (2002)]. Hence, since the EGARCH approach imposes no restrictions on the sign of the coefficients, the model appears to be satisfactory and overall the EGARCH(1,1)-AR(1)-in-mean model add some vital information (Table 4a).

The conditional standard deviation is significant at conventional significance levels, implying that it affects the volatility of reserve. The AR(1) is significant and improves the Q-square statistics test. The coefficient of the conditional shock c(5) is statistically significant and positive. This implies that the conditional shock raises the conditional volatility of the reserve holdings. The coefficient c(6) has a negative sign even though it is statistically insignificant. This indicates that shocks have asymmetric effects on the volatility of reserve holdings. The magnitude of the coefficient, being statistically significant, confirms that positive shocks react positively by reducing volatility, while volatility increases more in response to a negative shock rather than a positive one, which is reconfirmed by the News Impact Curve (Chart 1). The magnitude and the significance of the coefficient c(7) reveal that the degree of persistence of the shocks is high. Such an effect was conducted throughout the whole estimated ARCH type models, indicating that the impact of shocks to reserve holdings does not die out and has long-lasting effects.

In addition, the estimated results (Chart 1) indicate that the volatility of changes of reserve holdings is higher during the period 2008M01-2010M02 and again at the end of 2010. The higher volatility level (during this period first) corresponds to the economic crisis that swept Albania due to the global financial crisis. Second, the level of reserve holdings, consequently to volatility, is affected by the intervention of the Bank of Albania to stabilise the national currency price (lek) in the short-run and interventions for the payment of public debt. In addition, the higher level of volatility at the end of 2010 is due to the external borrowing from the Ministry of Finance.

Chart 1: Volatility of reserve holdings based on EGARCH(1,1)-AR(1)-in-mean model

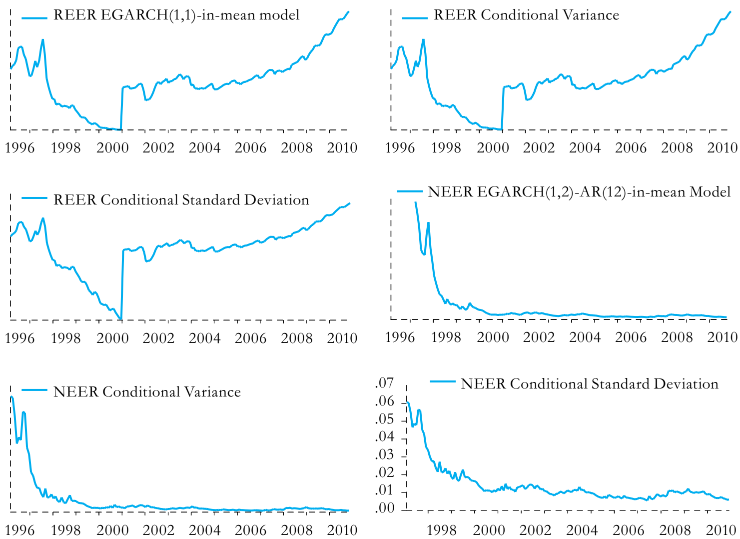


Moreover, the rising level of reserve holdings can be expressed related to some other precautionary and mercantilist motives. The precautionary approach assumes that financial integration of the developing countries increases exposure to volatile capital flows or hot money, which are subject to sudden stop and reversal [Calvo (1998)]. Thus, this study makes an attempt to test the importance of other alternative precautionary motives that seek to explain the reserve holdings, by incorporating some specific variables, namely the volatility of monthly average index of Nominal and Real Effective Exchange Rate (REER and NEER), along with other standard explanatory variables. On the other hand, mercantilist approach argues that reserve holding is the product of the undervalued exchange rate policies adopted mainly by the Asian economies to promote their exports and channel domestic and foreign direct investment to export industries [Aizenman and Lee (2005)]. According to Vika (2008), on short-run basis, the Bank of Albania has generally intervened in the foreign exchange market to reduce high market volatility or put a stop to exchange rate overshooting, but not to influence the exchange rate trend in the long-run. This provides a case to investigate whether it is also the mercantilist approach that can better explain the reserve holdings in the Albania case. For this reason, this study will further attempt to test the deviation of the nominal and real exchange rates from the trend to capture mercantilist argument of undervalued exchange rate policies. Besides, European Union countries are the major trading partner with Albania and a vast amount of foreign exchange transactions of Albanian Lek (ALL) take place in euro currency. In keeping with this, I have also considered the deviation of nominal exchange rate of Albanian Lek (ALL) against EU euro.

The data on REER and NEER are taken from the Research Department at the Bank of Albania. The exchange is expressed as the number of national currency per unit of foreign currency and accordingly a rise in the exchange rate indicates depreciation and a decline indicates an appreciation of the Albanian Lek (ALL). The volatility measure of REER and NEER, which capture the precautionary motives, is also estimated by applying the ARCH model based on equation (7) because the diagnostic ARCH-LM test indicates that the time series suffers from the ARCH effects.

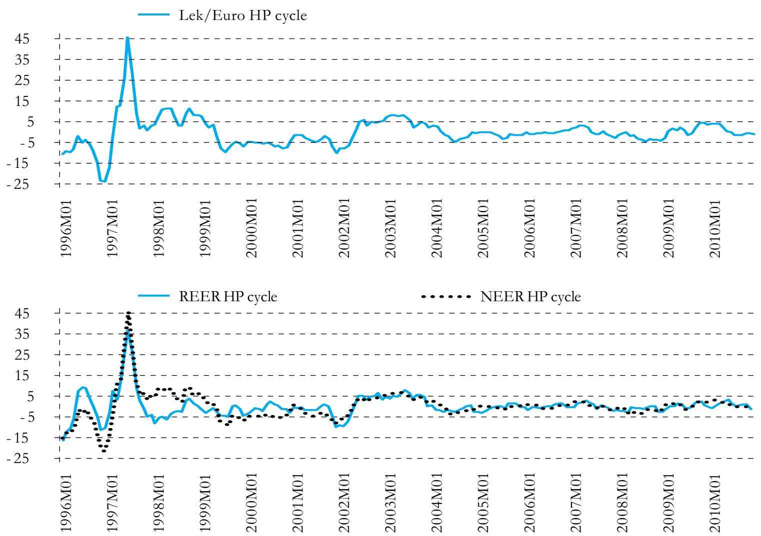
The best suitable model, among the specifications outlined above, is selected based on the AIC criterion and on the diagnostic test of Q-statistic and ARCH LM-test. Thus, EGARCH(1,1)-in-mean model specification for REER and the EGARCH(1,2)-AR(12)-in-mean for NEER are selected as the best arrangement to measure the volatility of changes in reserve holdings, while the model diagnostics do not indicate problems with serial correlation in the standardized squared residuals or ARCH effect on residuals. The results for the volatility of REER and NEER are presented in Table 4b and 4c. The conditional standard deviation is significant at conventional significance levels for REER, implying that it affects the volatility of REER. The coefficient of the conditional shock is statistically significant and for REER (NEER) is negative (positive). This implies that the conditional shock decreases (raises) the conditional volatility of the REER (NEER). The coefficient c(5) (Table 4b) has a positive sign and is statistically insignificant, while the coefficient c(7) (Table 4c) has a negative sign even though it is statistically insignificant. This indicates that shocks have asymmetric effects on the volatility of NEER and not on REER. The magnitude of the coefficient c(5) and (c(7) being statistically significant) indicate that the volatility of REER (NEER) increases more in response to a positive (negative) shock. Overall, the models represent that the degree of shock is persistence and high, even though it is insignificant on NEER. Furthermore, the estimated results (Chart 2) indicate that the volatility of changes in NEER is higher during the period 1997-1998 and lowering thereafter, meanwhile the volatility of changes in REER is higher during the period 1997-1998 and is again rising since 2001, reflecting more the changes in relative prices.

Chart 2: Volatility of REER and NEER based on EGARCH-in-mean Model



The measure of the undervalued exchange rate to capture mercantilist motive is contrasted using the HP filter method based on REER, NEER and Lek/Euro. The deviation of REER, NEER and Lek/Euro from the HP filter trend (chart 3) shows positive and negative values indicating that throughout the sample analysis the exchange rate has gone though a pattern of appreciation and depreciation against other currencies.

Chart 3: Deviation of REER, NEER and Lek/Euro
from the HP filter trend

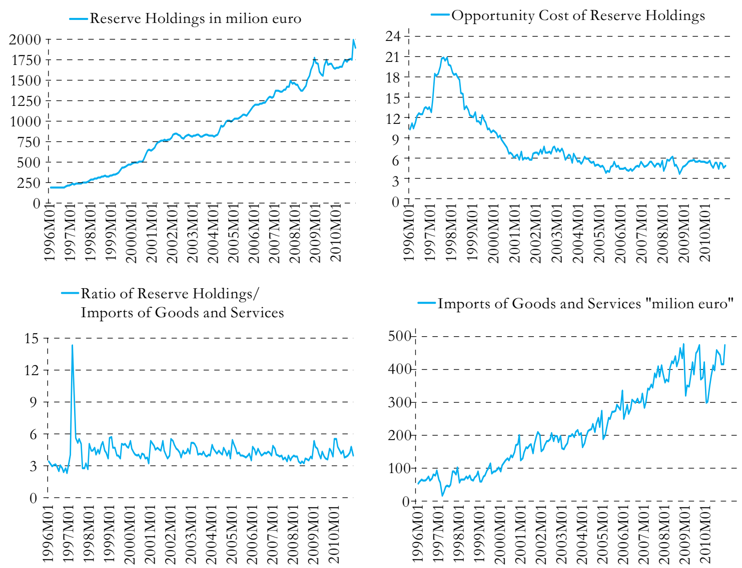


Opportunity cost of reserve holdings is the second variable to be generated. Generally, opportunity cost plays an important role in the reserve holdings estimation model. Overall this economic variable is defined as the difference between the highest potential forgone marginal productivity from an alternative investment of fixed assets and the yield (income) from the reserve holdings in foreign currencies [Ben-Bassat and Gottlieb (1992)]. This indicator can be defined as the difference between the yields (interest) paid on public debt and the rate of return from investing the reserve holdings [Edwards (1985)]. In particular, such definition considers the fact that reserve holdings are usually held in the form of short-term interest-bearing assets. Thus, it will represent the net cost, given by the difference between the domestic marginal product of capital and the return obtained from reserve holdings. However, for developing countries the opportunity cost must present a combination of internal and external costs because these costs differ greatly from investment return rate of reserves [Silva and Silva (2004)].

Albania, like most developing countries, borrows in international financial markets on a regular basis, which in turn brings in foreign capital inflows. Meanwhile, the cost of borrowing varies extremely as a result of borrowing capacities, type and duration of loan maturity. Conversely, reserves are invested by the Bank of Albania at a lower rate than the yield paid on debt services because the objective of the bank is to invest in safe investment instruments. Thus, in order to generate an indicator that optimises between the characteristics of Albania and satisfies the theoretical definition, the estimated variable of opportunity cost expresses the difference of the 3, 6 and 12 months average weighted bill rates and 10-year Eurobond monthly rate of return to the yield of investing reserves measured by 1-3 years German emissions index. The data on treasury bill rate and the German index are taken from the Monetary Operations Department at the Bank of Albania, while data on Eurobonds are taken from official website of the European Central Bank (ECB). Furthermore, data on imports are taken from the Research Department at the Bank of Albania and express the monthly volume of imports of goods and services in million Euros.

The data (Chart 4) indicates that during the sample evaluation the dynamic development in the stock of reserve holdings and imports of goods and services have an upward sloping trend, while data on the opportunity cost and volatility do not pose a clear deterministic trend. Thus, on the basis of this survey, the empirical evaluation contains a constant trend term. Data, apart from REER_hp_cycle and NEER_hp_cycle, are transformed in logarithmic form. Thus, estimated coefficients present the elasticities of the affecting dynamics of explanatory variables on the dependent variable.

Chart 4: Reserve holdings and explanatory variables



In particular, it has generally been assumed that countries are often exposed to difficulties in controlling capital movement over the crisis period mainly due to the development of modern technology, new financial instruments and the lack of controlling mechanism. Therefore, higher reserve volatility means that reserves hit their lower bound more frequently; the central bank should be willing to hold a larger stock of reserves and tolerate greater opportunity costs, in order to incur the cost of restocking less frequently [Flood and Nancy (2002)].

Moreover, according to Elbadawi (1990), volatility term (b_1) is viewed as a proxy for the theoretical concept of risk and uncertainty. Thus, it is assumed that in the long-run reserve holdings depend positively on volatility ($b_1>0$). Besides, a positive value of REER_hp_cycle, NEER_hp_cycle and Lek/Euro_hp_cycle would indicate an undervalued nominal and real exchange rate of Albanian Lek (ALL) against other foreign currencies and accordingly, it would increase reserve holdings [Prabheesh (2009)]. Thus, when mercantilist motives variables are considered, the coefficient (b_1) is predicted to be positively related to reserve holdings ($b_1>0$). Furthermore, reserves are generally exposed to opportunity costs, expressed through forgone earnings. So, the lower the alternative opportunity cost, the higher will be the level of reserve holdings ($b_2<0$), as alternative investment will be less attractive.

Finally, the volume of imports of goods and services, IM, apriority even though is justified, the direction of the impact of import is determined [Elbadawi (1990)]. On the one hand, a Keynesian model that emphasizes output adjustment will call for a negative impact; however, an alternative theory of adjustment mechanism emphasizing the role of relative prices and the price level would call for a positive impact. Hence, although this issue is an empirical question, referring to the strategy of managing reserve holdings followed by the Bank of Albania and the tendency to gradually move towards full capital mobility liberalisation, I assume that the developments in current and capital account play an important role in reserve holdings in the case of Albania. Hence, the higher the changes in foreign transaction payments, the higher will be the level of reserve holdings and for this reason I assume that the greater is the volume of imports in monetary value, the higher will be the level of reserve holdings ($b_3>0$).

B. THE BUFFER STOCK MODEL THROUGH THE ARDL APPROACH

An important step in assessing the optimal level of reserves empirically is to evaluate the Buffer Stock model through the long and short-run concern. Thus, I have applied the bound test ARDL approach developed by Pesaran et al (2001). First, as the sample period is relatively short, the pursuit of this methodology appears to be more efficient and appropriate. Second, this approach allows, through the specification of the model, a cointegration relationship in which the long and short-run coefficient are simultaneously evaluated. In return, this eliminates problems with omitted variables and serial correlation. So the estimated coefficients are unbiased and efficient. Third, the method assumes that included variables of interest can be cointegrated in long-run period, even though they might have different order of integration I(0) or I(1). In addition, the approach to a single equation provides more degrees of freedom compared to the Vector Autoregressive (VAR) and Vector Error Correction Mechanism (VECM) approach developed by Johansen and Jeselius (1990). Hence, the estimated regression can be specified by:

$$\Delta \log IR_t = a_0 + b_1 \log R_{t-1} + b_2 \log s_{t-1} + b_3 \log r_{t-1} + b_4 \log IM_{t-1}$$
$$+ \sum_{i=1}^{p} d_{1i} \Delta \log IR_{t-i} + \sum_{i=0}^{q} d_i \Delta \log s_{t-i} + \sum_{i=0}^{q} d_i \Delta \log r_{t-i} + \sum_{i=0}^{q} d_i \Delta \log IM_{t-i} + d_i T_t + e_t$$

(8)

Where, $\log IR_t$ is the logarithm of reserve holdings; $\log \sigma_t$ is the logarithm of reserve stock volatility, which in other models is replaced logREER, logNEER representing the volatility of REER and NEER and REER_hp_cycle, NEER_hp_cycle and Lek/Euro_hp_cycle representing the deviation of exchange rate from HP filter trend; $\log r_t$ is the logarithm of opportunity cost; $\log IM_t$ is the logarithm of imports of goods and services in million euro; β_i is the long-run coefficient; a_1 is the constant or the drift coefficient; Δ is the difference operator; T_t is the time trend.

I have considered three main steps in our application of the ARDL model. Initially, I have estimated equation (8) by ordinary least square (OLS) technique. Then, the present of long-run linear relationship is traced by conducting an F-test (Wald test) for the joint significance of the coefficients of the lagged levels of the variables. The approximate critical values for the F-test are obtained from Narayan (2004), who has re-estimated the lower I(0) and upper I(1) bound critical values appropriate to a small number of observations. Second, the long-run relationship between reserve and the explanatory variables is evaluated as follows:

$$\Delta \log R_t = c_0 + \sum_{i=1}^{p} b_1 \log R_{t-i} + \sum_{i=0}^{q=1} b_2 \log s_{t-i} + \sum_{i=0}^{q=2} b_3 \log r_{t-i} + \sum_{i=0}^{q=3} b_4 \log IM_{t-i} + b_{5i} T_t + e_t$$

(9)

Where, all variables are as previously defined1. The lag length in the ARDL model is selected based on the AIC criterion, which is known for selecting the respective maximum lags. For monthly data, Pesaran et al (2001) suggest a maximum of 12–24 lags. However, according to Bahmani-Oskooee and Rehman (2005) results of the F-test depend on the number of lags imposed. In the final step, I have obtained the short-run dynamic elasticises by estimating an error correction model convergence to long-run equilibrium. This is specified as follows:

$$\Delta \log R_t = a_0 + \sum_{i=1}^{p} b_{1i} \Delta \log R_{t-i} + \sum_{i=0}^{q} b_2 \Delta \log s_{t-i} + \sum_{i=0}^{q} b_3 \Delta \log r_{t-i} + \sum_{i=0}^{q} b_4 \Delta \log IM_{t-i}$$
$$+ ECM_{t-1} + b_{5i} T_t + e_t \tag{10}$$

Where, λ is the speed of adjustment towards equilibrium; δ_{1234} are the short-run dynamic elasticises of adjustment; ECM_{t-1} is the lagged error correction term estimated from equation (10):

$$ECM_t = \log R_t - a_0 - \sum_{i=1}^{p} b_1 \log R_{t-i} + \sum_{i=0}^{q=1} b_2 \log s_{t-i} + \sum_{i=0}^{q=2} b_3 \log r_{t-i} + \sum_{i=0}^{q=3} b_4 \log IM_{t-i} + b_{5i} T_t \tag{11}$$

The coefficient and the statistical significance (t-Statistic) of the error correction term are presented as an alternative option for evaluating the long-run cointegration relationship. The negative magnitude and the statistical significance of the lagged error correction term (*ECM_{t-1}*) is a good way to show that there is a long-run cointegration relationship between dependent and independent variables [Kremers, et al (1992)].

C. EMPIRICAL RESULTS AND DISCUSSION

The assessment of long-run cointegration relationship, through the ARDL approach, provides an analytical and statistical framework, which is based on the assumption that variables might be integrated of order I(0) or I(1). However, implementing the unit root test is necessary to understand first, their characteristics and second, to make sure that the ARDL approach is an appropriate method. The unit root test is based on Augmented Dickey-Fuller (ADF) and Philliphs Perron (PP) diagnostic tests. The results of these tests (Table 5) suggest that some variables are stationary in first difference I(1) and some are stationary at I(0). This indicates that applying the ARDL approach is suitable, while in the estimated equation I have included a constant and a time trend.

In addition, equation (8) is estimated by OLS technique. However, to fulfil the endogeneity condition, each variable is estimated as a dependant variable in the left hand side (LHS) of equation (8). The optimal lag that maximises the AIC criterion and meets the endogeneity condition is 12 when variables to capture the precautionary motives are used and 8 when the empirical model contented a mixture of variables on precautionary and mercantilist motives. The computed critical values of F-statistics from the Wald tests for restrictions imposed on the parameters are reported in Table 6a-to-f. Statistical value of F-test is higher than the critical value of the upper bound of 4.515 at the 5 per cent significance level, meanwhile when REER is the RHS variable it is higher at 10 per cent significance level. In addition, when mercantilist motives variables, namely REER_HP_cycle and NEER_HP_cycle are the RHS variable, the critical value of F-test is higher than the critical value of the upper bound 5.004 at 1 percent significance level, while when Lek/Euro_HP_cycle is the RHS variable it is higher at 5 percent significance level. This indicates that the alternative hypothesis of the existence of a unique linear relationship between reserve holdings and its determinants can be accepted for Albania, in this case. Meanwhile, the critical value of F-test, where the explanatory variables are set as the dependent variables, is smaller than the critical value of the lower bound at the equivalent significance level, rejecting the null hypothesis. In other words, applying the bound test to ARDL approach proves that reserve holdings and the explanatory variables in each case are bound together in the long-run when stock of reserve holdings is the dependent variable (LHS).

Having established that reserve holdings have a long-run linear relationship with other determinant variables, following the ARDL approach, equation (9) is estimated for the long-run elasticities. The optimum ARDL lag order suggested by AIC and the estimated long-run elasticity coefficients of the ARDL models suggested by AIC are reported in Table 7a-to-f. The results obtained from the estimation of the Buffer Stock model have been quite satisfactory. The long-run coefficients indicates that logKOSTO and lnIMP exhibit the theoretically expected sign and are statistically significant at conventional level, meanwhile apart from being statistically insignificant only logREER has the positive expected sign.

The elasticity of opportunity cost of reserve holdings is significantly negative at the conventional level and is in line with the findings of Prabheesh (2009) and Ramachandran (2006) for India, Silva and Silva (2004) for Brazil. This indicates that the ratio between reserve holdings and opportunity cost is negative. So a growing financial and economical cost will generate the need to reduce the stock of reserves. The magnitude and the significance of the coefficient reconfirms the conclusion of Edwards (1985) and Ben-Bassat and Gottlieb (1992) that when this net opportunity cost is used, the regression coefficient might be significantly negative. The reserve holding level will respectively change by -0.30 to -0.38 percent in respond to a 1 percent change in the opportunity cost. The elasticity of imports of goods and services is significantly positive at the conventional level. The level of reserve holdings will respectively change by 0.38 to 0.39 percent in respond to a 1 percent change in the volume of imports. This suggests that in the case of Albania, expenditure-reducing policies are being pursued, meaning that any attempt to improve the current account deficit is done through expenditure-reducing policies [see also Edwards (1985)]. The positive sign of import coefficient confirms, according to Clark (1970), that the accumulation and management of reserve holding is dictated by the philosophy of the Anglo-American doctrine, while increasing level has served as a self-insurance instrument to avoid costly liquidation of long-term projects, when the economy is susceptible to sudden stops of capital inflows and to support trade and monetary policies.

The magnitude of the coefficient associated with the precautionary and mercantilist concerns, apart from the volatility of REER, indicate that in the case of Albania there exists a negative relationship on reserve holdings. In the lights of high level of reserve holdings, a negative relationship is due to the tendency to use offset and reduce absorption in the volatility of transactions payments through reserves usage [Aizenman and Sun (2009)]. However, even though it might bring the exhaustion of reserve, the magnitude and the significance of the coefficient implies that such policy action is relatively small and insignificant. First, under a floating exchange rate mechanism, this is due to Bank of Albania's objective to intervene in the foreign exchange market only in the short-run and to accommodate fluctuations of the national income and expenditure in the form of smoothing consumption for different categories: government, current account deficit, pension funds etc. Second, the Bank of Albania targets and considers information neither on the real or nominal exchange rate nor on the REER, NEER and the volatility in the transaction of payments and receipts when considering the level of reserve holdings. The coefficient of time trend is statistically significant and has the expected positive sign. This is evidence that in time, further improvement of managerial and investment skills will eventually lead to raising the reserve holdings by the Bank of Albania.

Furthermore, the estimated elasticities of the long-run coefficients with respect to volatility, undervalue of the currency price level, net opportunity cost and imports suggest that in the long-run reserve holding is very sensitive to developments in the current account, mainly imports of goods and services and monetary authorities will generally respond more to changes in the volume of imports. This indicates the precautionary holding of reserves against the persistent current account deficit in Albania during the sample period. These developments are respectively close to the empirical findings by Frenkel and Jovanovic (1981), Silva and Silva (2004) and Prabheesh (2007). The elasticity magnitude and the statistical significance suggest that in the case of Albania, reserve holding is less sensitive to the variables associated with the mercantilist concerns and the precautionary motives associated with volatility. This provides a hint on the ground that the Bank of Albania does use reserve holdings neither as a tool to maintain comparative advantages in exporting industries nor to accommodate the negative effects of unstable foreign capital inflows as in the case of remittances and portfolio investment. Thus, the estimation of Buffer Stock model through the ARDL approach and the results obtained in the case of Albania appear to be consistent with other empirical estimates for transition and developing economies, where current account dynamics are the main affecting force on the movements and accumulation of reserve holdings.

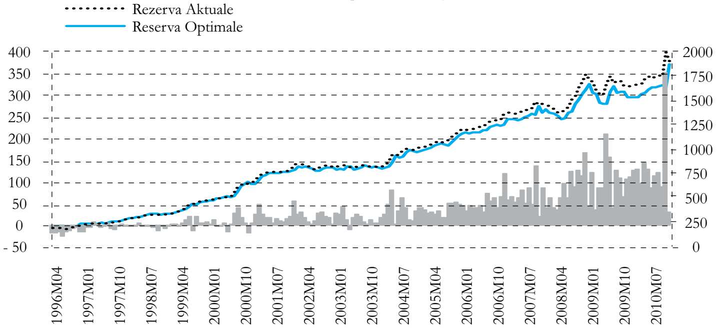
In addition, equation (10) is estimated using the lags determined in the evaluation of the long-run coefficients, while the short-run coefficients estimated by the ARDL approach are used to form the error correction term (returning to equilibrium). Table 8a, 8b, 8c, 8d, 8e and 8f report the results of the short-run error correction model along with a set of diagnostic tests conducted on the short-run model with respect to regression determination coefficient (R^2), model functional formulation Ramsey RESET test, normality (Jacque-Bera), serial correlation and heteroskedasticity in the error term and stability of the coefficient estimated using the cumulative sum (CUSSUM) and cumulative sum of squares (CUSSUMSQ) test.

The preliminary analysis indicates that the short-run coefficients are quite different from the long-run. Overall, the short-run elasticities do have the expected sign, while some of them are statistically significant. In the short-run, reserve correction and readjustment dynamics have the greatest impact. Overall, this effect is followed, in terms of the coefficient size, by the impact of the opportunity cost, imports and volatility. Still the impact of volatility on reserve holdings is the smallest. However, in the short-run, the analysis of one lagged coefficients suggests that the variables have the expected sign and the optimal level of reserve holdings is more affected by current account dynamics.

Moreover, the negative sign and the statistical significance of the error term at the 1 percent significance level is another indication that confirms that in the long-run, reserve holding is cointegrated with other explanatory variables. This confirms the theoretical approach introduced by Frenkel and Jovanovic (1981) in the case of Albania. Second, there is a causality affect in at least one direction [Granger (1986)]; and third, there is an error correction mechanism, which brings reserves back into equilibrium. Therefore, the long-run equilibrium is achievable. Meanwhile, overall the value of the magnitude of the error mechanism might be slow. This indicates that any deviation from equilibrium is eliminated within one month on a slow basis process. However, accordingly Clark (1970) would suggest that the low speed of adjustment illustrates that the difference between the actual and estimated optimum level of reserve holdings is relatively small. Additionally, the low speed of adjustment coupled with increasing level of reserve holdings indicates that adjustment towards equilibrium would require a high level of reserves to finance the balance of payment needs [Prabheesh (2007)]. Meanwhile the low speed of adjustment might give a hint toward a less active reserve management, in the case of Albania. This might be the case given the availability of data on real time, the floating exchange rate mechanism and the strategy of the Bank of Albania to spread the target level of the ratio of reserve to import throughout the year and not on a single moment, such that it would not affect the exchange rate.

Furthermore, the analysis on the gap between actual and the estimated optimum level of reserve holdings is relatively small, which justifies the low speed of adjustment. The relatively small difference indicates that the Bank of Albania has a sufficient level of reserve holdings to fulfil the minimum requirements and hence it stands in a somewhat comfortable zone with the existing stock of reserves. This proves that the composition and implementation of the strategy on the management of reserve holdings has been consistent and a function of objective set under the Monetary Approach to the Balance of Payments. In addition, this recommends that increasing level of reserves reflects necessarily and is close to the actual level. Accordingly, in the case of Albania, the low and increasing level of reserve holdings since the early 1990s is explained, with high but decreasing rate of opportunity cost and the low but increasing level of public debt and imports. Moreover, besides the possibility of rapid growth of reserve holdings, this development relates to the improvement of management and investment capacities by the Bank of Albania. However, the analysis of the gap level recommends that overall, in the last decade the actual level of reserve holdings is higher than optimum level estimated by the model. This result can be explained through the tendency to be self-insured against fluctuations in foreign capital inflows, fiscal dominance, growing public debt (especially foreign borrowing) and short-run risks in the exchange rate and the objectives to cover a certain number of monthly imports as an indicator of macroeconomic stability.

Chart 4: Actual vs. optimal level of reserve holdings based on the logVAR model



The critical value of the regression determination coefficient (R^2), throughout the whole models, might be considered as low, while a set of diagnostic tests conducted on the short-run model revealed no problem with respect to functional formulation and misspecification, serial correlation and heteroskedasticity in the error term. Moreover, the diagnostics the cumulative sum (CUSUM) and cumulative sum off squares (CUSUMSQ) plots (Diagram 1a-to-f) suggest that the residual variance is somewhat stable within the 5 percent bounds level of significance. This suggests that in the case of Albania the optimal demand level has been somewhat stable across time, even though evidence seems to illustrate that global financial and economic crises had an impact on the stock of reserve holdings.

IV. CONCLUSIONS

This working paper empirically evaluates a stochastic model for determining the optimal reserve holdings, while considering the importance of precautionary and mercantilist motives as well as the financial cost of reserve holdings. This approach has derived formally the explicit solution for optimal reserve holdings as a function precautionary and mercantilist motives, namely the variance of the stochastic process governing international payments and receipts, volatility of REER and NEER, deviation of nominal and real exchange rate from the trend, net opportunity cost and the dynamic development in the current account expressed through the volume of imports of goods and services based on the Buffer Stock model developed by Frenkel and Jovanovic (1981). The model was tested empirically under the assumption that on average net payments are zero, and the results were consistent with the predictions of the theoretical model.

This material evaluates the Buffer Stock model by the bound test to the ARDL approach developed by Pesaran (2001). So testing by this approach confirms the theoretical concept presented by Frenkel and Jovanovic (1981) in the case of Albania and shows that there is a long-run cointegrating relationship between reserve holdings and other explanatory variables, which is adopted to evaluate the coefficients of the long and short-run dynamics. This empirical investigation is vital as it allows modelling the indicator of volatility by ARCH estimation, while it allows testing whether increasing uncertainty helps explaining the stock of reserve holdings.

Estimated results are theoretically consistent and support the findings of Frenkel and Jovanovic (1981), Silva and Silva (2004) and Prabheesh (2007) that in transition and developing economies the optimal level of reserve holdings is determined mainly by developments in current account. Thus, the positive sign of the long-run import coefficient confirms that in the long-run, the level of reserve holdings is mainly influenced by the Anglo-American approach and the need to be self-insured against fluctuations and uncertainties is foreign capital inflows. The Asian financial crisis suggests that the negative effects of fluctuations in foreign capital inflows can be mitigated by improving the management of reserve holdings and public debts [Wijnholds and Kapteyn (2001)]. Meanwhile, evaluating the optimal level of reserve holdings based on the developments of current account ignores the fact that currency crisis are caused by foreign capital inflows [Feldstein (1999)]. So the suggested concepts will be part of future research. In addition, results suggest that reserve holding is affected neither by precautionary motives relative to capital flow volatility nor by mercantilist motives related to export promoting policies.

Moreover, the analysis on the gap between actual and the estimated optimum level of reserve holdings is relatively small, which justifies the low speed of adjustment found on the estimated models. The relatively small difference indicates that the Bank of Albania has a sufficient level of reserve holdings to fulfil the minimum requirements and hence it stands in a somewhat comfortable zone with the existing stock of reserves. This proves that the composition and implementation of the strategy on the management of reserve holdings has been consistent and a function of objective set under the Monetary Approach to Balance of Payments. In addition, this recommends that increasing level of reserves reflects necessarily and is close to the actual level. Furthermore, the statistical test suggests that in the case of Albania the optimal demand level has been somewhat stable across time, even though evidence seems to illustrate that global financial and economic crises had an impact on the stock of reserve holdings.

The Buffer Stock model provides an empirical analysis based on time series of a given country. However, the model is based on past developments approach, while reserve is a macroeconomic indicator which is better determined by the macroeconomic condition of a country (such as public debt, economic growth, foreign capital inflows, interest rates on debt services, remittances etc) in the future. Thus, our future aim is also to evaluate the optimal level of reserve holdings by first considering other explanatory variables and second using a calibration approach. Moreover, the Buffer Stock model does not allow analysing the optimal reserve holding by the monetary approach. Considering the monetary approach, constitutes an important element in determining the erogeneity of domestic credit in the future.

However, analysing the optimal level of reserve holdings empirically and the possible future challenges in managing reserves suggest that there is already a positive foundation to be considered so far. These developments should be translated into some decision-making strategies that still determine some frameworks of the current performance and future development perspective of this macroeconomic indicator, despite the need of dynamic improvements and the approach of concrete operational plans, which apparently take another weight and viewpoint at this stage of economic development.

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1 For more detailed discussions on the bounds test see Pesaran et al (2001)

2 The Bank of Albania is the responsible institution implementing the SAA obligations concerning the free movement of capital.

3 [See: Heller (1996); Clark (1970); Frenkel and Jovanovic (1981); Edwards (1983, 1984, 1985); Ben-Bassat and Gottlieb (1992); Wijnholds and Kaptyn (2001); Silva and Silva (2004); Ramachandran (2006); Jeanne and Ranciere (2006) and Jeanne and Ranciere (2009)].

4 Indicator (S) shows that the regression is stable and (U) stands for unstable.

APPENDIX I

Table 1a: Estimation results of the random walk model for dIR

Dependent Variable: dIR				
Method: Least Squares				
Sample (adjusted): 1996M02 2010M12				
Included observations: 179 after adjustments				
	Coefficient	Std. Error	t-Statistic	Prob.
C	9.584981	2.364425	4.053831	0.0001
R-squared	0.000000	Mean dependent var		9.584981
Adjusted R-squared	0.000000	S.D. dependent var		31.63385
S.E. of regression	31.63385	Akaike info criterion		9.751904
Sum squared resid	178124.7	Schwarz criterion		9.769710
Log likelihood	-871.7954	Hannan-Quinn criter.		9.759124
Durbin-Watson stat	1.980567			

Table 2a: Testing for ARCH residual effects on dIR

Heteroskedasticity Test: ARCH				
F-statistic	5.753021	Prob. F(1,176)		0.0175
Obs*R-squared	5.634226	Prob. Chi-Square(1)		0.0176
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Sample (adjusted): 1996M03 2010M12				
Included observations: 178 after adjustments				
Newey-West HAC Standard Errors & Covariance (lag truncation=4)				
	Coefficient	Std. Error	t-Statistic	Prob.
C	830.6951	352.8121	2.354497	0.0197
RESID^2(-1)	0.179986	0.016769	10.73320	0.0000
R-squared	0.031653	Mean dependent var		1000.663
Adjusted R-squared	0.026151	S.D. dependent var		4474.149
S.E. of regression	4415.260	Akaike info criterion		19.63469
Sum squared resid	3.43E+09	Schwarz criterion		19.67044
Log likelihood	-1745.488	Hannan-Quinn criter.		19.64919
F-statistic	5.753021	Durbin-Watson stat		2.012034
Prob(F-statistic)	0.017505			

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Table 1b: Estimation results of the random walk model for dlog(REER)

Dependent Variable: DLOG(REER)				
Method: Least Squares				
Sample (adjusted): 1996M03 2010M12				
Included observations: 178 after adjustments				
Convergence achieved after 3 iterations				
Newey-West HAC Standard Errors & Covariance (lag truncation=4)				
	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.002036	0.002307	-0.882528	0.3787
AR(1)	0.363966	0.081135	4.485912	0.0000
R-squared	0.132767	Mean dependent var		-0.001917
Adjusted R-squared	0.127840	S.D. dependent var		0.022539
S.E. of regression	0.021049	Akaike info criterion		-4.872785
Sum squared resid	0.077976	Schwarz criterion		-4.837034
Log likelihood	435.6778	Hannan-Quinn criter.		-4.858287
F-statistic	26.94439	Durbin-Watson stat		1.901971
Prob(F-statistic)	0.000001			
Inverted AR Roots	.36			

Table 2b: Testing for ARCH residual effects on dlog(REER)

Heteroskedasticity Test: ARCH				
F-statistic	6.587108	Prob. F(1,176)		0.0111
Obs*R-squared	6.421621	Prob. Chi-Square(1)		0.0113
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Sample: 1996M03 2010M12				
Included observations: 178				
Newey-West HAC Standard Errors & Covariance (lag truncation=4)				
	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000382	8.88E-05	4.304668	0.0000
RESID^2(-1)	0.100278	0.110535	0.907206	0.3655
R-squared	0.036077	Mean dependent var		0.000438
Adjusted R-squared	0.030600	S.D. dependent var		0.000975
S.E. of regression	0.000960	Akaike info criterion		-11.04746
Sum squared resid	0.000162	Schwarz criterion		-11.01171
Log likelihood	985.2240	Hannan-Quinn criter.		-11.03296
F-statistic	6.587108	Durbin-Watson stat		1.355460
Prob(F-statistic)	0.011104			

Table 1c: Estimation results of the random walk model for dlog(NEER)

Dependent Variable: DLOG(NEER)				
Method: Least Squares				
Sample (adjusted): 1996M08 2010M12				
Included observations: 173 after adjustments				
Convergence achieved after 69 iterations				
Newey-West HAC Standard Errors & Covariance (lag truncation=4)				
MA Backcast: 1996M07				
	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000980	0.001893	-0.517814	0.6053
AR(1)	0.309366	0.181323	1.706155	0.0898
AR(2)	-0.122889	0.151968	-0.808654	0.4199
AR(6)	-0.220872	0.136389	-1.619426	0.1072
MA(1)	0.246505	0.206168	1.195656	0.2335
R-squared	0.319743	Mean dependent var		-0.001124
Adjusted R-squared	0.303546	S.D. dependent var		0.023042
S.E. of regression	0.019229	Akaike info criterion		-5.036314
Sum squared resid	0.062119	Schwarz criterion		-4.945179
Log likelihood	440.6412	Hannan-Quinn criter.		-4.999341
F-statistic	19.74137	Durbin-Watson stat		1.984593
Prob(F-statistic)	0.000000			
Inverted AR Roots	.71-.40i	.71+.40i	.06+.80i	.06-.80i
	-.61-.39i	-.61+.39i		
Inverted MA Roots	-.25			

Table 2c: Testing for ARCH residual effects on dlog(NEER)

Heteroskedasticity Test: ARCH				
F-statistic	38.47587	Prob. F(1,170)		0.0000
Obs*R-squared	31.74396	Prob. Chi-Square(1)		0.0000
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Sample (adjusted): 1996M09 2010M12				
Included observations: 172 after adjustments				
Newey-West HAC Standard Errors & Covariance (lag truncation=4)				
	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000204	7.01E-05	2.913029	0.0041
RESID^2(-1)	0.429764	0.088754	4.842177	0.0000
R-squared	0.184558	Mean dependent var		0.000360
Adjusted R-squared	0.179761	S.D. dependent var		0.000975
S.E. of regression	0.000883	Akaike info criterion		-11.21434
Sum squared resid	0.000133	Schwarz criterion		-11.17774
Log likelihood	966.4333	Hannan-Quinn criter.		-11.19949
F-statistic	38.47587	Durbin-Watson stat		2.252111
Prob(F-statistic)	0.000000			

Table 3: Information criteria of the estimated models (errors follow a normal distribution)

Model	AIC	SIC	HQ	Serial Corelation Effects	Negative Coeffience in the Variance Equation	ARCH Effects
ARCH (11)	9.275463	9.346690	9.304345	No	No	[0.5625]
GARCH (11)	8.860027	8.949061	8.896130	Yes	No	[0.0112]
GARCH (11) - AR(1)	8.944731	9.054564	9.054564	No	No	[0.7190]
TGARCH (11)	8.869650	8.976490	8.912973	Yes	Yes	[0.0203]
TGARCH (11) - AR(1)	8.935122	9.060248	8.985864	No	No	[0.4375]
EGARCH (11)	9.092575	9.199414	9.135897	No	No	[0.6058]
EGARCH (11) - AR(1)	8.987551	9.112877	9.038495	No	Yes	[0.9179]

Table 4a: EGARCH (11) – AR(1)-in-mean model for dIR (errors follow a normal distribution)

Dependent Variable: dIR				
Method: ML - ARCH (Marquardt) - Normal distribution				
Sample (adjusted): 1996M03 2010M12				
Included observations: 178 after adjustments				
Convergence achieved after 112 iterations				
Presample variance: backcast (parameter = 0.7)				
LOG(GARCH) = C(4) + C(5)*ABS(RESID(-1)/@SQRT(GARCH(-1))) + C(6) *RESID(-1)/@SQRT(GARCH(-1)) + C(7)*LOG(GARCH(-1))				
	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	0.179143	0.087136	2.055907	0.0398
C	7.751772	1.630941	4.752943	0.0000
AR(1)	0.452236	0.057105	7.919381	0.0000
Variance Equation				
C(4)	-0.101686	0.411550	-0.247082	0.8048
C(5)	1.554286	0.435741	3.566996	0.0004
C(6)	-0.312856	0.209856	-1.490815	0.1360
C(7)	0.849841	0.090535	9.386923	0.0000
R-squared	-0.469417	Mean dependent var		9.599526
Adjusted R-squared	-0.520976	S.D. dependent var		31.72249
S.E. of regression	39.12266	Akaike info criterion		8.987751
Sum squared resid	261729.6	Schwarz criterion		9.112877
Log likelihood	-792.9098	Hannan-Quinn criter.		9.038493
Durbin-Watson stat	2.370426			
Inverted AR Roots	.45			

Table 4b: EGARCH (11)-in-mean model for dlog(REER) (errors follow anormal distribution)

Dependent Variable: DLOG(REER)				
Method: ML - ARCH				
Sample (adjusted): 1996M02 2010M12				
Included observations: 179 after adjustments				
Convergence achieved after 22 iterations				
Presample variance: backcast (parameter = 0.7)				
LOG(GARCH) = C(3) + C(4)*ABS(RESID(-1)/@SQRT(GARCH(-1))) + C(5) *RESID(-1)/@SQRT(GARCH(-1)) + C(6)*LOG(GARCH(-1))				
	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	-0.743097	0.090018	-8.254986	0.0000
C	0.011058	0.001447	7.641938	0.0000
	Variance Equation			
C(3)	-0.095318	8.44E-05	-1129.304	0.0000
C(4)	-0.029071	2.64E-09	-11014674	0.0000
C(5)	0.083754	0.021803	3.841314	0.0001
C(6)	0.987315	1.03E-07	9627658.	0.0000
R-squared	0.008603	Mean dependent var		-0.001798
Adjusted R-squared	-0.020050	S.D. dependent var		0.022531
S.E. of regression	0.022756	Akaike info criterion		-5.171984
Sum squared resid	0.089586	Schwarz criterion		-5.065144
Log likelihood	468.8925	Hannan-Quinn criter.		-5.128661
F-statistic	0.300237	Durbin-Watson stat		1.240005
Prob(F-statistic)	0.912189			

Table 4c: EGARCH (1,2)-AR(12)-in-mean model for dlog(NEER) (errors follow anormal distribution)

Dependent Variable: DLOG(NEER)				
Method: ML - ARCH				
Sample (adjusted): 1997M02 2010M12				
Included observations: 167 after adjustments				
Convergence achieved after 24 iterations				
Presample variance: backcast (parameter = 0.7)				
LOG(GARCH) = C(5) + C(6)*ABS(RESID(-1)/@SQRT(GARCH(-1))) + C(7) *RESID(-1)/@SQRT(GARCH(-1)) + C(8)*LOG(GARCH(-1)) + C(9)*LOG(GARCH(-2))				
	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	-0.258491	0.249465	-1.036183	0.3001
C	0.000675	0.001777	0.379808	0.7041
AR(1)	0.236256	0.069688	3.390192	0.0007
AR(12)	0.183470	0.062415	2.939497	0.0033
	Variance Equation			
C(5)	-0.737533	0.376449	-1.959183	0.0501
C(6)	0.318137	0.154865	2.054278	0.0399
C(7)	-0.094910	0.090280	-1.051290	0.2931
C(8)	0.569088	0.637559	0.892603	0.3721
C(9)	0.380631	0.615127	0.618784	0.5361
R-squared	0.157560	Mean dependent var		-0.000822
Adjusted R-squared	0.114905	S.D. dependent var		0.022439
S.E. of regression	0.021110	Akaike info criterion		-5.813511
Sum squared resid	0.070412	Schwarz criterion		-5.645475
Log likelihood	494.4282	Hannan-Quinn criter.		-5.745309
F-statistic	3.693799	Durbin-Watson stat		1.374214
Prob(F-statistic)	0.000558			
Inverted AR Roots	.89	.77+.43i	.77-.43i	.45-.75i
	.45+.75i	.02+.87i	.02-.87i	-.42-.75i
	-.42+.75i	-.73+.43i	-.73-.43i	-.85

Table 5: Unit root test analysis

Variablat	ADF test result				Phillips-Perron test result			
	Null Hypothesis: Unit Root				Null Hypothesis: Unit Root			
	Level		First Difference		Level		First Difference	
	[Prob.]	Laga	[Prob.]	Laga	[Prob.]	Bandëidthb	[Prob.]	Bandëidthb
Intercept								
log(IR)	[.2673]	4	[.0000]	5	[.1841]	4	[.0000]	5
log(r)	[.7539]	3	[.0000]	0	[.7411]	3	[.0000]	0
log(IM)	[.5153]	20	[.0000]	25	[.6159]	20	[.0000]	25
log(σ)	[.0004]	0	[.0000]	3	[.0004]	8	[.0000]	119
log(REER)	[.0007]	0	[.0000]	1	[.0019]	3	[.0000]	30
log(NEER)	[.0265]	0	[.0000]	0	[.0250]	2	[.0000]	3
REER_HP_Cycle	[.0000]	4	[.0000]	5	[.0000]	2	[.0000]	10
NEER_HP_Cycle	[.0000]	3	[.0000]	6	[.0035]	0	[.0000]	4
Lek/Euro_HP_Cycle	[.0000]	3	[.0000]	6	[.0007]	1	[.0000]	5
Intercept and Trend								
log(IR)	[.8915]	4	[.0000]	8	[.8846]	4	[.0000]	8
log(r)	[.7274]	2	[.0000]	0	[.5968]	2	[.0000]	0
log(IM)	[.0000]	1	[.0003]	25	[.0000]	1	[.0000]	25
log(σ)	[.0000]	0	[.0000]	3	[.0000]	8	[.0001]	111
log(REER)	[.0011]	0	[.0000]	1	[.0023]	2	[.0000]	31
log(NEER)	[.1322]	0	[.0000]	0	[.1326]	3	[.0000]	2
REER_HP_Cycle	[.0000]	4	[.0000]	5	[.0000]	2	[.0000]	10
NEER_HP_Cycle	[.0000]	3	[.0000]	6	[.0189]	0	[.0000]	4
Lek/Euro_HP_Cycle	[.0000]	3	[.0000]	6	[.0048]	1	[.0000]	5
None								
log(IR)	[1.000]	1	[.0000]	4	[1.000]	1	[.0000]	4
log(r)	[.2382]	5	[.0000]	1	[.2849]	5	[.0000]	1
log(IM)	[.8924]	36	[.0000]	21	[.9973]	36	[.0000]	21
log(σ)	[.7951]	4	[.0000]	3	[.8065]	111	[.0000]	133
log(REER)	[.4616]	20	[.0000]	1	[.5047]	33	[.0000]	30
log(NEER)	[.9868]	0	[.0000]	0	[.9845]	4	[.0000]	5
REER_HP_Cycle	[.0000]	4	[.0000]	5	[.0000]	2	[.0000]	10
NEER_HP_Cycle	[.0000]	3	[.0000]	6	[.0002]	0	[.0000]	4
Lek/Euro_HP_Cycle	[.0000]	3	[.0000]	6	[.0000]	1	[.0000]	5

a automatic lag selection based on SC criteria
b New-West Bandwidth selection through using the Bartlett Kernel

Table 6a: ARDL bound test for cointegration analysis for equation (7) (logVAR)

Dependant Variable(1)	AIC-SC lags	F-statistic	df	[Prob.]	Results***
FlogR(logIR│logVAR,logKOSTO,logIM)	12	4.60293	(4,108)	[.0018]	Cointegration
FlogVAR(logVAR│logIR,logKOSTO,logIM)	12	4.16239	(4,108)	[.0036]	No conclusive
FlogKOSTO(logKOSTO│logVAR,logIR,logIM)	12	1.41890	(4,108)	[.2326]	No cointegration
FlogIM(logIM│logVAR,logKOSTO,logIR)	12	2.71188	(4,108)	[.0334]	No cointegration

*** Based on the critical value suggested by Narayan (2004), for an equation with intercept and time trend, where k = 3 and n = 165

- (1 %) : lower bound I(0) = 4.568 dhe upper bound I(1) = 5.960
- (5 %) : lower bound I(0) = 3.363 dhe upper bound I(1) = 4.515
- (10 %): lower bound I(0) = 2.823 dhe upper bound I(1) = 3.885

Table 6b: ARDL bound test for cointegration analysis for equation (7) (logREER)

Dependant Variable(1)	AIC-SC lags	F-statistic	df	[Prob.]	Results***
FlogR(logIR│logREER,logKOSTO,logIM)	12	4.443	(4,109)	[.0023]	Cointegration
FlogVAR(logREER│logIR,logKOSTO,logIM)	12	0.966	(4,109)	[.4289]	No cointegration
FlogKOSTO(logKOSTO│logREER,logIR,logIM)	12	1.740	(4,109)	[.1464]	No cointegration
FlogIM(logIM│logREER,logKOSTO,logIR)	12	2.136	(4,109)	[.0812]	No cointegration

*** Based on the critical value suggested by Narayan (2004), for an equation with intercept and time trend, where k = 3 and n = 165

- (1 %) : lower bound I(0) = 4.568 dhe upper bound I(1) = 5.960
- (5 %) : lower bound I(0) = 3.363 dhe upper bound I(1) = 4.515
- (10 %): lower bound I(0) = 2.823 dhe upper bound I(1) = 3.885

Table 6c: ARDL bound test for cointegration analysis for equation (7) (logNEER)

Dependant Variable(1)	AIC-SC lags	F-statistic	df	[Prob.]	Results***
FlogR(logIR│logNEER,logKOSTO,logIM)	12	5.317	(4,97)	[.0006]	Cointegration
FlogVAR(logNEER│logIR,logKOSTO,logIM)	12	4.398	(4,97)	[.0026]	No conclusive
FlogKOSTO(logKOSTO│logNEER,logIR,logIM)	12	2.597	(4,97)	[.0409]	No cointegration
FlogIM(logIM│logNEER,logKOSTO,logIR)	12	2.854	(4,97)	[.0277]	No cointegration

*** Based on the critical value suggested by Narayan (2004), for an equation with intercept and time trend, where k = 3 and n = 165

- (1 %) : lower bound I(0) = 4.568 dhe upper bound I(1) = 5.960
- (5 %) : lower bound I(0) = 3.363 dhe upper bound I(1) = 4.515
- (10 %): lower bound I(0) = 2.823 dhe upper bound I(1) = 3.885

Table 6d: ARDL bound test for cointegration analysis for equation (7) (REER_HP_cycle)

Dependant Variable(1)	AIC-SC lags	F-statistic	df	[Prob.]	Results***
FlogR(logIR│REER_hp,logKOSTO,logIM)	8	5.440	(4,131)	[.0004]	Cointegration
FREER_hp(REER_hp│logIR,logKOSTO,logIM)	8	3.284	(4,131)	[.0133]	No cointegration
FlogKOSTO(logKOSTO│REER_hp,logIR,logIM)	8	2.351	(4,131)	[.0574]	No cointegration
FlogIM(logIM│REER_hp,logKOSTO,logIR)	8	4.025	(4,131)	[.0041]	No conclusive

*** Based on the critical value suggested by Narayan (2004), for an equation with intercept, where k=3 and n=165

- (1 %) : lower bound I(0) = 3.908 and upper bound I(1) = 5.004
- (5 %) : lower bound I(0) = 2.920 and upper bound I(1) = 3.838
- (10 %): lower bound I(0) = 2.747 and upper bound I(1) = 3.312

Table 6e: ARDL bound test for cointegration analysis for equation (7) (NEER_HP_cycle)

Dependant Variable(1)	AIC-SC lags	F-statistic	df	[Prob.]	Results***
FlogR(logIR│NEER_hp,logKOSTO,logIM)	8	5.427	(4,131)	[.0004]	Cointegration
FNEER_hp(NEER_hp│logIR,logKOSTO,logIM)	8	3.090	(4,131)	[.0181]	No cointegration
FlogKOSTO(logKOSTO│NEER_hp,logIR,logIM)	8	2.558	(4,131)	[.0416]	No cointegration
FlogIM(logIM│NEER_hp,logKOSTO,logIR)	8	4.022	(4,131)	[.0029]	No conclusive

*** Based on the critical value suggested by Narayan (2004), for an equation with intercept, where k=3 and n=165

- (1 %) : lower bound I(0) = 3.908 and upper bound I(1) = 5.004
- (5 %) : lower bound I(0) = 2.920 and upper bound I(1) = 3.838
- (10 %): lower bound I(0) = 2.747 and upper bound I(1) = 3.312

Table 6f: ARDL bound test for cointegration analysis for equation (7) (Lek/Euro_HP_cycle)

Dependant Variable(1)	AIC-SC lags	F-statistic	df	[Prob.]	Results***
FlogR(logIR│Lek/Euro_hp,logKOSTO,logIM)	8	4.507	(4,131)	[.0019]	Cointegration
FNEER_hp(Lek/Euro_hp│logIR,logKOSTO,logIM)	8	3.087	(4,131)	[.0182]	No conclusion
FlogKOSTO(logKOSTO│ Lek/Euro_hp ,logIR,logIM)	8	2.779	(4,131)	[.0295]	No conclusion
FlogIM(logIM│ Lek/Euro_hp ,logKOSTO,logIR)	8	3.697	(4,131)	[.0069]	No conclusion

*** Based on the critical value suggested by Narayan (2004), for an equation with intercept, where k=3 and n=165

- (1 %) : lower bound I(0) = 3.908 and upper bound I(1) = 5.004
- (5 %) : lower bound I(0) = 2.920 and upper bound I(1) = 3.838
- (10 %): lower bound I(0) = 2.747 and upper bound I(1) = 3.312

Table 7a: Estimating long-run elasticieties of reserve using ARDL approach (logVAR)

ARDL (2, 0, 0, 2) selected based on Akaike Information Criteria (AIC) criterion. Dependant Variable is ΔlogRt. 166 observations used for estimation from 1997M03 – 2010M12				
Regressors	Coefficients	Standart error	T-statistic	[Prob.]
Constant	5.0910	.547340	9.3013	[.000]
logVARt	-.012387	.014851	-.83408	[.406]
logKOSTOt	-.33464	.080688	-4.1473	[.000]
logIMt	.38683	.099299	3.8956	[.000]
trend	.0042028	.0010529	3.9918	[.000]

Table 7b: Estimating long-run elasticieties of reserve using ARDL approach (logREER)

ARDL (2, 0, 0, 1) selected based on Akaike Information Criteria (AIC) criterion. Dependant Variable is ΔlogRt. 155 observations used for estimation from 1998M02 – 2010M12				
Regressors	Coefficients	Standart error	T-statistic	[Prob.]
Constant	5.1150	.81154	6.3028	[.000]
logREERt	.013781	.043224	.31883	[.750]
logKOSTOt	-.33508	.11145	-3.0065	[.003]
logIMt	.39219	.11567	3.3905	[.001]
trend	.0040815	.0011771	3.4673	[.001]

Table 7c: Estimating long-run elasticieties of reserve using ARDL approach (logNEER)

ARDL (2, 3, 0, 2) selected based on Akaike Information Criteria (AIC) criterion. Dependant Variable is ΔlogRt. 167 observations used for estimation from 1997M02 – 2010M12				
Regressors	Coefficients	Standart error	T-statistic	[Prob.]
Constant	4.8412	.5470	8.8553	[.000]
logNEERt	-.014343	.013596	-1.0549	[.293]
logKOSTOt	-.30218	.079623	-3.7951	[.000]
logIMt	.38009	.093862	4.0494	[.000]
trend	.004805	.0010872	4.1210	[.000]

Table 7d: Estimating long-run elasticieties of reserve using ARDL approach (REER_HP_cycle)

ARDL (2, 0, 0, 0) selected based on Akaike Information Criteria (AIC) criterion. Dependant Variable is ΔlogRt. 172 observations used for estimation from 1996M09 – 2010M12				
Regressors	Coefficients	Standart error	T-statistic	[Prob.]
Constant	4.7009	1.2754	3.6857	[.000]
REER_HP_cyclet	-.12475	.011720	-1.0644	[.289]
logKOSTOt	-30299	.25993	-1.1656	[.245]
logIMt	.54936	.15888	3.4578	[.001]

Table 7e: Estimating long-run elasticieties of reserve using ARDL approach (NEER_HP_cycle)

ARDL (2, 0, 0, 0) selected based on Akaike Information Criteria (AIC) criterion. Dependant Variable is ΔlogRt. 172 observations used for estimation from 1996M09 – 2010M12				
Regressors	Coefficients	Standart error	T-statistic	[Prob.]
Constant	4.8289	1.1230	4.3001	[.000]
NEER_HP_cyclet	-.010710	.0097008	-1.1040	[.271]
logKOSTOt	-.38040	.21417	-1.7762	[.078]
logIMt	.54604	.13951	3.9139	[.000]

Table 7f: Estimating long-run elasticieties of reserve using ARDL approach (Lek/Euro_HP_cycle)

ARDL (2, 1, 0, 0) selected based on Akaike Information Criteria (AIC) criterion. Dependant Variable is ΔlogRt. 172 observations used for estimation from 1996M09 – 2010M12				
Regressors	Coefficients	Standart error	T-statistic	[Prob.]
Constant	5.3316	1.6502	3.2309	[.001]
Lek/Euro_HP_cyclet	-.016975	.015907	-1.0672	[.287]
logKOSTOt	-34738	.31647	-1.0977	[.274]
logIMt	.46019	.2139	2.1770	[.031]

Table 8a: The error correction for the selected ARDL model (logVAR)

ARDL (2, 0, 0, 2) selected based on Akaike Information Criteria (AIC) criterion. Dependant Variable is ΔlogRt. 166 observations used for estimation from 1997M03 – 2010M012					
Regressors	Coefficients	Standart error		T-statistic	[Prob.]
Constant	.6565E-3	.0055531		.11823	[.906]
ΔlogIR(-1)	.16650	.073302		2.2714	[.024]
ΔlogVAR	-.0012266	.0017594		-.69715	[.487]
ΔlogKOSTO	-.048079	.022605		-2.1269	[.035]
ΔlogIM	.022953	.011452		2.0043	[.047]
ΔlogIM(-1)	-.019263	.011435		-1.6846	[.094]
trend	-.6639E-6	.4151E-4		-.015993	[.987]
ECM(-1)	-.12784	.25665		-4.9811	[.000]
Diagnostic					
R2	.20698		-	180.9241	[.000]
Adj R2	.17185		X^2Re set	.26892	[.604]
F-stat (7, 158)	5.8914[.000]		X^2Auto	6.0127	[.915]
S. E. R.	.023543		X^2white	0.92047	[.762]
AIC	382.8776		Cusum	S	
SIC	370.4297		Csumsq	S	
ecmt = lnIRt + 0.012387*lnVARt + 0.33464*lnKOSTOt – 0.38683*lnIMPt – 0.0042028*Trendt – 5.0910					

Table 8b: The error correction for the selected ARDL model (logREER)

ARDL (2, 0, 0, 1) selected based on Akaike Information Criteria (AIC) criterion. Dependant Variable is ΔlogRt. 155 observations used for estimation from 1998M02 – 2010M012					
Regressors	Coefficients	Standart error		T-statistic	[Prob.]
Constant	.4549E-3	.0063990		.071091	[.990]
ΔlogIR(-1)	.17337	.076072		2.2790	[.024]
ΔlogREER	.4132E-3	.012471		.033134	[.974]
ΔlogKOSTO	-.046921	.023792		-1.9721	[.050]
ΔlogIM	.025358	.016573		1.5301	[.128]
trend	.6027E-6	.4722E-4		.012764	[.990]
ECM(-1)	-.13806	.029424		-4.6922	[.000]
Diagnostic					
R2	.19349		-	183.8179	[.000]
Adj R2	.16080		X^2Re set	1.2226	[.269]
F-stat (6, 148)	5.9179[.000]		X^2Auto	7.3188	[.836]
S. E. R.	.024003		X^2white	.26102	[.609]
AIC	354.7307		Cusum	S	
SIC	344.0787		Csumsq	S	
ecmt = lnIRt -.013781*lnREERt +.33508*lnKOSTOt – -.39219*lnIMPt – .0040815*Trendt – 5.1150					

Table 8c: The error correction for the selected ARDL model (logNEER)

ARDL (2, 3, 0, 2) selected based on Akaike Information Criteria (AIC) criterion. Dependant Variable is ΔlogRt. 167 observations used for estimation from 1997M02 – 2010M012					
Regressors	Coefficients	Standart error		T-statistic	[Prob.]
Constant	.6913E-3	.0053826		.12844	[.898]
ΔlogIR(-1)	.15918	.072681		2.1901	[.030]
ΔlogNEER	.6018E-3	.0020418		.29474	[.769]
ΔlogNEER(-1)	.0042615	.0020466		2.0822	[.039]
ΔlogNEER(-2)	.0057184	.0020032		2.8547	[.005]
ΔlogKOSTO	-.043189	.022066		-1.9573	[.052]
ΔlogIM	.021844	.011429		1.9113	[.058]
ΔlogIM(-1)	-0.16361	.010996		-1.4880	[.139]
trend	-.4376E-6	.4061E-4		-.010775	[.991]
ECM(-1)	-.13149	.024011		-5.4760	[.000]
Diagnostic					
R2	.24804		-	212.8935	[.000]
Adj R2	.20493		X^2Re set	.32884	[.566]
F-stat (9, 157)	5.7542[.000]		X^2Auto	9.7988	[.634]
S. E. R.	.083589		X^2white	.9070E-3	[.976]
AIC	387.6235		Cusum	S	
SIC	372.0335		Csumsq	S	
ecmt = lnIRt + .014343*lnNEERt + .30218*lnKOSTOt – .38009*lnIMPt – .0044805*Trendt – 4.8412					

Table 8d: The error correction for the selected ARDL model (REER_HP_cycle)

ARDL (2, 0, 0, 0) selected based on Akaike Information Criteria (AIC) criterion. Dependant Variable is ΔlogRt. 172 observations used for estimation from 1996M09 – 2010M012					
Regressors	Coefficients	Standart error		T-statistic	[Prob.]
Constant	.4975E-3	.0030241		.16453	[.870]
ΔlogIR(-1)	.13204	.074226		1.7789	[.077]
ΔREER_HP_cycle	-.0011093	.5499E-3		-2.0171	[.045]
ΔlogKOSTO	-.036333	.022598		-1.6078	[.110]
ΔlogIM	.010218	.010940		.93398	[.352]
ECM(-1)	-.037263	.0083631		-4.4556	[.000]
Diagnostic					
R2	.18299		-	201.8255	[.000]
Adj R2	.15838		X^2Re set	.0025163	[.960]
F-stat (5, 166)	7.4357[.000]		X^2Auto	9.6619	[.634]
S. E. R.	.095135		X^2white	.036742	[.848]
AIC	394.9388		Cusum	S	
SIC	385.4963		Csumsq	S	
ecmt = lnIRt + .012475*REER_HP_Cyclet + .30299*lnKOSTOt – .5436*lnIMPt – 4.7009					

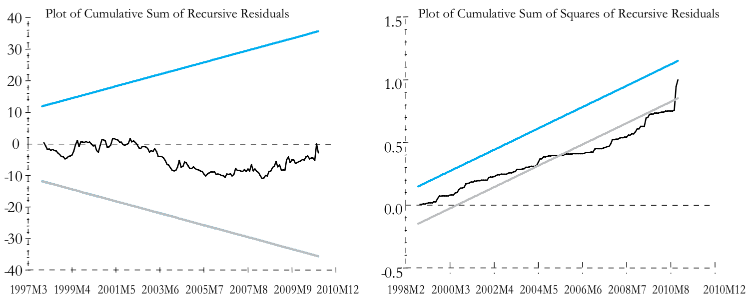
Table 8e: The error correction for the selected ARDL model (NEER_HP_cycle)

ARDL (2, 0, 0, 0) selected based on Akaike Information Criteria (AIC) criterion. Dependant Variable is ΔlogRt. 172 observations used for estimation from 1996M09 – 2010M012					
Regressors	Coefficients	Standart error		T-statistic	[Prob.]
Constant	.2550E-3	.0030604		.083321	[.934]
ΔlogIR(-1)	.13508	.074381		1.8160	[.071]
ΔNEER_HP_cycle	-.8267e-3	.6076E-3		-1.3606	[.175]
ΔlogKOSTO	-.039276	.022690		-1.7310	[.085]
ΔlogIM	.016030	.010862		.1.4758	[.142]
ECM(-1)	-.043573	.0097797		-4.4555	[.000]
Diagnostic					
R2	.17498		-	217.0102	[.000]
Adj R2	.15013		X^2Re set	.090594	[.763]
F-stat (5, 166)	7.0416[.000]		X^2Auto	8.4992	[.745]
S. E. R.	.096066		X^2white	.0037382	[.951]
AIC	394.1006		Cusum	S	
SIC	384.6581		Csumsq	S	
ecmt = lnIRt + .010710*NEER_HP_Cyclet + .38040*lnKOSTOt – .54604*lnIMPt – 4.8289					

Table 8f: The error correction for the selected ARDL model (Lek/Euro_HP_cycle)

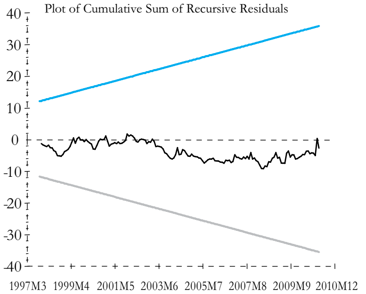
ARDL (2, 1, 0, 0) selected based on Akaike Information Criteria (AIC) criterion. Dependant Variable is ΔlogRt. 172 observations used for estimation from 1996M09 – 2010M012				
Regressors	Coefficients	Standart error	T-statistic	[Prob.]
Constant	.9289E-3	.0032489	.28592	[.775]
ΔlogIR(-1)	.12121	.076612	1.5821	[.116]
ΔLek/Euro_HP_cycle(-1)	.4699E-3	5419E-3	-.86705	[.387]
ΔlogKOSTO	-0.37064	.023015	-1.6104	[.109]
ΔlogIM	.0088082	.011252	.78284	[.435]
ECM(-1)	.02870	.0073098	-3.9358	[.000]
Diagnostic				
R2	.16098	-	174.4001	[.000]
Adj R2	.13571	X^2Re set	.0023948	[.961]
F-stat (5, 166)	6.3701[.000]	X^2Auto	9.9255	[.622]
S. E. R.	.07697	X^2white	.30342	[.582]
AIC	392.6533	Cusum	S	
SIC	383.2108	Csumsq	S	
ecmt = lnIRt + .016975*Lek/Euro_HP_cyclet + .34738*lnKOSTOt – .46019*lnIMPt – 5.3316				

Diagram 1a: Stability test analysis based on CUSUM and CUSUNSQ (logVAR)

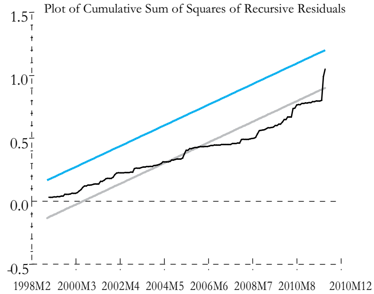


The straight lines represent critical bounds at 5% significance level The straight lines represent critical bounds at 5% significance level

Diagram 1b: Stability test analysis based on CUSUM and CUSUNSQ (logREER)

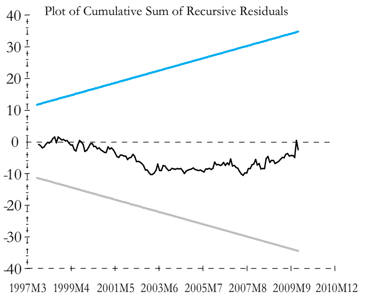


The straight lines represent critical bounds at 5% significance level

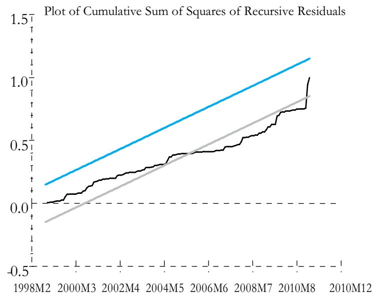


The straight lines represent critical bounds at 5% significance level

Diagram 1c: Stability test analysis based on CUSUM and CUSUNSQ (logNEER

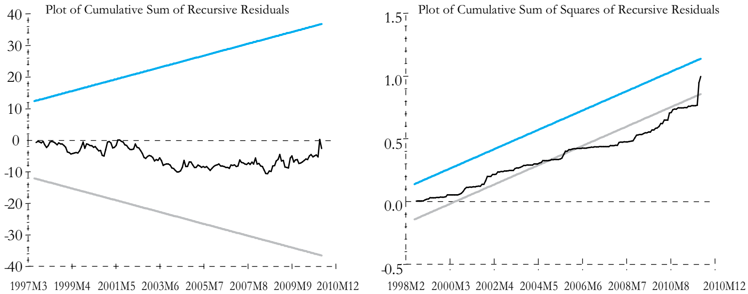


The straight lines represent critical bounds at 5% significance level



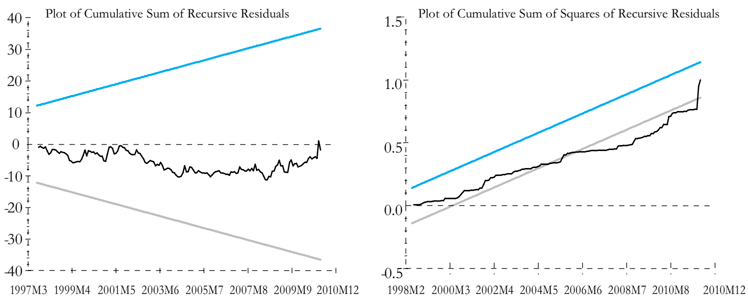
The straight lines represent critical bounds at 5% significance level

Diagram 1d: Stability test analysis based on CUSUM and CUSUNSQ (REER_HP_cycle)



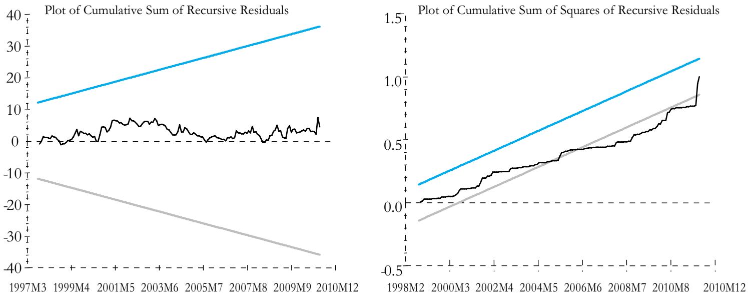
The straight lines represent critical bounds at 5% significance level   The straight lines represent critical bounds at 5% significance level

Diagram 1e: Stability test analysis based on CUSUM and CUSUNSQ (NEER_HP_cycle)



The straight lines represent critical bounds at 5% significance level   The straight lines represent critical bounds at 5% significance level

Diagram 1f: Stability test analysis based on CUSUM and CUSUNSQ (Lek/Euro_HP_cycle)



The straight lines represent critical bounds at 5% significance level

The straight lines represent critical bounds at 5% significance level

A BAYESIAN ESTIMATION OF A SMALL STRUCTURAL MODEL FOR THE ALBANIAN ECONOMY

Elona Dushku
*Vasilika Kota**

ABSTRACT

In this paper we develop a small structural model for the Albanian economy and estimate it using Bayesian estimation techniques. The model captures the essential of small, open, flexible exchange rate economy linkages between the policy instrument (repo rate) and the main macroeconomic variables of output, inflation, exchange rate and unemployment. The main structure of the model relies on the paper presented by Carabenciov et.al. (2008), which we have enriched by incorporating also the exchange rate as an important transmission channel mechanism for the Albanian economy. We conduct three different shocks on three key sources of uncertainty like the output gap, inflation and policy rate and we evaluate the properties and the model performance.

JEL classification: C11, C13, E17, E37
Keywords: Structural Equation Models, Bayesian Estimation, Model Projection

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I. INTRODUCTION

Models of the economy are very useful to monetary policy decision making. They are not only used to produce projection and forecasts of the main macroeconomic variables, but they also provide a structured way to discuss various features of the economy, and also to construct analysis of what might happen if a given shock occurs. IS/LM models are the first to have been introduced for monetary policy analysis. Generally, they include the main transmission channels and use calibrated and/or estimated coefficients in order to construct a good representation of the economy. However, as new theoretical and practical arguments on the importance of the expectations on the behaviour of the economy's agents began to arise, it became clear that there was a need to incorporate them into modelling. This second type of modelling is known as DSGE model; generally DSGE models incorporate a detailed theoretical structure of the optimization process for businesses and consumers. However, as these models are mainly theoretical, bringing them to the data is difficult.

If we put these two types of models in a straight line, the so-called structural model lies somewhere in between. This third type of model has features of both sides: it incorporates expectations, it is based on theoretical background but it also makes use of the data in order to provide a good representation of the economy.

Currently, the Bank of Albania uses MEAM (Macro Econometric Model of the Albanian Economy) which is an IS/LM macro model used mainly for shock analysis and economic projections (Dushku, Kota and Binaj (2006), Kota and Dushku (2010)). This macro model incorporates the main transmission channels of the Albanian economy, and it has a good description of all the sectors of the economy. Therefore it is considered to be a medium size macro model. MEAM is a dynamic model with a linear functional form which uses only backward looking expectations. The model has also a monetary reaction rule which is switched on, only for analysis of possible movements in the monetary policy.

However, monetary policy decision-making at the Bank of Albania would also profit from a smaller macroeconomic model which would be more focused on the monetary policy reaction. This is the aim of this paper. Here we present a small structured model of the Albanian economy, which will be a support to the policy analysis on an inflation targeting regime to be implemented by the Bank of Albania in the near future. We propose a simple structural model because it captures the essential small, open, flexible exchange rate economy linkages between the policy instrument (repo rate) and the main macroeconomic variables of output, inflation, exchange rate and unemployment. The main structure of the model relies on the paper presented by Carabenciov et.al. (2008), which we have enriched by incorporating also the exchange rate as an important transmission channel mechanism for the Albanian economy.

The structure of the paper is as follows. The second section includes an introduction to the core developments of the Albanian economy during the last decade. The third section presents the specification of the model followed by the fourth section, which deals with model estimation using Bayesian approach. Finally, we present model behaviour and some shocks in order to discuss what the impulse responses of the model are. The last section concludes and specifies the need for future research.

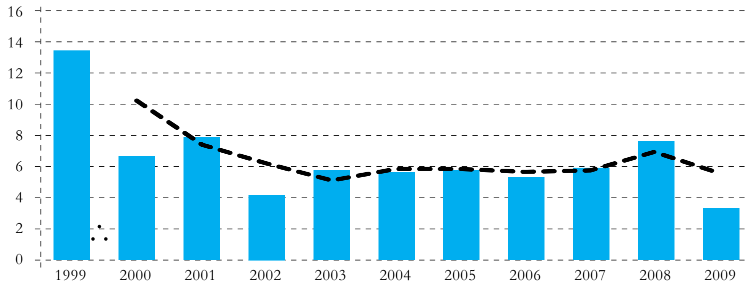
II. THE ALBANIAN ECONOMY OVER THE PERIOD 2000-2009

Albanian economic performance over the last decade has been satisfactory, with significant economic growth, inflation rate within the 2-4 % target set by the Bank of Albania and stable exchange rate vis-à-vis euro. The paragraphs below provide a more detailed picture of these developments:

- Real GDP Growth

Figure 1 gives the real GDP growth figures in Albania suggesting that the economy has experienced a strong sustained economic growth from 1999 to 2008, with an average of 6.8 percent. Only during 2009, the real GDP growth shrank to about 3.6 percent as credit growth almost dimidiated, trade deficit widened, and consumption and investment slowed down. All these developments were results of the global crisis in 2008.

Figure 1: Real GDP Growth, 1999-2009 (in percent, in bars); moving average (the line)



Source: Instat (2010)

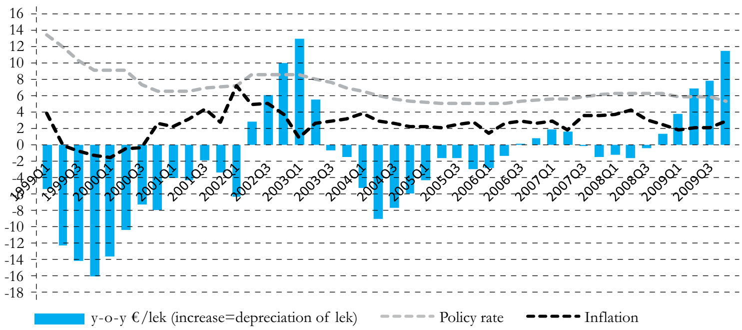
- The exchange rate, policy rate and inflation

Figure 2 presents the main developments of exchange rate, policy rate and inflation in Albania over the last decade. At the beginning of the period, the interest rate (policy rate) was very high, approximately 13 percent, reflecting a high country risk and the determination to keep inflation under the central bank's target. As inflation rate slowed down within the Bank of Albania's target, repo rate was accommodated to the current level of 5%.

An interesting feature of the Albanian economy is that a change in exchange rate has a significant impact on the changes of CPI (inflation), so the pass-through in Albania appears to be considerable. This is confirmed by empirical results in MEAM (Kota and Dushku, 2010) which states that the long run coefficient of the exchange rate impact on domestic CPI is 0.75. This result is also confirmed by Istrefi (2007) for the period 1996-2006. Therefore exchange rate is considered to be one of the main transmission channels of the monetary policy.

Finally, inflation rate in Albania after 2003, has mainly lied within the target set by the Bank of Albania, currently 31%.

Figure 2: Exchange rate, policy rate and inflation (1999-2009)



Source: Bank of Albania, Instat (2010)

The model we aim to construct should replicate these developments of the Albanian economy, by also capturing the important turning points and having reasonable impulse response functions to a given shock.

III. THE SPECIFICATION OF THE MODEL

The model we present here is based on Carabenciov et.al. (2008), a structure that mixes the New Keynesian theory on nominal and real rigidities and the role of aggregate demand in output determination with the real business cycle tradition of DSGE. This macro model approach aims to forecast future developments of output, exchange rate, inflation and unemployment and also analyze their behaviour. The differences between the model presented by Carabenciov et.al. (2008) and the model that we propose in this paper, deal mainly with two issues:

a. Carabenciov et.al. (2008) incorporates in the model not only shocks to the growth rate of the variables, but also to their level. In our case we will focus on shocks only to the growth rate of the variables, as one can easily incorporate shocks to the levels of the variables using our approach.

b. Carabenciov et.al. (2008) proposes a closed economy model which does not incorporate exchange rate developments. Given the importance of exchange rate in Albanian economy, we enriched the model by adding exchange rate determination using uncovered interest rate parity. This way, the Albanian economy will be directly impacted by developments in the European market, which is an important feature of the actual developments.

At its core the model has five equations; (1) an aggregate demand or IS curve that relates the level of real activity to expected and past real activity, the real interest rate, the real exchange rate and the foreign real activity: (2) a Phillips curve that relates inflation to past and expected inflation, the output gap and the exchange gap: (3) an uncovered interest rate parity condition for the nominal exchange rate that includes forward and backward looking expectations and a country risk premium; (4) a rule for the monetary policy, that under an Inflation Targeting definition the loss function will attach a high cost to deviation of inflation from the target and the output gap (5) and a dynamic version of Okun's law, where unemployment gap is a function of output gap and its lagged value.

All variables of the model are determined in terms of deviations from the equilibrium, or in "gap" terms. The model itself does not intend to explain the factors that determine movements in equilibrium variables like real output, real exchange rate and the real interest rate. But the aim of the model is to explain how the variables react to a given shock, as compared to their equilibrium level. The model abstracts from issues related to aggregate supply and fiscal solvency and does not explore the determinants of current account. It is relatively transparent, simple, and takes into consideration all the key features of the economy for monetary policy analysis and forecasting (Berg, Karam, and Laxton 2006).

The section below explains in detail all the relationships of the model.

- Phillips Curve

Equation 1 is the inflation equation, otherwise known as the Phillips curve. In this equation, inflation depends on its past and future values, the lagged output gap and the exchange rate gap, as follows:

$$\pi_t = \alpha_1 \pi_{t+1} + (1-\alpha_1)\pi_{t-1} + \alpha_2 ygap_{t-1} + \alpha_3 \Delta z_t + \varepsilon_t^{\rho} \quad (1)$$

Where π_t is inflation, measured as the annualized quarterly change[1], π_{t+1} and π_{t-1} are the forward-looking and backward-looking components of inflation, $ygap_{t-1}$ is the output gap and Δz_t is the change in the real exchange rate (z_t) from the last periods level (z_{t+1}) .α_1 and α_2 are model parameters and ε_t^{p} is the disturbance term that captures other exogenous supply shocks, not included in the model, like oil price shocks.

Aggregate supply or the New Keynesian Phillips Curve is based on price-setting model by Calvo (1983), where we assume an imperfect competition and nominal rigidities. Two distinct features characterize the relationship between inflation and economic activity in the New Keynesian Phillips Curve. First, the forward-looking character of inflation is a consequence of the fact that firms set prices on the basis of their expectations about the future evolution of demand and cost factors. Second, the link between inflation and real activity, which comes through the potential effect on the latter of the real marginal cost (GaIi & Lopez-Salido, 2000).

In equation 1, the size of α_1 plays an important role because it measures the relative weight of the forward-looking and backward-looking expectations in the inflation process. The main restrictions in the Phillips curve are that the coefficients before lagged and expected inflation sum to one, and the coefficient on the level of the output gap and forward-looking element should be greater than zero. These restrictions ensure that the monetary policy takes the commitment to adjust the policy rate in response to nominal variables to provide an anchor to the system (Berg, Karam, and Laxton 2006). The residual term enters in the equation with positive sign, so the shock to the residual will be treated as a shock that results in upward pressure on the inflation rate.

1 Where $\pi_t = 400 * [\log(cpi_t) - \log(cpi_{t-1})]$ and $\pi 4_t = (\pi_t + \pi_{t-1} + \pi_{t-2} + \pi_{t-3}) / 4$ is the four-quarter change in consumer price index (CPI) and is considered a year-on-year rate.

Output gap equation

Domestic output depends on the real interest rate, the real exchange rate and the demand in the rest of the world, represented by European Union. The output gap is the deviation of actual output from equilibrium level of GDP (a positive number indicates that output is above the potential) as follows:

$$ygap_t = 100*(gdp_t - gdp^*_t) \qquad (2)$$

Where *gdp* is real output measured in logs, and is gdp^*potential GDP.

The equation above is simply a definition of the output gap, because GDP and potential GDP are measured in logs, therefore *ygap* is measured in percent.

While equation (3) below is a behavioural equation of output gap that is a function of its lead and lagged value, the gap between the actual real interest rate and its equilibrium value, the real exchange gap and the EU output gap. Dynamics are added through the influence of past and future domestic output gap, and lagged reactions to the interest rate and exchange rate gap:

IS curve:

$$ygap_t = \beta_1 ygap_{t-1} + \beta_2 ygap_{t+1} - \beta_3 (rr_t - rr^*_{t-1}) + \beta_4 z_{t-1} + \beta_5 ygap^{EU}_t + \varepsilon^{ygap}_t \qquad (3)$$

where *ygap* is the output gap, rr[2]is the real interest rate gap, Z is the real exchange rate, $ygap^{EU}$ is the European Union output gap and the star above a variable, denotes the equilibrium value of the variable.

The equation above represents the IS curve, where the real interest rate provides the crucial link between monetary policy and the economy. As Albania is a small open economy, the real exchange rate affects the level of activities through the prices of imports and exports, while the foreign output gap is an important determinant of exports demand. The ε^{ygap}_t term captures other temporary exogenous

2 The real interest rate gap in Albania is measured as the difference between policy rate and inflation, $rr_t = rs_t - \pi 4_{t+1}$

factors, such as the fiscal policy and other demand shocks. Equation (4) below provides a stochastic process for potential GDP, where potential GDP is a function of its lagged value plus the quarterly growth rate $g^{gdp*}/4$ thus assuming that the shock can affect only the growth rate of potential output, not the level of potential output.

Stochastic process for potential GDP:

$$gdp_t^{*}=gdp^{*}_{t-1}+g_t^{gdp*}/4 \tag{4}$$

As shown in equation (4) above, in the long run the growth rate of potential GDP, g_t^{gdp*} is equal to its steady-state rate of growth g^{ss}. However, it can diverge from this steady-state growth following a positive or negative value of the disturbance term ε_t^{gss} and will return to g^{ss} gradually with the speed of return based on the value of ω_1 (Laxton, Rose and Scott, 2009).

$$g_t^{gdp*}=\omega_1 g^{ss}+(1-\omega_1)\, g_{t-1}^{gdp*}+\varepsilon_t^{gss} \tag{5}$$

Exchange rate

In order to incorporate exchange rate development, we introduce a nominal uncovered interest parity (UIP) equation in this model, where the nominal exchange rate depends on the difference between real interest rate in Albania and the counterpart in the EU, the change in real exchange rate, the change in real exchange gap and the risk premium. We divide the risk premium in two components: permanent risk premium and temporary risk premium.

The equation for the nominal exchange rate may thus be written as:

$$[rs_t-rs_t^{EU}]/4=\Delta Z_t^{*}-\Delta Z_t+s_{t+1}+s_{t-1}-(\pi_{t-}\pi_t^{EU})/4-(risk\_p_t+risk\_t_t) \tag{6}$$

Where rs_t is the policy interest rate in Albania and rs_t^{EU} is the three-month Euribor in EU, (these rates are divided by four because they are in annual term). s_{t+1} and s_{t-1} are the expected and lagged values of nominal exchange rate, π_t^{EU} is the inflation in EU, $risk\_p_t$ and $risk\_t_t$ are the risk premium and the temporary risk premium.

Below we present how permanent risk premium and temporary risk premium develop to their steady state value.

Exchange rate risk definition

Blanchard and Quah (1989) provide an econometric technique which allows researchers to decompose a time series into its temporary and permanent components (Sarno and Taylor). Lastrapes (1992) based on the Blanchard and Quah (1989) decomposition finds that the real shocks cause a permanent real and nominal appreciation of the exchange rate, while nominal shocks are found to cause a permanent nominal depreciation. The idea we follow here is similar, we divide risk premium into temporary and permanent component and then determine how they develop to their steady state.

Equation (7) below gives the permanent risk premium:

$$risk\_p_t = 0.5 * risk\_p_{t-1} + (1-0.5) * risk\_p_t^* + \varepsilon_t^{risk\_p} \qquad (7)$$

Where $risk\_p_t^*$ is risk premium at steady state and the disturbance term is $\varepsilon_t^{risk\_p}$ captures the permanent shocks to the permanent risk premium, which we use here as permanent shocks to exchange rate, as $risk\_p_t$ determines the equilibrium real exchange rate equation as given in equation (11).

The development of temporary risk premium is given as:

$$risk\_t_t = \gamma_1 * risk\_t_{t-1} + \varepsilon_t^{risk\_t} \qquad (8)$$

Where $\varepsilon_t^{risk\_t}$ captures the temporary shocks that affects the movement in the temporary risk premium, which can be considered as temporary shocks to exchange rate.

In our model the real exchange rate (*z_real*) depends on nominal exchange rate (s) and the difference on price level between European Union, cpi^{EU} and Albania, *cpi*, while the real exchange rate gap is calculated as the difference between the real exchange rate and the real exchange rate equilibrium.

$$z\_real_t = s_t + cpi_t^{EU} - cpi_t \qquad (9)$$

$$z_t = z\_real_t - z_t^* \tag{10}$$

The equilibrium real exchange rate equation is defined as follows:

$$z_t^* = z_{t-1}^* + (rr_t^* - rr_t^{*EU})/4 - risk\_p_t \tag{11}$$

Where rr_t^* and rr_t^{*EU} are the real interest equilibrium in Albania and in EU. Thus the equilibrium of real exchange rate is a function of its lagged value, the interest rate differential and permanent risk premium.

The equations below determine the real interest rate $r\_real_t^{EU}$ and the real interest rate gap (rr_t^{EU}) in the foreign country.

$$r\_real_t^{EU} = rs_t^{EU} - \pi_{t+1}^{EU} \tag{12}$$

$$rr_t^{EU} = r\_real_t^{EU} - rr_t^{*EU} \tag{13}$$

Real interest rate equilibrium equation in European Union is as follows:

$$rr_t^{*EU} = \text{ø}_1 rr_{t-1}^{*EU} + (1 - \text{ø}_1) rr_t^{ss\_EU} + \varepsilon_t^{*EU} \tag{14}$$

Where $rr_t^{ss\_EU}$ represents the real interest rate at steady state and ε_t^{*EU} is the shock to the real interest rate equilibrium.

The real interest gap equation is arranged as follows, where the disturbance term ε_t^{rrEU} captures the shocks to the real interest rate gap in the European Union:

$$r\_real_t^{EU} - rr_t^{*EU} = \delta_1 * rr_{t-1}^{EU} + \varepsilon_t^{rrEU} \tag{15}$$

Monetary policy rule

The monetary policy rule determines the decisions of the central bank to use the instrument variable (the policy rate) in order to achieve its target level for inflation. Clarida, Gali and Gertler (1999) emphasize that for the central bankers it is very important to take into account the movements in economy, when they take a decision, thus in our reaction function we have included also the output gap. The monetary policy rule is as follows:

$$rs_t = \lambda_1\, rs_{t-1} + (1-\lambda_1)(rr_t^* - \pi 4_{t+4}) + \lambda_2(\pi 4_{t+4} - \pi_t^{ss}) + \lambda_3 ygap_t + \varepsilon_t^{rs} \qquad (16)$$

Where λ_1 is the degree of interest rate smoothing, the λ_2 term measures the aggressiveness of monetary policy in achieving the inflation target, the λ_3 term is the coefficient on the output gap, and ε_t^{rs} is interpreted as economic shock (demand and supply shocks).

Foreign country (European Union)

The rest of the world in the model is represented by the European Union. We have modelled only the Phillips curve and the output gap for European Union, as these are the main variables that have an impact on the Albanian economy. As expected, we suppose that the Albanian economy does not affect the European Union economy as it is a small country.

Output gap (EU)

$$ygap_t^{EU} = 0.8 * ygap_{t-1}^{EU} + \varepsilon_t^{EU} \qquad (17)$$

Where $ygap_t^{EU}$ is the output gap in European Union and it is measured as the difference of real output from potential value; ε_t^{EU} measures the disturbance term in output gap equation for the European Union.

Inflation equation (EU)

$$\pi_t^{EU} = \sigma_1\, \pi_{t-1}^{EU} + (1-\sigma_1)\, \pi_t^{ss\_EU} + \varepsilon_t^{\pi\_EU} \qquad (18)$$

Where π_t^{EU} represents inflation in European Union, measured as quarterly annual changes of HCPI; $\pi_t^{ss\_EU}$ is the equilibrium value of inflation in steady state; and $\varepsilon_t^{\pi\_EU}$ is the supply shock term.

Unemployment equation

The equation below provides a dynamic version of Okun's law, where unemployment gap (measured as the difference between equilibrium level of unemployment rate and actual unemployment rate) is a function of its lagged value, the output gap and the disturbance term ε_t^{un}.

$$un_t = \mu_1 un_{t-1} + \mu_2 ygap_t + \varepsilon_t^{un} \tag{19}$$

The equilibrium level of unemployment or NAIRU rate of unemployment is defined in equation (20), where *un** is a function of its past value plus a growth term, g_t^{un*}. The growth rate of potential unemployment rate is a function of its lagged value and the disturbance term ε^{gun*} as given in equation (21).

$$un_t^* = un_{t-1}^* + g_t^{un*} \tag{20}$$

$$g_t^{un*} = (1-\hbar)\, g_{t-1}^{un*} + \varepsilon_t^{gun*} \tag{21}$$

Thus, we have assumed that NAIRU can be affected only from growth shocks.

Once we have specified the model, we move to model estimation. The next section discusses in detail the steps we follow to determine the structural parameters of the macro model.

IV. MODEL ESTIMATION

There are two possible ways to determine the parameters of the structural model. The first approach is to calibrate the parameters so that shocks and impulse response given by the model would match as closely as possible their empirical counterparts. Calibration can be carried out on the basis of experts' knowledge on the economic structure of the given country and/or make use of the conclusions from studies of similar countries and use them as a benchmark. The model can also be calibrated using theoretical expectations on the size of the parameters. However, in order for the model to be used as a serious tool for policy analyses, rigorous econometric evaluation is needed. This is the second approach to determine the parameters of the structural models. Both approaches have some drawbacks, as the first one does not really relate to the data, while the second approach could undermine the importance of the theoretical background.

Therefore, it is important that the researcher brings the data to the model by incorporating not only experts' knowledge but also the information that comes from the latest. This is the approach we follow here by using Bayesian estimation. We suggest not only to estimate the model, but also to incorporate other knowledge from outside the data. First we will discuss the data we use in the model, and then briefly present the basic idea of Bayesian estimation.

A. DATA

To estimate the model we use quarterly data on output, inflation, interest rate and exchange rate from 2003 to 2009. Data are collected from INSTAT concerning inflation and output, and the Bank of Albania for interest rate and exchange rate in Albania. We choose this time period in order to avoid potential structural breaks in the data of output, as INSTAT started to publish quarterly GDP data only after 2003. Foreign GDP data and 3-month Euribor interest rate are collected from Eurostat. The output growth rate is the log-difference in the real gross domestic product (GDP). The inflation rate is the log difference in the consumer price index (CPI). All the data used in the estimation are demeaned.

B. ESTIMATION METHODOLOGY-BAYESIAN APPROACH

Bayesian analysis allows the researcher to formally incorporate uncertainty and prior information on the parameters of the model. The idea is that the model builder uses prior information, e.g., from earlier microeconometric or macroeconometric studies for calibration purposes. In this context, Bayesian estimation is considered as a generalization of the calibration. In the Bayesian approach the values of the prior information are considered as the means or modes of the prior densities to be specified, where the prior uncertainty about these values can be expressed by choosing the appropriate variance of the prior.

When estimating a model, two sets of random variables have to be considered: the parameters and the data. The Bayesian approach makes use of the likelihood principle according to which all relevant information about the unknown parameters can be learned from the likelihood function (their probability distribution). This is given in the equation below known as the Bayes' theorem. The theorem gives the relationship between the posterior density and the prior and the likelihood as given below:

$$p(\xi/Y)=\frac{L(\xi/Y)\pi(\xi)}{\int \xi/Y)\pi(\xi)d\,\xi} \propto L(\xi/Y)\pi(\xi) \qquad (22)$$

Where $p(\xi/Y)$ gives the posterior density of ξ which is the vector of the parameters, $L(\xi/Y)\approx f(Y/\ \xi\,)$ is the likelihood of the sample Y (observables) and $\propto$ denotes proportionality. Draws from the posterior density of the structural parameters can be generated through the Metropolis-Hastings algorithm. Summary statistics of the parameters like posterior means (the point estimate of the structural parameters), standard deviations and confidence intervals are then calculated using these draws.

The first step of the Bayesian estimation requires the specification of the prior distribution and calculation of the likelihood function. We will estimate only the parameters of the Philips Curve, IS curve and monetary policy rule. The reason we exclude estimating the labour market and directly calibrate the labour coefficients is due to poor data statistics. Even in MEAM, labour market uses basically calibrated and restricted parameters, which we will import directly to the GAP model.

C. CHOICE OF PRIOR

The prior distribution of the parameters describes the available information prior to observing the data used in the estimation. We choose as prior information, coefficients which we obtain after running three shocks to MEAM:

1. Government expenditure shock
2. Exchange rate shock
3. Monetary policy shock

The results of the shocks are then used to derive the prior mean of the structural parameters of the GAP model so that the impulse response of similar shocks in the structural model would be comparable to the results of MEAM. We are confident in using MEAM as our prior information as it has been used for some time in policy decision making. Also MEAM incorporates the best knowledge on the full linkages of the Albanian economy, being the only macro model in Albania in terms of variables and structure of the economy. This macro model includes a wide range of information concerning the main relationships between all the sectors of the economy, it is estimated with some calibration, and therefore it includes also experts' knowledge. Since the Bayesian estimation technique allows us to use prior information from earlier studies in a formal way, we are confident that MEAM provides a very good orientation on these priors.

Table 1 reports the prior distribution and initial values for the parameters. For all the parameters bounded between 0 and 1 we use the beta distribution, basically all the autoregressive parameters. Forward-looking output gap in aggregate demand and forward-looking interest rate in Philips Curve are also set to have beta prior distribution with not large standard deviations. For parameters assumed to be positive, such as the impact of exchange rate and interest rate on output, we use an inverse gamma distribution. The prior mode of exchange rate parameter in Philips Curve is set, so that pass-through is 6 % in the first quarter. Finally, the prior mean on the inflation coefficient is set to 1 with normal distribution and narrow standard deviation. The lagged interest rate coefficient to 0.5 implies that interest rate smoothing is not very large and the output reaction of 0.1 per quarter corresponds to a standard Taylor response of 0.4 for the annualized interest rate. Finally, for the standard deviations of the shock, we use the inverse gamma distribution with mean 1 and a wide standard deviation equal to 1.

The equilibrium conditions of the structural model are determined around the steady state conditions. Movements of the variables around the steady states are interpreted as cyclical fluctuations. We calibrate the steady state of the main variables to values commonly agreed for the Albanian economy. The steady state growth rate of GDP is calibrated to 6 %, which is the average growth rate of the Albanian economy prior to the global financial crisis (commonly agreed as the potential growth in Albania). Real interest rate steady state equals 3% and inflation rate steady state equals the Bank of

Albania's target (3%). The same holds for foreign inflation steady state of EU, which equals 2 % with 2% real interest rate.

D. ESTIMATION RESULTS

The results of the joint posterior distribution of all estimated parameters are reported in Table 1. Combining the joint prior with the likelihood leads to the posterior density that is analytically untraceable. Hence, in order to sample from the posterior we employ the Metropolis-Hastings algorithm and generate 1600 draws from the posterior. Table 1 shows the posterior mean of all the parameters along with the 5th and 95th percentiles of the posterior distribution.

Table 1: Prior and posterior distributions

	Prior distribution			Posterior distribution		
Parameter	Type	Mean	St.dev.	Mean	5%	95%
Lagged output gap in aggregate demand	Beta	0.800	0.100	0.910	0.827	0.986
Forward output gap in aggregate demand	Beta	0.100	0.050	0.063	0.019	0.107
Real interest rate gap in IS equation	Inv_ gamma	0.050	0.050	0.031	0.016	0.042
Real exchange rate gap in IS equation	Inv_ gamma	0.050	0.010	0.059	0.037	0.081
Foreign output gap in IS equation	Inv_ gamma	0.050	0.050	0.054	0.021	0.097
Forward looking inflation in Philips Curve	Beta	0.200	0.100	0.058	0.012	0.126
Output gap in Philips Curve	Inv_ gamma	0.300	0.020	0.299	0.254	0.345
Real exchange rate in Philips Curve	Inv_ gamma	0.120	0.100	0.087	0.046	0.143
Interest rate smoothing	Beta	0.500	0.100	0.725	0.657	0.816
Inflation aggressiveness -1	Normal	1.000	0.200	1.175	0.945	1.436
Output gap in reaction function	Inv_ gamma	0.100	0.100	0.078	0.032	0.111
Autoregressive coefficient of permanent risk premium	Beta	0.500	0.100	0.590	0.482	0.688
Autoregressive coefficient of transitory risk premium	Beta	0.500	0.100	0.472	0.320	0.614

Autoregressive coefficient of real interest rate	Beta	0.500	0.100	0.658	0.569	0.729
Autoregressive coefficient of foreign output gap	Beta	0.500	0.100	0.5333	0.392	0.676

In the following we discuss the results in terms of the means of the marginal posteriors. The model appears to support a high degree of persistence in output (0.9) paired with a low impact of interest rate (0.03) and exchange rate (0.06) on output. Low degree of forward looking in inflation (0.06) is accompanied by high persistence in inflation (0.94) and a moderate exchange rate pass-through. A relatively high degree of inflation persistence was also found by Kota (2009) for headline inflation.

The parameters of the Taylor rule display reasonable values with a mean for the inflation coefficient of about 1.2, and the mean of the output gap coefficient of about 0.08. We recall that Taylor (1993) suggested values of 1.5 and 0.5 on inflation and the output gap, respectively. However, in his original rule inflation is measured as an average over the last four quarters, whereas in the present study inflation is the annualized quarterly growth rate of the CPI, which may be one reason for the weaker responsiveness of the interest rate to inflation in our study. Of course, the structure of the economy in Albania is different from that of the USA, therefore aggressiveness of the monetary policy to inflation and to output gap (which is not a target of the Bank of Albania) is expected to be different. The degree of interest rate smoothing has a mean of about 0.6. Finally, permanent and transitory risk premiums are not very persistent with an average mean of around 0.5.

V. SHOCK ANALYSIS

In this part we examine how different shocks affect the main macroeconomic variables and as compared to their steady state. Here we will present the results of the model from an unanticipated temporary shock that we have named as supply and demand shock and an anticipated temporary monetary policy shock.

Most research distinguishes between *anticipated* and *unanticipated* shock to a variable. The anticipated shock refers to a situation in which the behaviour of one variable in our case the level of prices, output or interest rate is rising/or decreasing at a rate that all economic agents expect. While the unanticipated shock to one variable characterizes situations when agents cannot predict or adjust for in advance of what they expect for the behaviour of variables. Fisher (1992) emphasizes that both anticipated and unanticipated solutions tend to converge towards the same long-run solution with the difference largely in terms of dynamic, but the unanticipated effects are stronger than in the anticipated case in the period in which the shock is introduced.

Another concept related to monetary policy shocks is permanent and temporary policy changes. Based on the Wallis et al. (1986) we can conclude that the difference between a permanent and temporary policy change is restricted to the period following the removal of temporary change. So the backward looking models react in the same way to permanent and temporary shocks during the period in which they are forced. A permanent policy change will generally take the solution to the model on to a new steady-state trajectory, while a temporary policy shock will take the model solution on the same path, whilst it is in force. The long-run difference between the temporary and permanent shock is a feature of the model with forward expectations variables. In addition, they may react differently to a shock, depending on whether this shock is anticipated to be permanent or temporary.

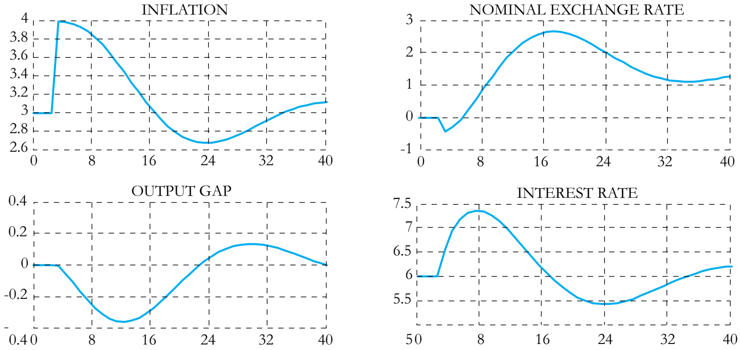
In our example we will carry out two unanticipated and temporary shocks that are demand and supply shocks and at the end, an anticipated temporary shock to the monetary policy due to an increase in future inflation.

- Supply shock

A positive shock of 1 percent to inflation equation leads to 1 basis point increase to inflation, while interest rate increases by 1.25 basis points after 4 quarters. Higher interest rates put downward pressures on inflation, which falls from 4 basis points to target after 2.5 years. The real exchange rate appreciates leading to lower aggregate demand, represented by a fall in output gap and inflation.

The rest of the dynamic developments reflect the system returning to its steady state.

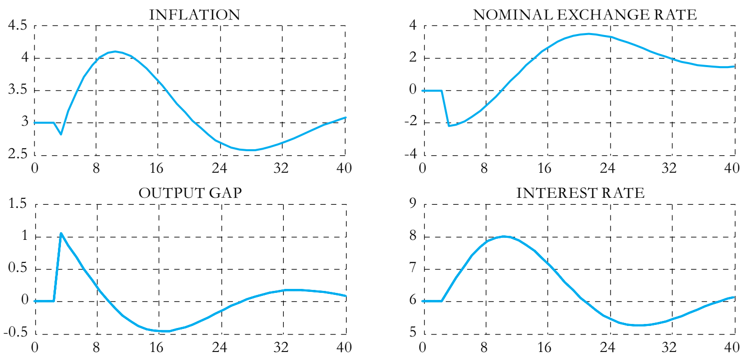
Figure 3: A 1 percent unanticipated shock to inflation



- Demand shock

1 percent shock to output gap that can be a credit shock or a fiscal shock at first, puts downward pressures on inflation up to 0.3 pp, which is followed by higher inflationary pressures due to exchange rate depreciation. Interest rates will increase to keep inflation within the target, so that around 1 pp wider output gap accompanied by 1 pp higher inflation, increases the interest rate up to 2 pp. This indicates the monetary policy is very sensitive to changes in inflation, regardless of the developments in output gap and exchange rate.

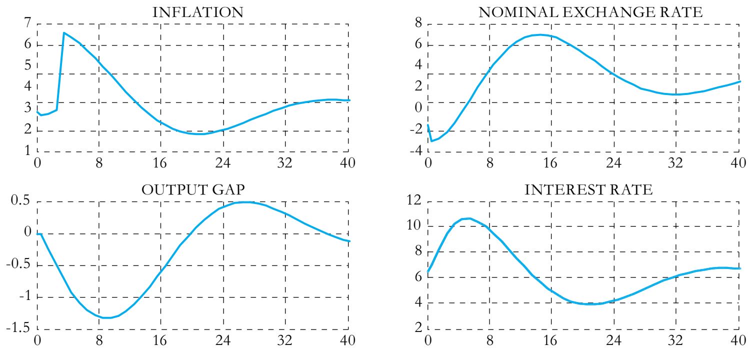
Figure 4: A 1 percent unanticipated shock to output gap



- Monetary policy shock

A very useful application of this model is that we can analyze the changes in the policy instrument and discuss its impact on other variables of the model. This type of analysis is necessary, since it serves directly as policy analysis to the decision-making process. We have analysed a one basis point anticipated shock to the repo rate due to a future shock on the Phillips curve. Based on inflation expectations, we assume that the inflation rate will go up after 4 quarters; therefore the policymakers decide to increase the repo rate at this moment by 1 basis point. The figure below shows that an increase in repo rate has a direct impact on exchange rate appreciation, followed by an immediate deprecation and a wider negative output gap. Then the shock is transmitted to the inflation rate that goes to the target level of 3 percent within two years.

Figure 5: A 1 percent anticipated shock to policy rate in response of future shock in Phillips curve



In general, we can say that the impact of output gap on inflation appears to be high, among all shocks and therefore future research is required on this area. As expected, nominal interest rates react to changes of inflation, which includes the transmission of the output gap impact. Also, it appears that exchange rate is the relevant transmission channel of the monetary policy, which also requires some future research.

VI. CONCLUDING REMARKS AND FUTURE WORK

In this paper we present a small quarterly model for Albanian economy, where we include an endogenous output, inflation, policy rate, exchange rate and unemployment. The aim of the model is to unify the theoretical framework and the empirical evidence of the Albanian economy. The model has been designed to support policy analysis and to capture the essential linkages between the policy instrument of the Bank of Albania and the rest of the macroeconomic variables.

Based on Bayesian approach we used to estimate the model, we find a lagged output gap term on IS curve around 0.9 % that is the same like in other studies[3] for similar economies and a small coefficient on the lead of the output gap. We also find that the coefficient of interest rate is small implying that one percentage point increase in interest rate would lead to a 0.03 percent fall in the output gap on the following period. Being a small open economy, we would expect the coefficient on the real exchange rate to be higher, but we estimate a coefficient of around 0.08 %.

The results of the estimation indicate a relative high degree of inflation persistence in the Phillips curve and also a moderate exchange rate pass-through. To ensure that monetary policy has an effect on inflation, we expect that the coefficient on output gap and exchange rate gap to be higher than zero. In our case we have found a moderate pass-through but a higher effect of aggregate demand on inflation, as we expected.

The parameters of the Taylor rule display reasonable values with a mean of the inflation coefficient at about 1.2 %, and the mean of the output gap coefficient at 0.08 %. The degree of interest rate smoothing is moderate with a mean of about 0.7 %. Finally, permanent and transitory risk premiums are not very persistent with an average mean of around 0.5 %.

[3] Berg, A., et al (2006)

As future research, we plan to work on tuning the model so that impulse responses following a given shock better match our expectations and knowledge of the Albanian economy. Also it is important to estimate the labour market, so the model can be estimated and solved as a whole. Once the model is well-established, we aim to use it for forecasting purposes, besides policy and shock analysis.

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MACROECONOMIC EFFECTS OF FISCAL POLICY IN ALBANIA: A SVAR APPROACH

*Armela Mançellari**

ABSTRACT

This paper tries to estimate the effect of fiscal policy on Gross Domestic Product, Prices and Interest Rates in Albania. The main research question is: How much of a 1 ALL discretionary fiscal policy increase goes into GDP? We discriminate between two different types of fiscal policy: a tax decrease and an expenditure stimulus. We employ a Structural Vector Auto Regressive model using real government primary expenditures, real government net revenues, real GDP, CPI, and real 12-month T-bills interest rates as endogenous variables. To identify fiscal shocks, the tax code and fiscal policy decision lags are exploited, following the methodology developed by Blanchard and Perotti (2002). The income elasticity of government revenues is needed as input to identify policy shocks. We calculate it using an application of the Divisia Index based on Choudhry (1979). The study finds that a tax cut stimulus has the highest cumulative GDP multiplier, reaching 1.65 after five quarters, indicating no evidence of Ricardian equivalence in Albanian consumers. Between capital and current spending, the GDP multiplier of capital spending is 0.95 after one quarter, and higher than

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the current spending multiplier. We do not find statistically significant responses of interest rates following fiscal spending shocks, but they do increase after a tax cut. Lastly, a current spending shock slightly increases prices after one quarter, while a cut in net revenues significantly decreases prices by 55 bps on impact, settling at 40 basis points after four quarters.

Keywords: Fiscal policy, Structural Vector Autoregressions, tax elasticity, fiscal multiplier

JEL Classification: E62, C32, H20, H40

1. INTRODUCTION

Fiscal policy is an important determinant of economic developments and often government decisions on spending and taxes are assigned a crucial role in speeding up or slowing down economic growth. The recent global financial and economic turmoil highlighted the importance of fiscal stimuli in enabling economic recovery, in coordination with monetary policy. This paper investigates the macroeconomic effects of discretionary fiscal policy in Albania, with the aim of identifying the most effective type of policy in bolstering economic growth, while exerting low to moderate pressures on inflation.

Economic theory remains ambivalent on the macroeconomic effects of fiscal policy, mostly torn between two schools of thought – the Classical school and the Keynesian school. The more modern approaches to these theories are the neo-classical, neo-Keynesian and monetarist views. According to classical economists, fiscal policy is ineffective in boosting demand, due to the nature of markets to settle at equilibrium at all times. Neo-classicals go even further: fiscal policy might even hinder economic growth due to crowding out effects on private consumption and investment. They build their arguments upon the rational expectations assumption. As such, one would expect that an empirical investigation of the effects of fiscal policy would conclude that the latter does not affect neither output, nor prices or interest rates, at best. Keynesian economists, on the other hand, argue that the restoration of equilibrium in markets is a lengthy process, and fiscal policy (in coordination with monetary policy, according to neo-Keynesians) is required to boost private consumption and private investments. This study will also try to validate one of these schools in the case of Albania, through estimation of Gross Domestic Product multipliers for different types of fiscal policy. To the best of my knowledge, fiscal policy effects have not been empirically studied in Albania, so far. Thus, the paper aims at contributing to the current literature by quantitatively and qualitatively measuring government's influence on aggregate demand, prices, and interest rates, to aid both the fiscal and the monetary decision-making process.

Unlike monetary policy effects, which have been substantially studied in a time series analysis framework, fiscal shocks' dynamics on the economy have only recently received attention in terms of empirical validation of theoretical models[1]. Vector Autoregressive (VAR) Models are now well-established time series tools for policy analysis, structural inference and description of economic relationships[2]. They have been extensively used in analyzing the monetary policy transmission mechanism and to measure the effects of monetary shocks on real economic variables. In the last decade, VARs have also been used to investigate fiscal policy. The main challenge of empirical fiscal studies is the identification of discretionary (exogenous to the model) fiscal shocks. Romer and Romer (1989), Ramey and Shapiro (1997), Burnside et al. (2003), etc, identify what they call 'truly exogenous' fiscal episodes, such as the Reagan fiscal expansion or the Vietnam war, and estimate their effects on macroeconomic variables in a reduced-form VAR setup. Mountford and Uhlig (2002 and 2008) use sign restrictions to identify government spending and government revenues shocks, while controlling for business cycle and monetary shocks. For example, when tax revenues increase while government spending does not, a discretionary tax shock is identified. Another application is that of Fatas and Mihov (2001), who rely on recursive identification, with government spending shocks ordered first.

1 For a full survey of both theoretical and empirical literature of macroeconomic effects of fiscal policy, see Beetsma, R., (2008): A survey of the effects of discretionary fiscal policy, Studier i Finanspolitik No.2008/2.

2 For fundamental work on Vector Autoregressions, see Christopher A. Sims, 1980, "Macroeconomics and Reality", Econometrica 48. Also, a full survey on the uses of VAR models can be found in Stock, James H., and Mark W. Watson, "Vector Autoregressions," Journal of Economic Perspectives, Vol. 15 No. 4 (Fall 2001), 101-115.

In addition, the fourth bulk of literature on fiscal policy VAR is attributed to Blanchard and Perotti (2002), extended in Perotti (2005). They use institutional information on tax and transfer systems, and exploit quarterly data dynamics and fiscal policy decision lags to identify fiscal shocks in a Structural VAR setting. While all methodologies have their advantages and disadvantages[3], the last approach is deemed as more appropriate in the case of Albania, given the country's short history of free markets and the relatively long history of compliance with IMF economic programs (where fiscal consolidation has been a constant requirement).

This paper studies the effects of fiscal policy – defined as government spending and government net revenues – on Gross Domestic Product, prices, and interest rates, using the methodology developed by Blanchard and Perotti (2002). To fully identify our fiscal structural shocks we rely on the following rationale: Fiscal policy comprises three different components – an automatic response to output fluctuations (due to built-in structures like unemployment benefits, social security, etc), a systematic discretionary response (for instance, a systematic increase in public wages following recessions), and random discretionary shocks. By acknowledging that fiscal policy decisions are lagged, we can assert that it usually takes more than one quarter to decide about a systematic discretionary response. Therefore, the second component of fiscal shocks is inexistent in quarterly data.

Furthermore, we are able to identify the automatic component of fiscal shocks – expressed as the contemporaneous effect of the economic indicator to government revenues or spending – by calculating the within-quarter elasticity of net revenues and spending with respect to that indicator. All we are left with is the identified random discretionary shock. Section three explains the methodology used to calculate within-quarter elasticities. The estimation of elasticities contributes to current literature as well, since, to the best of my knowledge, there has not been a similar study for Albania, yet.

The main findings of the paper indicate that a tax cut stimulus has the highest cumulative GDP multiplier, reaching 1.65 after

3 For further discussion on the advantages and disadvantages of alternative fiscal VAR specifications, see Perotti (2005).

five quarters, indicating no evidence of Ricardian equivalence in Albanian consumers. Between capital and current spending, the GDP multiplier of capital spending is 0.95 after one quarter, and higher than the current spending multiplier. We do not find a statistically significant response of interest rates following fiscal spending shocks, but they do decrease after a tax cut. Lastly, a current spending shock slightly increases prices after one quarter, while a cut in net revenues significantly decreases prices by 55 bps on impact, settling at 40 bps after four quarters.

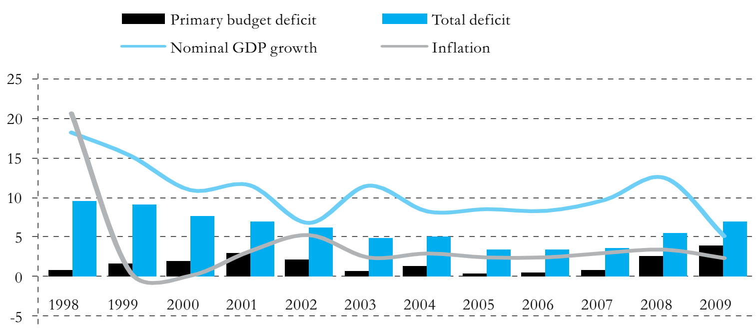
The following section presents some stylized facts on fiscal policy in Albania from 1998 onwards. In section 3, we describe the data and discuss the SVAR methodology. The same section includes the methodology used to calculate within-quarter elasticities (or the contemporaneous restrictions in the SVAR specification). Section 4 includes estimation results and impulse responses. Section 5 presents a further breakdown of fiscal spending policy into current and capital spending, compares results and presents fiscal multipliers. Section 6 concludes and discusses possible areas for future research.

2. FISCAL POLICY IN ALBANIA DURING 1998-2009

The beginning of the '90s marked the beginning of Albania's economy transition from centrally planned to a free market economy. Most of that decade witnessed very high volatility of macroeconomic and financial indicators, caused by well known factors like price liberalization, large increase in demand, opening of the economy to foreign markets, inexperience in designing and, most importantly, implementing economic policy, fragile institutions, etc. Aided by IMF stabilization programs, by the end of the '90s, the country had overcome the initial transition macroeconomic distress and was determined to achieve macroeconomic stability and sustainable, non-inflationary economic growth. The Albanian government was a crucial agent to the achievement of these objectives. Recognizing this role, it committed to reduce budget deficits through continuous fiscal consolidation, and major reformation of the tax collection system.

During the period of 1998–2000, Albania implemented the "Enhanced Structural Adjustment Facility II (ESAF II)" - an IMF stabilization program aiming at further consolidation of macroeconomic stability in the country through a series of structural reforms. As a result, the budget deficit in 2000 was reduced to 9.1% of GDP from 12.9% in 1997, mainly through cuts in government subsidies and personnel expenditures. During 2002–2008, several other economic IMF and World Bank economic programs were implemented by the Albanian government[4], which ensured further fiscal consolidation, improved the tax collection system, enhanced the independence of the monetary authority and built sound foundations for fiscal sustainability. General macroeconomic development trends throughout our estimation period are depicted in graph 1.

Graph 1: Selected macroeconomic indicators



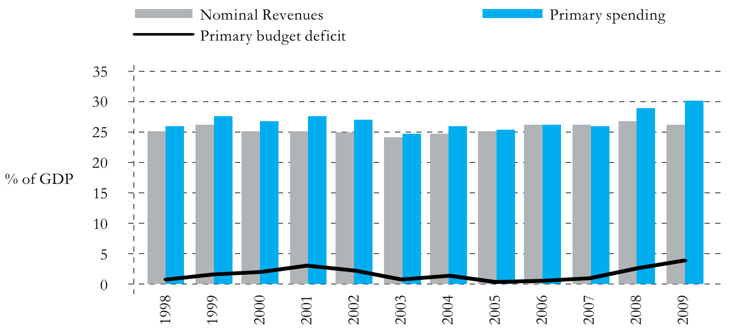
Source: Bank of Albania, Ministry of Finance and INSTAT

In the last decade, the Albanian tax system underwent these major reforms: the change from progressive tax rates to flat 10% income tax (2007) and corporate profit tax (2008); major reductions in customs duties imposed by the membership in the World Trade Organization, bilateral free trade agreements with South-Eastern European countries, the CEFTA agreement, the Stabilization and

4 During 2002-2005 Albania signed the "Poverty Reduction and Growth Facility (PRGF)" agreement with the IMF. This economic program was extended through 2008 with the "Extended Fund Facility (EFF)" agreement signed with the IMF and the World Bank. In January 2009, Albania graduated from the Fund-supported program.

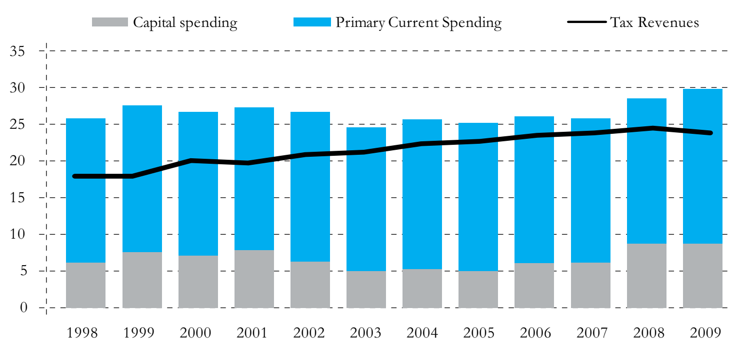
Association agreement with the European Union, etc.[5], which were accompanied by considerable increases in excise taxes, and; the reduction of social security contributions from 42.5% in 2005 to 26.5% in 2009. All these reforms have resulted in a balanced growth of tax revenues (despite considerable tax rate reductions). Graphs 2 and 3 show fiscal developments during our estimation period.

Graph 2: Nominal general government budget



Source: Bank of Albania, Ministry of Finance and INSTAT

Graph 3: Tax Revenues, Primary Spending



5 For detailed information on free trade agreements' terms, see the website of the Ministry of Economy, Trade and Energy, at http://www.mete.gov.al/index.php?l=e.

3. DATA AND METHODOLOGY

3.1. DATA DESCRIPTION AND SETTING UP THE VAR

The paper uses quarterly data from 1998Q1 to 2009Q4 for Gross Domestic Product, government net primary expenditures, government net revenues, the price level as measured by the Consumer Price Index, and interest rates, represented by the 12-month Treasury Bills' rate. Government net revenues are defined as in Perotti (2005): VAT revenues + Direct taxes + Revenues from Customs Duties + Excise taxes – Government transfers, where transfers represent Welfare Expenditures, Pensions and Government Subsidies. Quarterly GDP is interpolated from annual data[6] following Dushku (2008). Government net primary expenditures are defined as total current expenditures net of government transfers and interest payments, plus capital expenditures.

Given the relatively high frequency of quarterly data, all variables are seasonally adjusted. They are also deflated with CPI and enter the VAR in natural logarithmic form, except for the interest rate, which enters in levels.

After conducting Augmented Dickey Fuller, Philips Perron unit root tests and the KPSS stationarity test, we find conclusive evidence only on the non-stationarity of the level of GDP at a 95% confidence level. CPI, interestingly enough, has a unit root in levels, according to ADF and PP, but is also stationary in levels according to KPSS. Due to conflicting results of the ADF and KPSS tests,[7] we remain skeptical about the power of unit root tests and specify two VAR models: one in levels and one in first differences.

In both cases, we do not impose long run cointegration restrictions. According to VAR literature, when there are cointegration relationships among the variables, we are able to estimate the

6 The Albanian Institute of Statistics (INSTAT), which produces the official country statistics, has only recently begun to publish quarterly GDP data, starting from 2004Q1. Such a sample is not long enough for the purpose of this study, and therefore interpolated annual figures have been used. However, due diligence is paid to the convergence of both series.

7 Refer to Appendix A, Table 3 for ADF and PP unit root tests' results and KPSS stationarity test results.

VAR in levels and leave the long run structure unrestricted only if the cointegration rank is high and the short run coefficients are ignored (Peersman and Smets, 2001, Lütkepohl and Krätzig, 2004, and Heiricourt, 2006). For this reason, we perform a Johansen cointegration test. See Table 4, Appendix A for results. The test suggests that there are 2 cointegrating relationships among the variables in the VAR. Furthermore, the study will measure the impact of fiscal policy through impulse responses of the relevant economic variables, rather than their short run coefficients. Therefore, level estimation is justified.

Moreover, a possible disadvantage of restricting the long-term structure of VAR relationships is that errors in estimating long-run relationships can have serious implications for the short-run behavior of the model (Faust and Leeper, 1997). However, to avoid possible non-stationary impulse responses, we also estimate a VAR in first differences, assuming stochastic trends for all variables. This second specification does not impose long run structure either, focusing only on the short to medium run. Differencing in a cointegration setting might be disadvantageous in terms of losing valuable information about long run relationships. In any case, we are not interested in estimating an equilibrium; rather, we want to estimate the short to medium run fiscal policy multipliers of GDP and fiscal policy effects on prices and interest rates.

Both specifications of the VAR fulfill stability tests and residuals' autocorrelation, normality and heteroskedasticity tests[8]. To choose the appropriate lag length, we base our judgment on information criteria (BIC, AIC, HQ and LR), the length of our sample and economic sense. Due to the short time horizon of the database, we limit the lag length a-priori to 4 lags. Although most information criteria suggest using 1 lag, we will allow for dynamic interaction in up to 2 lags in the levels specification, which minimizes the AIC and 1 lag in the first-differences specification, as suggested by SC and HQ. Appendix A, Table 6 reports test results.

The reduced-form VAR has 5 variables, where the first two represent the fiscal policy variables, namely expenditures and net

8 Refer to Appendix A, Table 5 for diagnostic tests.

taxes. In general form, the reduced-form VAR(2) can be written as:

$$X_t = \sum_{i=1}^{2} \Gamma_i X_{t-i} + U_t \tag{1}$$

Where $X_t = [g_t, nr_t, y_t, p_t, r_t]$ with g_t as real government expenditures, nr as real government net tax revenues, y_t as real Gross Domestic Product, p_t being the real CPI index, and r_t the real 12-month Treasury bills' interest rate. $U_t = [u_g, u_{nr}, u_y, u_p, u_r]$ is the vector of each equation's residuals[9], or shocks, in VAR terminology.

When we estimate a VAR (2) in its reduced form, the errors are expected to be i.i.d. in each equation, but correlated across equations. As such, it is impossible to isolate a shock of one of the variables only, since the u_k typically contains information about the rest of the shocks, too. Thus, we need to identify our shocks of interest, i.e. the government expenditures shock and the government tax shock.[10] To be able to isolate these shocks we need to impose structure on our VAR, meaning we define the contemporaneous (lag 0) effects of variables to each other.

The reduced-form VAR (2) in equation (1) is transformed into:

$$AX_t = AC + A\sum_{i=1}^{2} \Gamma_i X_{t-i} + AU_t \tag{2}$$

where the A matrix contains the contemporary coefficients of our variables. The A matrix is the square root of the variance-covariance matrix Σ. Transforming the original VAR into equation (2) makes our structural shocks e_g and e_{nr} uncorrelated with the rest of the e_k shocks; therefore fiscal shocks are now identifiable.

The relationship between reduced-form shocks u_k and the structural shocks e_k is given by the following equation:

$$Au_k = Be_k \tag{3}$$

9 For notational convenience, we are dropping the time subscript *t* from the individual equations' residuals and structural shocks from this moment on.

10 Note that the only shocks that have interpretation in this estimation are the fiscal shocks. The other structural errors are not assigned any economic meaning.

with the shocks being standardized at 1[11]. In matrix notation, the above relationship is presented as:

$$\underbrace{\begin{bmatrix} 1 & -a_{g,nr} & -a_{g,y} & -a_{g,p} & -a_{g,r} \\ -a_{nr,g} & 1 & -a_{nr,y} & -a_{nr,p} & -a_{nr,r} \\ -a_{y,g} & -a_{y,nr} & 1 & -a_{y,p} & -a_{y,r} \\ -a_{p,g} & -a_{p,nr} & -a_{p,y} & 1 & -a_{p,r} \\ -a_{r,g} & -a_{r,nr} & -a_{r,y} & -a_{p,y} & 1 \end{bmatrix}}_{\text{A}} \underbrace{\begin{bmatrix} u_g \\ u_{nr} \\ u_y \\ u_p \\ u_r \end{bmatrix}}_{u_k} = \underbrace{\begin{bmatrix} \sigma_g & b_{g,nr} & 0 & 0 & 0 \\ b_{nr,g} & \sigma_{nr} & 0 & 0 & 0 \\ 0 & 0 & \sigma_y & 0 & 0 \\ 0 & 0 & 0 & \sigma_p & 0 \\ 0 & 0 & 0 & 0 & \sigma_r \end{bmatrix}}_{\text{B}} \underbrace{\begin{bmatrix} e_g \\ e_{nr} \\ e_y \\ e_p \\ e_r \end{bmatrix}}_{e_k} \qquad (4)$$

To identify this relationship – in other words, to identify the variance-covariance matrix, – we need to impose 35 restrictions on the elements of both A and B. The number of restrictions is equal to the total number of coefficients in A and B minus the number of the distinct elements in the variance-covariance matrix. That is $2k^2 - ((k^2-k)/2 + k)$ or 35 restrictions across elements of both A and B. The diagonal elements of A are restricted to 1, since they represent the relationship of reduced-form shocks to each other. The diagonal elements of B are the standard deviations of the structural shocks. Since we want to recover fiscal policy shocks that are uncorrelated with the shocks of other equations, all elements of B are zero, except for the *b* coefficients representing the underlying relationship of cyclically adjusted fiscal shocks with structural shocks. Let us focus on the first two equations of (4) to show how we establish this relationship:

$$u_g = a_{g,nr}u_{nr} + a_{g,y}u_{nr}, + a_{g,p}u_p + a_{g,r}u_r + e_g + b_{g,nr}e_{nr} \qquad (4.1)$$

$$u_{nr} = a_{nr,g}u_g + a_{nr,y}u_y + a_{nr,p}u_p + a_{nr,r}u_r + e_{nr} + b_{nr,g}e_g \qquad (4.2)$$

By taking $a_{g,nr} = a_{nr,g} = 0$, we can remove the cyclical (correlated) components of the reduced-form fiscal residuals obtained by estimating the VAR, and write the cyclically adjusted (structural) fiscal shocks as:

11 Some textbooks and econometrics software use this definition for the relationship between structural and reduced-form shocks. The estimation for this paper was carried out in Eviews and JMulTi, which do have a B matrix representing the variance of the error terms. However, equation (3) can also be found as $\text{A}u_k = \text{B}e_k$, where shocks are not standardized.

$$u_g^{CA} \equiv u_g - a_{g,y}u_y + a_{g,p}u_p + a_{g,r}u_r = e_g + b_{g,nr}e_{nr} \quad (5.1)$$

$$u_{nr}^{CA} \equiv u_{nr} - a_{nr,y}u_y - a_{nr,p}u_p - a_{nr,r}u_r = e_{nr} + b_{nr,g}e_g \quad (5.2)$$

In equation (5.1), $a_{g,y}$ represents the within-quarter income elasticity of government spending. Coefficient $a_{g,p}$ represents the price elasticity of government spending; whereas $a_{g,r}$ is the interest rate elasticity of government spending. In equation (5.2) $a_{nr,y}$ is the within-quarter income elasticity of government net revenues; $a_{nr,p}$ is the price elasticity of government net revenues; while $a_{nr,r}$ is interest rate elasticity of net revenues. The estimates of all elasticities are reported in the next subsections; thus, all coefficients a_j are identified.

The last step in building our SVAR is the identification of b_j coefficients. Given the relatively long period of fiscal consolidation (see section 2), we might have grounds for suspecting that when taking policy decisions the government tends to decide on spending first, and then on tax policy. Our reasoning is also supported by the fact that the Albanian government decided to stimulate the economy during the 2009 "crisis" year through spending increases, rather than tax cuts. Therefore, we assume that the government makes spending decisions before tax decisions. The cyclically adjusted shocks become:

$$u_g^{CA} = e_g \quad (6.1)$$

$$u_{nr}^{CA} = e_{nr} + b_{nr,g}e_g \quad (6.2)$$

where by estimating equation (6.1), $b_{nr,g}$ captures the effect of a structural spending shock on a discretionary tax decision.

3.2. SHORT TERM ELASTICITIES OF GOVERNMENT SPENDING AND REVENUES

As discussed in the previous subsection, to achieve full identification of the SVAR we need to provide the contemporaneous effects of GDP, prices and interest rates on fiscal policy variables. A useful property of our definition of government expenditures is the exclusion of interest payments. This leads to zero interest rate elasticity of spending, thus $a_{g,r} = 0$. Furthermore, we also assume zero interest rate elasticity of net revenues, since we cannot identify any measurable relationship between tax payments and interest rates. Hence, $a_{nr,y} = 0$.

3.2.1 Estimating the output elasticity of government net revenues and spending

Tax elasticity in public finance is defined as the percent change in tax revenue due to a 1% change in income, or GDP. It is worth noting that tax elasticity measures the automatic, endogenous response of 1% change in income. Therefore, the elasticity of tax revenues assumes no structural change, thus no discretionary fiscal policy decisions. Tax buoyancy, on the other hand, measures the total effect of a percent increase in GDP on tax revenues. Coefficient $a_{nr,y}$ is exactly the built-in elasticity of taxes with respect to output.

Budget elasticities are nowadays routinely reported in most statistical databases of developed countries, based on the methodology developed by Giorno et al. (1995), and revised in van den Noord (2000). Both these studies are brought forth by OECD. As explained in van den Noord (2000), the OECD methodology requires data, inter alia, on the tax bases of each distinct tax category, potential employment and potential GDP, actual and potential consumption and corporate income. At present, official data on distinct tax bases, corporate income, and current consumption data are not available for Albania[12]. Furthermore, except for potential output, the potential levels of all other variables need to be estimated, which goes beyond the scope of this paper. Therefore, the application of the OECD methodology in calculating tax elasticities is not viable at present, but will be addressed in future research.

A literature survey on alternative methods for estimating built-in tax elasticities leads to four main methods: 1. the proportional adjustment method, 2. the constant rate structure, 3. dummy variable methods, and, 4. the Divisia Index approach. The first method requires data on ex-ante and ex-post estimates of tax yields resulting from discretionary changes in fiscal policy. These data are not available for Albania. The second method requires detailed data

12 While there are data on annual consumption in National Accounts, the most recent figures date year 2008; there is a lag of two years in the publication of expenditure based GDP and its components.

on the tax bases of distinct tax categories, while the third can only be effective if discretionary changes have not been frequent in the past. Constrained by data availability, we believe that the only appropriate method for estimating net tax revenue elasticities is the Divisia Index approach[13], developed by Choudhry (1979). The methodology does not require any adjustment of the revenue series to eliminate discretionary policy effects.

According to Choudhry (1979), the Divisia index - heavily used to measure technical change[14] - can intuitively be used to measure discretionary fiscal change. "The intuition is clear: discretionary tax measures produce changes in tax yield over and above those caused by the automatic growth in the tax bases, as technical change induces changes in total productivity over and above those that can be accounted for by increases in factor inputs" (Choudhry, 1979, p. 89). Then, if we assume that an aggregate tax function exists, a discretionary fiscal policy shifts the aggregate tax function, just like technical change is supposed to induce a shift in the production function.

Building his rationale on the analogy with the Divisia index for technical change, Choudhry (1979) argues that a Divisa index of discretionary change should be equal to the percent increase in total tax yield divided by the percent increase in total tax yield caused by the automatic increase in tax bases. He also argues that the validity of this approach is contingent on the existence of a continuously differentiable aggregate tax function, which possesses the invariance[15] property.

13 Choudhry (1979) explicitly states in his paper that whenever data are available, the proportional adjustment method should be preferred to the Divisa Index approach.

14 An application pioneered by Solow (1957) in the article "Technical Change and the Aggregate Production Function". The Review of Economics and Statistics, Vol. 39, No. 3. pp. 312-320.

15 This means that if there are no discretionary tax changes, there will be no discretionary revenue changes, and tax yield will increase only due to tax base increases. Although the assumption seems strong, in terms of not accommodating progressive tax systems, Hulten (1973) has shown that the homogeneity restriction can be circumvented through a modification in the index. See Hulten, Charles (1973), "Divisia Index Numbers", *Econometrica*, Vol. 41, pp. 1017-25.

Starting from the continuously differentiable aggregate tax function:

$$T(t) = f(x_i(t),\ldots,x_k(t);\, t) \tag{7}$$

where T is the aggregate tax yield, x_i is the proxy tax base for the k-th category of taxes and the time variable t is a proxy for discretionary tax measures, Choudhry (1979) derives the discretionary change Divisia index, by differentiating the tax function with respect to time t.

$$\log D(n) = \log\left(\frac{T(n)}{T(0)}\right) - \sum_1^k \bar{b}_i \log\left(\frac{x_i(n)}{x_i(0)}\right) \tag{8}$$

Furthermore, the tax buoyancy can be estimated from the function of taxes, expressed in terms of total tax base, i.e. GDP:

$$T = ay^{\mu} \tag{9.1}$$

which in logarithmic form is $\log(T) = a + \mu\log(y)$ (9.2)

Equation (9.2) is estimated through OLS. Allowing for both contemporaneous and lagged effects of GDP on net government revenues, a dummy for year 2009 - when real economic activity was substantially slower than the historical trend -, and a dummy for 2008Q2 to capture an outlier in government revenues, we obtain:

$$\underset{\begin{pmatrix}-11.25\\0.59\end{pmatrix}}{\text{LOG(NR)} = -6.68} + \underset{\begin{pmatrix}11.29\\0.11\end{pmatrix}}{1.28}\text{*LOG(Y)} - \underset{\begin{pmatrix}-3.63\\0.018\end{pmatrix}}{0.064}\text{*DUM\_09} + \underset{\begin{pmatrix}10.1\\0.04\end{pmatrix}}{0.42}\text{*DUM\_98} + \underset{\begin{pmatrix}2.11\\0.07\end{pmatrix}}{0.15}\text{*LOG(Y(-1))} \tag{10}$$

where NR and Y are defined as in the VAR, expressed in real terms and are seasonally adjusted. The brackets include t-statistics and standard errors[16].

Once the buoyancy is estimated ($\mu = 1.28$), elasticity is defined as:

$$\bar{r} = \mu - \frac{\log D(n)}{\log[x(n)/x(0)]} \tag{11}$$

The calculation of the term $\log D(n)$ requires data on different tax categories and proxies for their bases. As previously mentioned, real

16 See Appendix A, Table 7 for diagnostic tests.

net revenues include real V.A.T taxes, real direct taxes, real excise taxes and real customs duties. All variables are quarterly, deflated with CPI and seasonally adjusted. Table 1 presents the proxy bases for our tax categories.

Table 1 Proxies for tax bases

Tax category	Base Proxy
V.A.T	Private Consumption
Direct Taxes	GDP at factor prices*
Excise Tax	Private Consumption
Customs Duties	Imports of goods and services

Source: INSTAT, the Ministry of Finance and author's calculations

* Calculated as GDP at market prices (the official published series) less V.A.T taxes plus subsidies.

The estimated quarterly elasticity of government revenues is 0.96, meaning that a 1% increase in GDP results in 0.96% increase in government revenues. Given the progressive nature of both income and corporate tax until late 2007, we would expect elasticity greater than one. Our result could be explained with the high degree of informality in the Albanian economy. However, this hypothesis goes beyond the scope of this paper, thus, interpretation and further investigation of the tax system elasticity will be addressed in further research.

We proceed with the estimation of government transfers elasticity. Using the same Divisia index method, with total GDP at market prices as transfers' base proxy, we find the transfers' elasticity to be -0.15[17]. We sum both elasticities after multiplying with their average weights (government revenues have a weight of 1.61 with respect to government net revenues; whereas transfers account for 0.61% of net transfers), and $a_{nr,y}$ coefficient in the matrix of contemporaneous effects is 1.45.

The income elasticity of government spending is assumed 0, because: a) it typically takes more than one quarter for the government to take spending decisions in response to GDP developments; and, b) official quarterly GDP data are published with a 12-week

17 The low elasticity of transfers suggests a weak social net; however, this remains an hypothesis to be addressed in further research.

lag in Albania[18], making it impossible for the government to take contemporaneous decisions following GDP developments.

3.2.2. Estimating price elasticity of fiscal policy

If we divide net government spending in three components –purchases of goods and services, wages, and government investment– the average weight of the three to total expenditures is around 31%, 34% and 35%, respectively. Given that public wages are not indexed to quarterly y-o-y inflation (although they are adjusted every year or so), we would expect an elasticity of wages equal to -1, since the purchasing power decreases at the exact same amount that prices increase. Purchases of goods and services, and government investments are assumed to have 0 price elasticity. Supposing that most government purchases are contract-based, where prices are agreed upon in advance, we can assume no contemporaneous effect of inflation on purchases of goods and services. A weighted sum of all components' elasticities yields a total elasticity of -0.34. This is our $a_{g,p}$ coefficient.

With respect to price elasticity of net revenues we also assume an elasticity equal to -1, following the same purchasing power reasoning, as in the case of wages.

4. IMPULSE RESPONSES

Once the two structural fiscal shocks are identified, we solve recursively for GDP, CPI and Interest Rates. Note that the structural identification is the same in both the level and first difference specifications, since coefficients represent elasticities. The SVAR is fully identified as:

$$\underbrace{\begin{bmatrix} 1 & 0 & 0 & 0.34 & 0 \\ -a_{nr,g} & 1 & -1.45 & 1 & 0 \\ -a_{y,g} & -a_{y,nr} & 1 & 0 & 0 \\ -a_{p,g} & -a_{p,nr} & -a_{p,y} & 1 & 0 \\ -a_{r,g} & -a_{r,nr} & -a_{r,y} & -a_{p,y} & 1 \end{bmatrix}}_{A} \underbrace{\begin{bmatrix} u_g \\ u_{nr} \\ u_y \\ u_p \\ u_r \end{bmatrix}}_{u_k} = \underbrace{\begin{bmatrix} \sigma_g & 0 & 0 & 0 & 0 \\ b_{nr,g} & \sigma_{nr} & 0 & 0 & 0 \\ 0 & 0 & \sigma_y & 0 & 0 \\ 0 & 0 & 0 & \sigma_p & 0 \\ 0 & 0 & 0 & 0 & \sigma_r \end{bmatrix}}_{B} \underbrace{\begin{bmatrix} e_g \\ e_{nr} \\ e_y \\ e_p \\ e_r \end{bmatrix}}_{e_k} \qquad (12)$$

18 Refer to the National Statistics Institute (INSTAT) for the Official Publications' Calendar at http://www.instat.gov.al/

Impulse responses are computed up to 8 periods (two years) through the Moving Average representation of the SVAR:

$$X_t = [1 - \Gamma(L)]^{-1} A^{-1} B V_t \tag{13}$$

Where $\Gamma(L)$ is the lag polynomial of reduced-form coefficients and V_t is the vector of structural shocks. One fundamental difference between the nature of structural shocks in the level VAR and first-difference VAR is the persistence of the shock. While in the former specification shocks might have either a transitory or a permanent effect on variables (depending on variables' stationarity), in the later specification we explicitly model shocks with a permanent effect on the levels of the variables. Thus, to be able to compare impulse response results, we look at the accumulated impulse responses in the first-difference VAR (which capture shocks' effect on the level of the variable, rather than on the growth rate).

Structural shocks are interpreted as a 1% increase in the policy variables, and impulse responses represent the percent change of responding variables. We also present the 68th percentile[19] confidence interval coverage, obtained from 500 bootstraps of the impulse response distributions[20].

4.1. THE MACROECONOMIC EFFECTS OF GOVERNMENT SPENDING

According to the level specification, a 1% increase in real government total spending leads to a 0.06% increase in GDP on impact, reaching 0.08% after one quarter and the effect disappears after three quarters. The accumulated peak response is 0.16% after

19 We follow Sims and Zha (1995, 1999) in choosing to report 68th percentile confidence intervals, instead of the classical 95th percentile CI. The coverage probability of bootstraped intervals is not a classical econometrics concept, rather, a Bayesian concept. Sims and Zha (1995, 1999) point that in most cases 68 percentile CI have a closer coverage probability to the nominal boostrap percentile. Although one could argue that it is not justifiable to use Bayesian criteria in classical inference, Sims and Zha (1995, 1999) show that Bayesian confidence intervals are valid even under classical criteria and classical (bootstrap) inference of confidence intervals can be made under Bayesian criteria.

20 Confidence intervals are obtained with Hall Bootstrap Percentile, available in the JMulTi package. For a general discussion on bootstrapping and the Hall bootstrap procedure see Hall, P. (1992) The Bootstrap and Edgeworth Expansion, Springer, New York.

two quarters, and it stabilizes at 0.11% after five quarters. Spending impulse response graphs are reported in Appendix B.

Impulse responses generated with the first-difference VAR, reveal that GDP increases by 0.07% on impact, reaching 0.1% after one quarter, to stabilize at 0.06% after four quarters. The results are very close to the level specification. Considering that a 1% spending shock accounts for only 0.18% of GDP[21], we can conclude that the response of GDP is quite substantial and statistically significant up to three quarters.

To have a clearer picture of the magnitude of the response, we transform the shocks to 1 pp of GDP[22]. In the level VAR, output responds with an increase of 0.36% on impact, reaching the peak of 0.43% after one quarter, to become statistically insignificant after four quarters. The accumulated response is 0.9% at its peak, after two quarters. First-difference VAR accumulated impulse responses show an increase of 0.4% on impact, reaching a peak of 0.58% after one quarter, and stabilizes at 0.46% after four quarters.

With regard to prices, both the level and first-difference VARs generate statistically insignificant responses. Theoretically, we would expect an increase in the price level following a positive government spending shock (either on impact or at a longer horizon, depending on the level of price stickiness), supported by the considerable increase in GDP. However, we do not observe this behavior. To be able to provide an explanation, we further investigated the effects of government spending, by disaggregating spending policy into current and capital components. Section 5 presents and discusses results of government current spending and government capital spending on GDP, prices and interest rates.

Real 12-month Treasury bills rates increase by 13 bps on impact following a 1% spending shock in the level VAR, and reach a peak of 31 bps after six quarters. At the end of two years, the effect is 16 bps and statistically significant. The accumulated response reaches

21 18% is the average share of government spending in GDP (according to the variable definitions of this study).

22 Since spending has a share of 18% in GDP, a 1 pp of GDP shock to spending means an increase of the share of spending/GDP by 1 pp (i.e. from 18% to 19%).

a peak of 2 pp at the end of the second year. In the first-difference specification, interest rates behave quite differently. Their accumulated response is statistically insignificant up to two quarters and responses become significant after three quarters, settling at -4 pp.

The level VAR indicates an interest rates' response that we would expect in case of a deficit financed spending shock, with domestic funding and liquidity constraints. According to the level VAR estimation, the primary deficit (approximated by net revenues less total primary spending) increases by 0.96% on impact, and gradually slows to 0.13% after three quarters, to become insignificant after four quarters. However, we are unable to tell whether such deficit is externally or domestically financed, making us unable to interpret the interest rates results in the level VAR. Furthermore, we can clearly spot a possible unit root in interest rates, indicated by the permanent effect of the spending shock. This might have implications on the accuracy of confidence intervals (which rely on asymptotic properties of impulse responses' distribution) and model results[23]. Therefore, we would prefer to draw conclusions about fiscal policy effects on interest rates that are estimated with a first-difference VAR. Moreover, we have theoretical reasons to expect current spending and capital spending to have different effects on interest rates. Hence, in the next section we present results of the disaggregated spending, first-difference VAR.

4.2. EFFECTS OF NET REVENUES ON REAL GDP, PRICES AND INTEREST RATES

The level VAR generates an increase of 0.05% in GDP on impact to a negative 1% shock in net revenues[24]. However, the response is insignificant, and becomes statistically significant in quarters two to five, but with a reversed sign. This peculiar result could be explained with the fact that following a tax cut, government total spending decreases by around 1% at peak[25]. However, given the potential

23 Other variables are not structurally affected by interest rates, since interest rates are ordered last in the VAR, but they are affected by lagged values.

24 We assume a symmetrical response of shocks, meaning that negative shocks and positive shocks have the same effect in terms of magnitude, but with a different sign.

25 If we analyze the effect of a 1% tax increase shock, higher revenues from taxes could be interpreted as greater room for more discretionary expenditures. In reality, we can expect this government behavior.

impulse response stability problems mentioned in section 4.1, we prefer to rely on the first-difference specification to draw conclusions.

Accumulated impulse responses generated with the first-difference VAR reveal that GDP increases by 0.18% on impact, reaching 0.19% after two quarters and stabilizing around this level. First-difference VAR yields the expected sign and significance of GDP response.

When the tax shock is transformed to 1 pp of GDP, the accumulated first-difference VAR GDP response is 1.4% on impact, reaches the peak of 1.5% after one quarter, and stabilizes around 1.49% after three quarters. We need to note though, that this is a cumulative *non-cyclically adjusted* effect. Because GDP increases on impact, net revenues continue to increase at every quarter due to the high income elasticity of net revenues, which GDP and other variables perceive as a highly persistent shock. We would need to estimate cyclically adjusted responses to address this issue. We present results in subsequent sections.

As for prices, in the level VAR, prices increase by 23 bps on impact following a 1% net revenues decrease, reaching a peak of 73 basis points after one quarter and becoming statistically insignificant after five quarters. Theoretically speaking, the sign of price response depends on the price setting behavior of economic agents. For example, we would expect a price decrease following a tax increase if private demand decreases to the point of driving prices downwards. However, we would expect a price increase if prices are set in a monopolistic fashion, where producers transfer tax increases to consumers through higher prices. The level results confirm the first explanation (i.e. prices are driven up by increased demand following a tax cut). In cumulative terms, however, price impulse responses are statistically insignificant, which could be explained as balanced pressures from supply and demand sides.

On the other hand, first-difference VAR price responses seem to validate higher supply side price control, since the impact response is 50 bps decrease, reaching 45 bps after two quarters and settling at this level.

Real interest rates have a statistically insignificant response up to two quarters ahead, and increase by 0.12 pp after two quarters, reaching a peak of 0.14 pp after four quarters. In cumulative terms, the accumulated response is statistically significant at 0.31 pp. In the first difference VAR, interest rates increase by 0.15 pp on impact (statistically significant), reach a peak of 0.26 pp after four quarters and settle at that level. This result is expected, since a tax reduction stimulates short term private consumption, which in turn, decreases savings and drives up interest rates.

5. FISCAL MULTIPLIERS OF GOVERNMENT CURRENT SPENDING, CAPITAL SPENDING AND NET REVENUES

To be able to asses in a comparative fashion the effects of different types of policy on Gross Domestic Product, we compute fiscal multipliers. Since there is sufficient evidence to support different effects of specific components of government spending[26], we disaggregate government spending into net primary current spending and capital spending (i.e. public investment). The new SVAR specification is estimated in first-differences, motivated by some of the ambiguous results obtained in subsections 4.1. and 4.2.

The identification task requires some a-priori assumptions on the order of decision-making when the government decides to implement all three kinds of policies contemporaneously. Recalling equations (5.1) and (5.2) in subsection 3.1 we can write in a similar way:

$$u^{CA}_{g\_c} \equiv u_{g\_c} - a_{g\_c,p} u_p - a_{g\_c,r} u_r = e_{g\_c} + b_{g\_c,g\_i} e_{g\_i} + b_{g\_c,nr} e_{nr} \tag{14.1}$$

$$u^{CA}_{g\_i} \equiv u_{g\_i} - a_{g\_i,y} u_y - a_{g\_i,p} u_p - a_{g\_i,r} u_r = e_{g\_i} + b_{g\_i,g\_c} e_{g\_c} + b_{g\_i,nr} e_{nr} \tag{14.2}$$

$$u^{CA}_{nr} \equiv u_{nr} - a_{nr,y} u_y - a_{nr,p} u_p - a_{nr,r} u_r = e_{nr} + b_{nr,g\_c} e_{g\_c} + b_{nr,g\_i} e_{g\_i} \tag{14.3}$$

26 Current government expenditures are accounted for as consumption in National Accounts data; whereas capital expenditures directly affect gross capital formation, thus investments.

Because we already know all a_j elasticities[27], we only need to identify b_j coefficients. In recent years, public investment has been the main priority of the Albanian government. Apart from this, we can argue that in transition economies government capital spending comprises a sustainable portion in fiscal programs due to the continuous need to build capacity and infrastructure that was either lacking in the command economic regime, has outdated technology, or is not ample enough to accommodate the fast convergence process to a free market economy. Therefore, we assume that capital spending decisions are taken first, current spending decisions follow, and tax decisions are taken last. Simple estimation of the following relationships fully identifies our three fiscal shocks:

$$u^{CA}_{g\_i} = e_{g\_i} \tag{15.1}$$

$$u^{CA}_{g\_c} = e_{g\_c} + b_{g\_c,g\_i} e_{g\_i} \tag{15.2}$$

$$u^{CA}_{nr} = e_{nr} + b_{nr,g\_c} e_{g\_c} + b_{nr,g\_i} e_{g\_i} \tag{15.3}$$

Once the 6-variable first difference SVAR(1)[28] is estimated we compute impulse responses of GDP, Prices and Interest Rates to 1% fiscal shocks. Appendix B shows impulse responses.

A 1% increase in net primary current spending causes an impact increase in GDP of 0.064%, reaching to a 0.037% increase after four quarters, and does not change thereafter. GDP responds by 0.03% on impact to a 1% increase in capital spending. It reaches a peak of 0.04% after one quarter and settles at an increase of 0.032% after three quarters. With regard to taxes, following a 1% decrease in net revenues, GDP increases by 0.21% on impact, and settles at 0.19% after two quarters.

A current spending shock results in statistically insignificant response of prices on impact, and a slight increase of 10 bps after

27 The only extra computations that we need to make regard the price elasticity of current and capital spending. The latter is assumed 0, due to the contractual nature of such spending; while the former is recalculated to be -0.57, because the only component that is contemporaneously affected by prices is wage expenses (decreased purchasing power) that have a share of 57% to total net primary current expenditures.

28 Lag length information criteria suggest a lag 0 specification; however, we are allowing for some dynamic interaction and choose to estimate a model with one 1 lag. See Appendix A, Table 4 for test results.

two quarters. Capital expenditures do not seem to affect prices at all, since their cumulative impulse responses are always insignificant. Although price response magnitude is lower for capital expenditures, when aggregated in total spending, their effect might explain the ambiguous results we get in the 5 variable-VAR. A 1% net revenues decrease shock causes prices to increase on impact by 54 bps, reaching 40 bps after four quarters and settling there.

Interest rates have statistically insignificant responses to both current and capital spending shocks. This result is somewhat unexpected, given the recent evidence of 12-month Treasury bills' interest rates increase[29] in the Albanian economy that is mainly attributed to increased spending (due to domestic financing). However, year 2009 witnessed sharp liquidity constraints[30] in the Albanian banking system, reflecting an abnormal situation for the availability of credit to the economy. Therefore, during that year, upward pressures on interest rates are mainly caused by liquidity constraints, and do not represent an average situation for the Albanian economy. In an IS-LM framework, an increase in either current or capital expenditures results in an upward shift of the IS curve, which would normally drive interest rates up. A no change or very small change in interest rates could result only if a) the LM curve shifts to the right as well, or b) if the LM curve does not shift, but has a very small slope (nearly flat). A shift of the LM curve means an increase in the money supply following an expansionary fiscal policy shock. We tend to believe that the statistically insignificant change in interest rates is better explained with the shape of the LM curve. Kolasi et al. (2010) report that an increase in the interest rate causes money demand to statistically significantly decrease only after five quarters. This result suggests a low short-term interest rates elasticity of money demand. Therefore, we have reasonable grounds to believe that the short- run LM curve might have a small slope.

A 1% net revenue decrease (tax cut) results in a statistically significant increase in interest rates by 0.16 pp on impact, reaching

29 See The 2009 Annual Report of the Bank of Albania, p. 207, at http://www.bankofalbania.org/web/2009_Annual_Report_5733_2.php

30 See The 2009 Annual Report of the Bank of Albania, p. 11, for a description of the Albanian economy during 2009, at http://www.bankofalbania.org/web/2009_Annual_Report_5733_2.php

0.26 pp after two quarters and stabilizing at that rate. Theoretically, this result is expected since a tax cut results in an immediate increase in consumption, discouraging saving, and thus driving interest rates up. In an IS-LM framework, a tax would decrease the slope of the IS curve, thus increasing output and slightly increasing interest rates (if we believe in an almost flat LM curve).

We then use the impulses responses to calculate GDP multipliers of fiscal policy. We provide results for two definitions of the multiplier: 1. The cumulative percent change in GDP up to quarter *h* over the cumulative cyclically-adjusted change[31] in the fiscal policy variable up to quarter *h*, following a shock equal to 1 pp of GDP; 2. The cumulative percent change in GDP up to quarter h over the cumulative cyclically-adjusted deficit generated by a 1 pp of GDP shock to the fiscal policy variable. Table 2 reports cumulative multipliers.

Table 2 Cumulative cyclically adjusted fiscal multipliers

	Cyclically adjusted cumulative multipliers			
	Impact	Peak	1 year	2 years
Current Expenditures	0.52	0.69	0.47	0.49
Capital Expenditures	0.42	0.95	0.71	0.71
Tax cut	1.58	1.65	1.63	1.65
	Cyclically adjusted cumulative deficit multipliers			
	Impact	Peak	1 year	2 years
Current Expenditures	0.53	0.79	0.5	0.51
Capital Expenditures	0.39	0.89	0.66	0.66
Tax cut	1.58	1.65	1.63	1.65

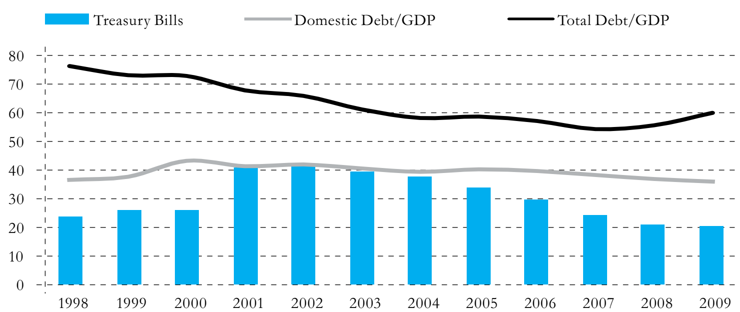
One of the most interesting results is that a tax stimulus has the highest multiplier, which is even higher than 1. In standard Keynesian economics textbooks, the highest multiplier is expected to be that of government spending, since a tax cut would also induce increased savings, along with increased consumption. However, the tax multiplier largely depends on the marginal propensity to consume,

31 We follow Perotti (2005) and compute cyclically adjusted multipliers, which take out the automatic effect of GDP on policy variables. The cyclically adjusted impulse responses of the policy variables are:
$\tilde{g}\_c^{CA} = \tilde{g}\_c - a_{g\_c,p}\tilde{p}$; $\tilde{g}\_i^{CA} = g\_i$; and $\tilde{nr}^{CA} = \tilde{nr} - a_{nr,y}\,\tilde{y} - a_{nr,,p}\tilde{p}$, where the tilde, as in Perotti (2005), denotes an impulse response. Note: we are not writing the time subscript for notational convenience.

on the degree of "forward-looking" behavior of consumers and on the level of income of the consumers it targets. Therefore, if the marginal propensity to consume is high; consumers are either myopic or do not have reasonable grounds to believe in a future tax increase (do not exhibit Ricardian Equivalence); and are not in the high end of income level, a tax cut is likely to be entirely consumed. Furthermore, a tax cut might also result in a crowding-in of investment, if it provides enough incentives to increase capital holdings and expand investments.

According to Dushku et al. (2007), the Albanian consumers' marginal propensity to consume is around 0.8. Furthermore, we tend to believe that consumers do not exhibit Ricardian Equivalence, since taxes in Albania have mostly been decreasing, rather than increasing throughout the past two decades. Moreover, public debt also shows a downward trend (except for the last two years) as a result of continuous fiscal consolidation, which probably does not raise concerns about future fiscal sustainability among consumers. However, these results might not be valid in the future, if the raising debt to GDP level starts to raise concerns about fiscal sustainability. Graph 4 shows debt developments during 1998 – 2009.

Graph 4: Gross Government Debt, Domestic Debt and T- Bills' share of domestic debt



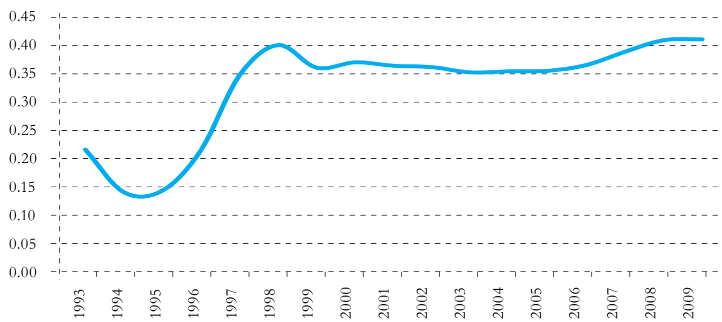
Source: Bank of Albania and IMF

Another possible explanation[32] of the high tax multiplier is directly linked to the composition of government tax revenues.

32 I am thankful to Ms. Anjeza Gazidede, Economist at the Monetary Policy Department, Bank of Albania, for indicating this possible channel of the multiplier.

Graph 5 shows that VAT revenues make up the bulk of government tax revenues; therefore, tax elasticity of prices is mostly affected by the VAT elasticity of prices. As such, we can speculate that half of a 1% government net revenues cut goes to a VAT decrease. If we believe that the decrease in VAT decreases the cost of production, then we would observe a simultaneous shift to the right of both the aggregate demand and the aggregate supply curves, leading to no change/lower prices and higher output.

Graph 5: Share of VAT revenues to Total Nominal Tax revenues



Source: Ministry of Finance

High tax multipliers (although for developed economies) are also found by other authors employing not only Vector Autoregressions, but also other models for estimating fiscal multipliers. Romer and Romer (2010) find that a $1 tax cut results in $3 increase in GDP after ten quarters. Mountfort and Uhlig (2004) report a deficit multiplier, caused by a tax shock, equal to 3.22 after twelve quarters; while Blanchard and Perotti (2002) report a tax multiplier of 1.32 after eight quarters. Tax multipliers in all these studies are higher than spending multipliers, which are reported as smaller than 1.

With regard to spending multipliers, our results show that the cumulative deficit multiplier caused by capital spending is higher than that caused by current expenditures, reaching a maximum of 0.9 after one quarter and settling at 0.66 after four quarters. Although the lower than 1 multiplier suggests some crowding-out effect of private consumption and investment, we did not find statistically significant responses on interest rates, which leads us to conclude that there might be some leakages caused by an increase in imports, that result in lower than 1 ALL-to-1 ALL effects.

6. CONCLUSIONS AND FUTURE RESEARCH

In this study we investigated the macroeconomic effects of fiscal policy in Albania, by employing Structural Vector Autoregressions to measure the responses of GDP, Prices and Interest rates to a current expenditure shock, a capital expenditure shock and a net revenues decrease shock. We find that an exogenous tax cut has the highest multiplier effect on GDP, reaching up to 1.65 after five quarters. Between current and capital expenditures, capital expenditures have peak cumulative multiplier effect of 0.95 on GDP after one quarter; while current expenditures multiply GDP by 0.69 at peak, after one quarter.

While a tax cut causes interest rates to decrease, due to increased consumption and lower savings, capital and current expenditure shocks do not result in a statistically significant change in interest rates. We believe that this result might be supported by a relatively insensitive money demand to interest rates (i.e. a relatively flatter LM curve).

Furthermore, a tax cut causes prices to decrease by 55 bps on impact, reaching 40 bps after four quarters and settling at that level. A 1% increase in current expenditures causes prices to statistically significantly increase after one quarter by 10 bps, and settle at 9 bps after four quarters. A capital expenditures increase has no statistically significant effect on prices.

Although standard Keynesian economics textbooks explicitly state that government spending has a higher multiplier than a tax cut stimulus, many empirical studies reveal the opposite[33]. The multipliers we estimate are also consistent with multipliers generated with the structural Macroeconometric Albanian Model (MEAM) of the Bank of Albania. Dushku and Kota (2010) report a government

33 Gregory Mankiw provides a list of authors that find this result, at http://gregmankiw.blogspot.com/2008/12/spending-and-tax-multipliers.html

spending multiplier equal to 0.75 after one year[34]. A similar exercise for a tax cut results in a multiplier of 2 after one year and 1.5 after two years; and the capital expenditure multiplier is 0.96 after one year and 0.37 after two years.

Although our results are validated by a structural model and theoretical explanations, there are some caveats that deserve special attention and possibly further research:

- Our time series include only eleven years of observations, which imposes limitations in our choice on the number of endogenous variables to include in the VAR. A useful exercise would be to include different components of GDP and check fiscal policy effects on consumption and investment separately. However, at present a VAR estimation would suffer from loss in degrees of freedom, and results would be questionable.

- Favero and Gaviazzi (2007) show that VAR results on fiscal multipliers might be misleading when the stock-flow relationship between fiscal variables and government debt is not accounted for. They particularly show that insignificant effects of fiscal shocks on long-term interest rates can be explained by the misspecification resulting from a missing debt feedback effect. For this reason, we will try to address the debt feedback issue in future research.

- Since the income elasticity of government revenues is an important input (assumption) in determining structural relationships among our variables, we will attempt to calculate a more precise elasticity estimate in future work.

- Motivated by the notable advantages that Bayesian estimation provides, especially when dealing with short time series, we will attempt to estimate the SVAR with Bayesian techniques in the future. Impulse response error bands show the coverage probability of confidence intervals through many replications of the posterior likelihood of response distributions.

34 In their paper, Dushku and Kota (2010) report the response of GDP following a 10% increase in government spending. We transform it into a multiplier by dividing the GDP response with the average share of government consumption, which is around 13%.

- Finally, one known caveat of the methodology we employ is its inability to model expectations and take into account anticipated fiscal policy shocks. Perotti (2005) provides a thorough discussion of this critique and concludes that "there are many reasons why fiscal decisions announced in advance might not be taken at face value by the public…[since] the yearly budget is often largely a political document…; any decision to change taxes or spending in the future can be modified before the planned implementation time arrives" (p.14). Furthermore, "whether estimated innovations are truly unanticipated matters only if anticipated and unanticipated fiscal policies have different effects. This is a controversial empirical issue, largely revolving around the importance of liquidity constraints" (p.14). The methodology developed by Mountford and Uhlig (2004) can tackle the problem of anticipated fiscal policy, thus in future research we will try to apply this model.

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APPENDIX A: TIME SERIES TESTS, LAG LENGTH CRITERIA AND VAR DIAGNOSTICS

Table 3 Unit Root Tests

H0: Variable has Unit Root	Augmented Dickey Fuller Test P-values				Philips Perron Test P-values			
	Level	First Diff.	Intercept	Trend	Level	First Diff.	Intercept	Trend
S	0.010		√		0.010		√	
NR	0.021		√		0.000		√	
Y		0.000	√			0.000	√	
P		0.000	√			0.000	√	
R_int		0.000	√		0.011		√	
Curr	0.000		√	√	0.014		√	
Cap	0.005		√		0.005		√	

The null is rejected for p-values smaller than 5%.

	KPSS LM Statistic			
H0: Variable is stationary	Level	First Diff.	Intercept	Trend
S	0.483**		√	
NR	0.165**		√	√
Y		0.322**	√	
P	0.873**		√	
R_int	0.483***		√	
Curr	0.857**		√	
Cap	0.154***		√	√

*The null for stationary is accepted at 10% significance level.

**The null is accepted at 5%.

***The null is accepted at 1% significance level.

Table 4 Johansen Cointegration Test

Hypothesized No. of CE(s)	Unrestricted Cointegration Rank Test (Trace)			
	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.676	104.990	69.819	0.000
At most 1 *	0.475	54.313	47.856	0.011
At most 2	0.355	25.336	29.797	0.150
At most 3	0.090	5.593	15.495	0.743
At most 4	0.030	1.347	3.841	0.246

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level.

* denotes rejection of the hypothesis at the 0.05 level.

**MacKinnon-Haug-Michelis (1999) p-values.

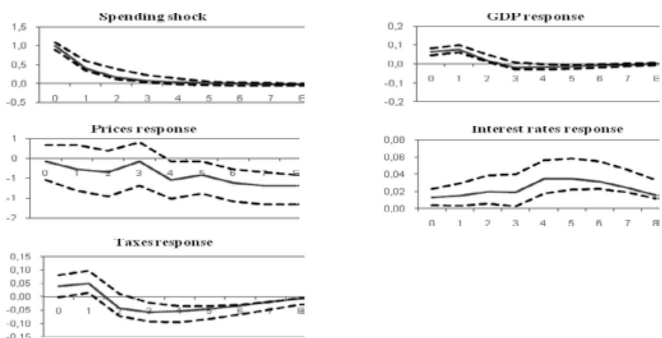
Hypothesized No. of CE(s)	Unrestricted Cointegration Rank Test (Maximum Eigenvalue)			
	Eigenvalue	Max-Eigen. Statistic	0.05 Critical Value	Prob.**
None *	0.676	50.677	33.877	0.000
At most 1 *	0.475	28.977	27.584	0.033
At most 2	0.355	19.743	21.132	0.077
At most 3	0.090	4.246	14.265	0.833
At most 4	0.030	1.347	3.841	0.246

Max Eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level.

* denotes rejection of the hypothesis at the 0.05 level.

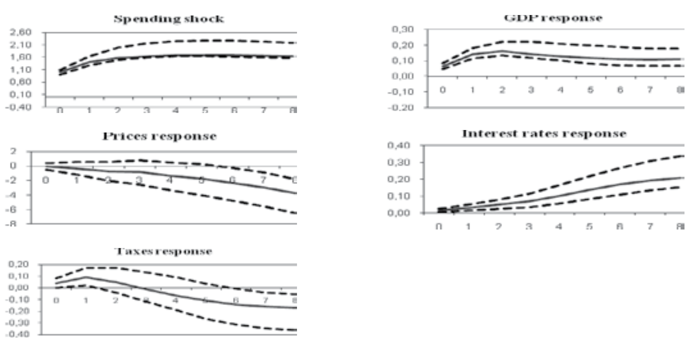
APPENDIX B: IMPULSE RESPONSES AND FISCAL MULTIPLIERS

Graph 6: Impulse Responses of a 1% structural spending shock in the levels SVAR(2)

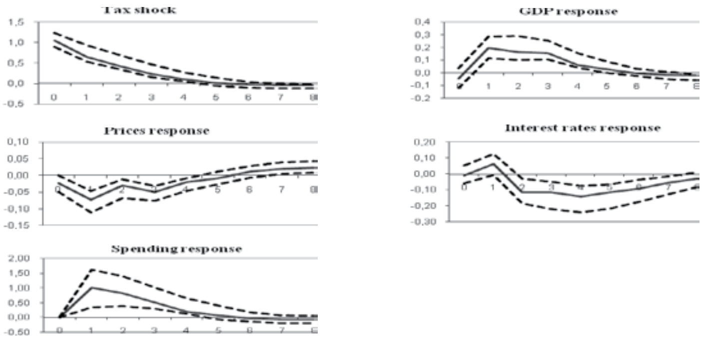


Source: Ministry of Finance

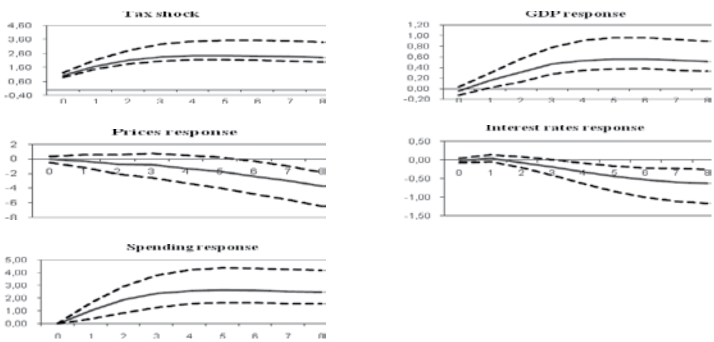
Graph 7: Cumulative Impulse Responses to a 1% spending shock in the levels SVAR(2)



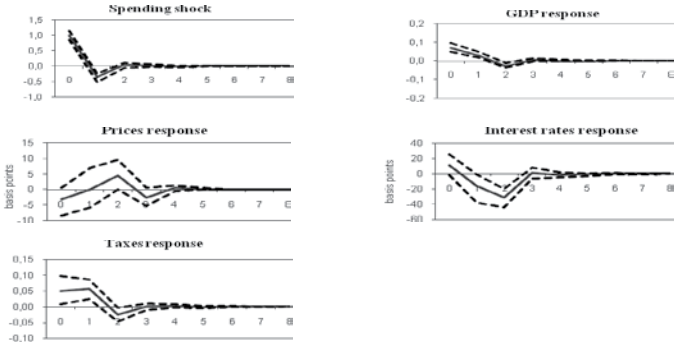
Graph 8: Impulse Responses of a 1% tax increase shock in the levels SVAR(2)



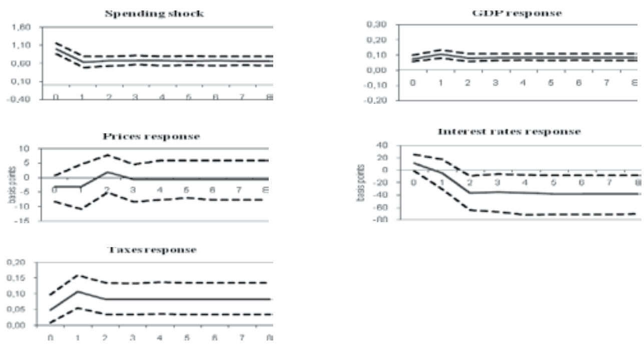
Graph 9: Cumulative Impulse Responses to a 1% tax increase shock in the levels SVAR(2)



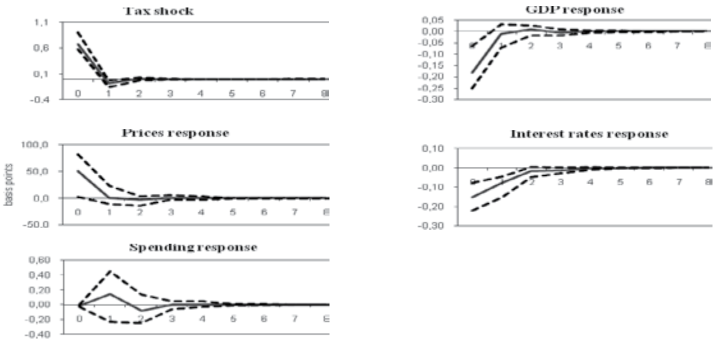
Graph 10: Impulse Responses of a 1% structural spending shock in the first-differences SVAR(1)



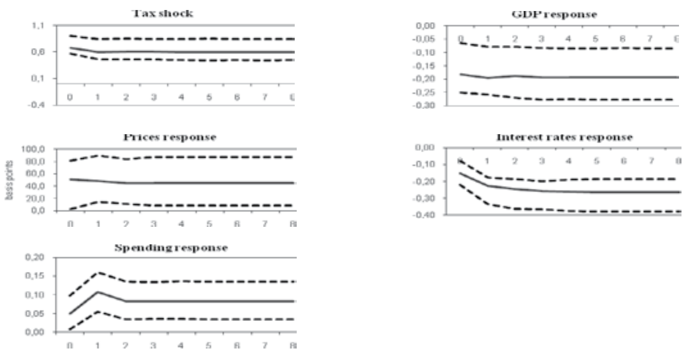
Graph 11: Cumulative Impulse Responses to a 1% spending shock in the first-differences SVAR(1)



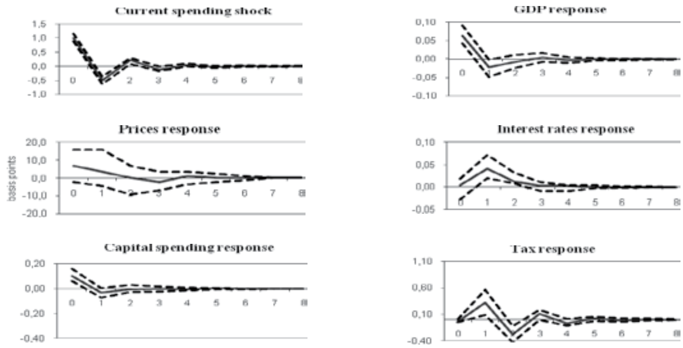
Graph 12: Impulse responses to a 1% tax shock in the first-differences SVAR(1)



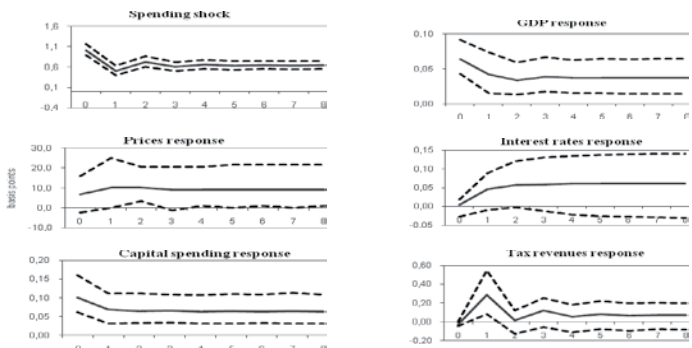
Graph 13: Cumulative Impulse responses to a 1% tax shock in the first-differences SVAR(1)



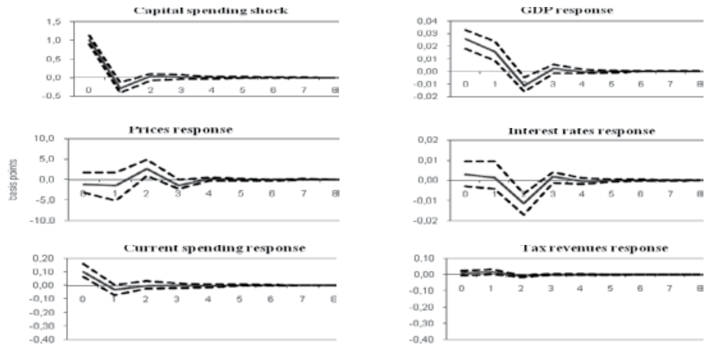
Graph 14: Impulse responses to a 1% current spending shock in a 6-variable first-difference SVAR(1)



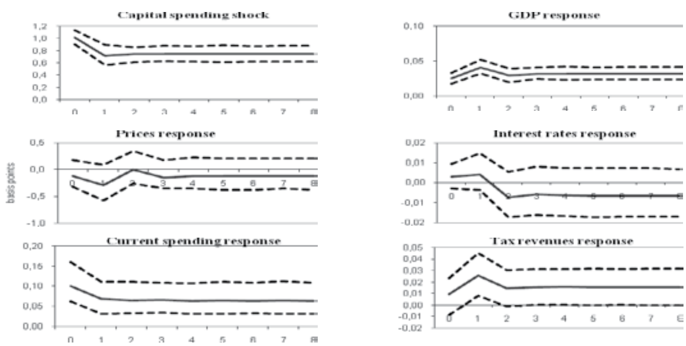
Graph 15: Cumulative Impulse responses to a 1% current spending shock in the first-differences SVAR(1)



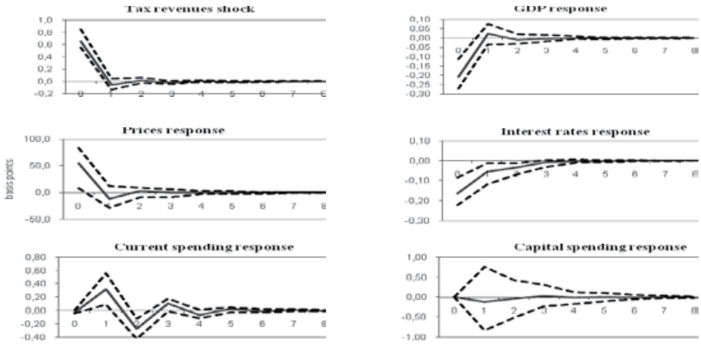
Graph 16: Impulse responses to a 1% capital spending shock in a 6-variable first-difference SVAR(1)



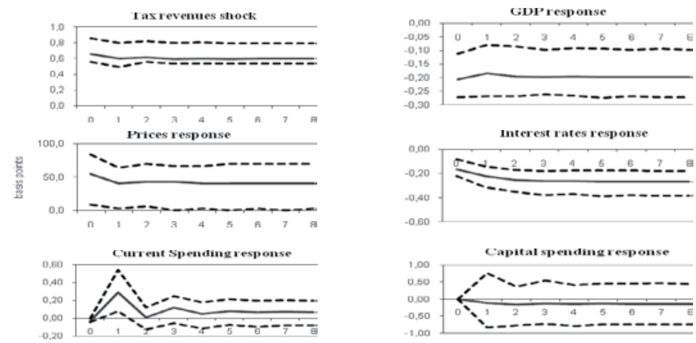
Graph 17: Cumulative Impulse response functions to a 1% capital spending shock



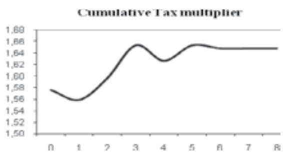
Graph 18: Impulse responses to a 1% tax increase shock in a 6-variable, first-difference SVAR(1)

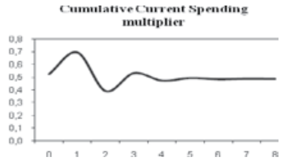


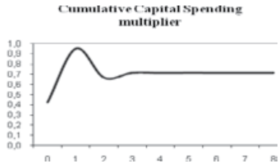
Graph 19: Cumulative Impulse response functions to a 1% tax increase shock



Graph 20: Cumulative cyclically adjusted GDP multipliers of fiscal policy







DID THE CRISIS CHANGE IT ALL? EVIDENCE FROM MONETARY AND FISCAL POLICY

Ana Mitreska
Maja Kadievska Vojnovic
Ljupka Georgievska
Branimir Jovanovic
*Marija Petkovska**

ABSTRACT

The recent financial and economic crisis has triggered bold and diverse policy responses to prevent further, sharper and prolonged adverse effects to the financial and the real sector. The measures for alleviating the cycle were a feature both of the advanced and the emerging and developing economies, albeit less pronounced in the latter. The bulk of extraordinary measures undertaken refers to providing monetary and fiscal stimulus, implying possible change within the monetary and the fiscal policy reaction function. Hence, in this study we estimate monetary and fiscal policy reaction function, on a sample of 61 advanced and emerging and developing countries, using panel techniques. Since the purpose is to assess the potential change in the reaction functions during the recent crisis, estimates are done for the period prior and during the crisis. More precisely, we have analyzed whether monetary and fiscal policies have been more focused on closing the output gap during the recent crisis vis-à-vis the period before the crisis. Our findings prove that the magnitude of the reaction has been much stronger during the crisis period. In addition to this key research question, the analysis investigates whether policy responses in the advanced economies have been stronger compared to the ones in developing economies. Advanced economies appear to have been much more aggressive in stabilizing output during the crisis compared to their emerging

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The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bank of the Republic of Macedonia.

and developing counterparts. Finally, the role of the constraints - the exchange rate regime, the initial conditions in context of external position (the current account balance and the level of external indebtedness), as well as the fiscal space (public debt) - is also explored. We find that the pegged exchange rate regime, the high current account and the high external indebtedness have constrained monetary authorities to respond to inflation and output during the crisis, while there is mixed evidence for the constraining role of the high level of public debt to the fiscal policy reaction.

Keywords: global crisis, monetary policy, fiscal policy, policy change, policy constraints, panel

JEL classification: E43, E52, E58, E61, E62, E63

I. INTRODUCTION

After the default of Lehman Brothers in mid-September 2008, the financial markets turmoil, which started in August 2007, turned into one of the most severe and synchronized global economic downturn since 1930s. Against the background of appalling state of the financial system and perceived urgency of preventing a very deep recession, monetary and fiscal authorities responded with bold and decisive interventions, including measures that were unprecedented in nature, scope and timing. The bulk of the extraordinary measures undertaken refers to providing monetary and fiscal stimulus, implying possible changes within the monetary and the fiscal policy reaction function. Furthermore, policy responses have differed markedly among different economies. Differences may reflect the initial conditions in terms of international exposure, financial and external vulnerabilities, as well as heterogeneity in macroeconomic setups. For example, the lower stage of development and the relatively low integration in the world financial market has most likely helped emerging and developing economies to avoid turmoil on their financial markets, while at the same time advanced economies were facing severe disorders, with important financial institutions collapsing or "pleading" for bailouts. On the other hand, the greater external vulnerability has very much narrowed the scope for emerging and developing economies to take more vigorous monetary and fiscal measures.

In this study, we try to evaluate the potential change in the policy reaction functions triggered by the latest crisis. Hence, we estimate the conventional monetary and fiscal policy reaction function prior and during the crisis, on a sample of 61 advanced and emerging and developing countries, using panel technique. We restrict our empirical analysis to the conventional policy instruments. More precisely, our research is focused to answer: whether monetary and fiscal policies have put more weight on the output gap during the recent crisis, vis-à-vis the period before the crisis? In addition to this key research question, the analysis investigates whether policy responses in the advanced economies were stronger compared to the ones in emerging and developing economies. Finally, the role of the potential constraints - the exchange rate regime, the initial conditions in context of external position (current account balance and level of external indebtedness) as well as the fiscal space (constrained by public debt) - for more vigorous policy responses are also explored.

The paper is organized as follows. Section II provides a chronological overview of policy responses employed by advanced and emerging and developing economies during the crisis. Section III discusses the data and methodology. Section IV documents the empirical results. Section V concludes.

II. POLICY RESPONSES TO THE RECENT CRISIS

The 2007-2009 global economic and financial crisis caused hardship around the world, posing complex challenges for central banks, both in advanced and emerging and developing economies. In order to cope with the crisis, the most severe one since the Great Depression, central banks were compelled to *clearly depart from the conventional monetary policy implementation framework* (Ishi et *al*, 2009), by employing unprecedented easing measures and developing new innovative tools. This particularly refers to central banks in advanced economies (hereafter referred to as AE), which on the backdrop of systemic financial stress and rapidly weakening economic fundamentals, aggressively cut interest rate and heavily engaged themselves in so-called balance sheet policies. Emerging and developing economies (hereafter referred to as EDE) also eased monetary conditions at large. However, due to their characteristics, the specific macroeconomic context that they are operating in and the varied degrees of external and financial vulnerabilities, EDE response to the crisis considerably differed from that of AE as in timing, type, magnitude and novelty.

AE were the first to be affected by the financial turbulence, since it erupted in mid-summer 2007, provoking their central banks to have an early reaction with anti-crisis intervention measures. Still, even as signs of stress appeared in the financial system, during the initial stage in late 2007 and the first half of 2008, shocks seemed to be isolated and limited to liquidity strains on AE money and short-term credit markets. The events that followed later on, with the financial disorder progressively evolving into the deepest and broadest financial and economic crisis since the 1930s, were hard to imagine at that time. In such circumstances, major central banks generally reacted through their conventional means by raising the scale of their liquidity-providing operations. Besides the U.S. Federal Reserve (FED), which almost instantaneously engaged in aggressive interest rate cut[1], during the first year of the crisis, the rest of the AE central banks did not ease their interest rates much. In mid-2008, the European Central Bank (ECB) even raised its main refinancing rate because of concerns related to the ongoing inflation pressures within the euro zone. One year later, in its 79th Annual Report, BIS will note that policymakers have *underappreciated the extent of the slowdown in mid-2008 and the strength of the associated disinflationary forces*, so they reacted the way they reacted, by increasing the policy rates or keeping them unchanged (BIS 79th Annual Report, pp.92).

With the events of September 2008, the crisis entered into a new stage, far more challenging for monetary policy and world economy overall. The failure of Lehman Brothers and intervention of AIG led to hoarding liquidity by financial and nonfinancial companies and severely disrupted monetary policy transmission channels. Economic activity started to collapse, which along with the apparent prospects of deflation made aggressive monetary easing critical.

1 Federal funds rate was reduced by 325 bps to 2 percent between July 2007 and June 2008.

Against this background, AE central banks responded by decreasing policy rates and more ample liquidity-providing interventions, both in domestic and foreign currency. As of the beginning of 2009, as economic contraction was proceeding with alarmingly progressive pace, AE central banks continued to ease their monetary policy stance more forcefully. They cut policy interest rates to historical lows, near the effective lower-bound, and several publicly committed to maintaining them at these levels for prolonged periods (FED, Bank of Canada). However, given the size of the shocks, the severely impaired monetary policy transmission channels and appalling state of the financial sector and the economy at large, it became clear that the well-known traditional monetary policy instrument, i.e. the policy rate, though effective in the pre-crisis period, would not be sufficient for AE to bridge over this crisis episode. Bearing this in mind and constrained by the zero bound on the interest rates, most of the AE central banks shifted their focus to "balance sheet policies", thus hiring some "unconventional" measures in the form of quantitative and qualitative easing. The role of these balance sheet policies was to target particular segments of the transmission mechanism, involving initiatives to alleviate strains in wholesale interbank markets and supporting specific credit markets (BIS, 2009). However, as noted by Gerlach (2010), many of the facilities employed by the central banks were not that novel in their essence, as they had actually been in place before the crisis, although the terms and conditions have been changed in response to the new environment (Gerlach, 2010, pg.52). Repo-operations have already been well established as standard monetary instrument for providing the financial sector with liquidity. During the crisis they had only modified their role with central banks considerably increasing the scale and extending the maturity of these operations. Lending facilities were also in place before, even though during the crisis central banks had considerably enhanced access, increased the number of counterparts and expanded eligible collateral. Several central banks provided liquidity by purchasing large amounts of securities directly. FED and the Bank of England introduced a few new facilities such as the Term Auction Facility in the US, while with the purpose of meeting foreign exchange liquidity shortfalls FX swaps were employed. As a result, AE central banks' balance sheets considerably expanded in size and modified in composition, urging for appropriate exit-strategies as soon as the crisis fades away.

EDE central banks also responded to the crisis, though their measures differed from those of AE in timing, type and magnitude. EDE central banks generally started to implement anti-crisis measures later. These measures were of a smaller magnitude compared to AE's and were mainly focused on foreign exchange liquidity. As noted in several studies exploring the crisis (Fujita et al, 2010; Ishi et al, 2009), these differences can be related to the varied degrees of financial stress and external vulnerability in EDE compared to AE, as well as the varied macroeconomic context that the two groups of countries are operating in. Thus, due to their lower stage of development and the relatively lower degree of financial integration into the global market, the first stage of the crisis with financial turmoil hitting the AE, had limited or no effects on EDE. EDE financial systems remained sound and stable with their liquidity markets staying functional at large. In such circumstances, there was no need for EDE central banks to react early on the crisis by easing their monetary policy stance. Actually, before September 2008, alike ECB, several EDE also raised their policy rates in response to the inflationary pressures prevailing at that time. However, September 2008 marked the turning point for EDE with crisis starting to spill-over on their territories as well. As Lehman brothers bankruptcy tensions sky-rocketed, markets froze and global liquidity dried up. This was instantaneously felt on EDE foreign exchange markets, posing strong pressures for EDE domestic currencies to depreciate. In order to mitigate tensions, EDE central banks largely focused on foreign exchange liquidity measures. So, access to foreign liquidity facilities was relaxed at large and in some countries new tools were introduced, such as foreign exchange repo-transactions, credits and swaps. Guided by their domestic markets position, several central banks raised the scale of their liquidity-providing operations in domestic currency as well. Reactions with interest rate cuts came in the crisis later on, with economic activity being slumping and inflation expectations being stabilized at large. Still, this was done cautiously and at a considerably lesser extent compared to AE. Thus, EDE policy rates remained well above the effective lower bound on interest rates. The potential risks of repeated deterioration of the external imbalances limited the room for maneuver precluding more aggressive counter-cyclical adjustments in EDE monetary policy stance. EDE did not resort to unconventional monetary policy tools as much, which can be explained by the less disrupted monetary transmission that their central banks had to deal with and the monetary policy not being constrained by zero lower bound on interest rates. The near absence of quantitative and credit easing measures caused the sizes of EDE central banks' balance sheets to increase by much less compared to AE.

Summing up, central banks, both in AE and EDE have heavily intervened during the recent crisis, though the effectiveness of the measures that were undertaken is hard to measure, particularly with respect to the balance sheet policies. Still, what matters is that they considerably contributed towards alleviating the liquidity strains, thus enhancing the state of the key markets. Beginning from the third quarter of 2009, economic activity also started to resurge at large, principally in AE, which is an additional fact in favor of monetary policy effectiveness. Still, what is indisputable is that monetary policy was only one way of stabilizing the economy. Without fiscal policy supporting the monetary policy to a large extent, the necessary stabilization would have hardly been achieved, meaning that during this crisis fiscal policy has certainly witnessed its revival as potent macroeconomic tool.

As the space for further monetary easing was diminishing, and the collapsed financial system impaired monetary transmission channels as well, the role for the fiscal policy in stimulating aggregate demand and restoring confidence was increasing. Many advanced economies employed bold and diverse fiscal stimulus packages, giving the discretionary component a large weight. Hence, despite the previous consent for the discretionary fiscal policy not to be used as a countercyclical tool, the depth and the length of the crisis asked for a more aggressive fiscal approach. The emphasis on the discretionary fiscal measures became even more prominent and viable at the same time, as in the later stage of the crisis it was certain that the current recession would be long lasting. Hence, the well known shortcoming of the fiscal measures, the long internal lags, in a longer recession was more probable not to be an obstacle.

The first involvement of the fiscal authorities refers to the recapitalization of banks and government guarantees aimed at stabilizing the impaired financial system and regaining the confidence. Yet, as the financial crisis unfolded and transformed itself into a serious economic recession, a wider and stronger set of fiscal measures was required for alleviating the cycle. By the end of May 2009, many OECD and non-OECD emerging economies announced fiscal stimulus packages (BIS, 2009). The size of the fiscal stimulus varies greatly among countries. The differences are not conditioned on the severity of the output drop, but mostly on the effectiveness of the automatic stabilizers. The largest stimulus was seen in US (gravitating at around 2% of GDP in 2009 and 2010, each), Korea (with cumulative stimulus at around 3.5% of GDP in 2009 and 2010) and Germany (with cumulative stimulus at around 3% of GDP in 2009 and 2010), while in countries like France and Italy the size of the fiscal stimulus was below 1% of GDP. Apart of the built–in automatic stabilizers, the difference in the magnitude of the discretionary fiscal impulse was driven to a large extent by certain country specifics. This mainly refers to the initial "fiscal space", i.e. the cyclical position of the fiscal policy prior to the crisis. For most of the AE, the fiscal policy prior to the crisis followed the countercyclical pattern, by saving in "good" times and spending in "bad" times, thus alleviating the business cycle. Hence, there was enough room for employing bold fiscal stimulus measures in these economies. For those economies where a pro cyclical fiscal pattern was followed prior to the crisis, a large discretionary package could lead to serious endangering of the fiscal sustainability. Furthermore, economies with accumulated public debt were also heavily constrained, as the widening of the budget deficit could yield in jeopardizing the debt sustainability. The proactive fiscal policy was also hampered by the policy frameworks in certain economies. This mainly refers to countries with an exchange rate peg, where currency pressures driven by the falling external demand and reversal in the capital inflows, did not allow for growth supporting fiscal policy stance.

The fiscal response to the recent crisis, in almost all countries followed the traditional recipes of utilizing, both the revenue and expenditure policies for boosting the aggregate demand. In many economies, the poor economic outlook was driven by the fall in the personal consumption, on the backdrop of slacked labor market and gloomy expectations. Aiming at stimulating the consumption, the bulk of the revenue measures was concentrated in alleviating the personal tax burden (close to 0.8% of GDP, cumulative 2009 and 2010). Albeit important, the other tax reliefs (business taxes, consumption and other taxes) jointly did not exceed the personal tax measures. As for the expenditures measures, albeit it is believed for the government consumption stimulus to have the outmost effect in shortening the length of the crisis, much of the emphasis within this crisis was put on public investment measures. "Fifteen of the G20 have announced plans to increase spending on infrastructure, largely on transportation networks (Canada, France, Germany, and Korea, among others), either in the form of direct central government spending, or through capital transfers to local authorities. According to Horton et al. (2009), the emerging G20 countries have announced somewhat larger stimulus packages for 2009, on average, than the advanced G20 countries. This reflects smaller automatic stabilizers and consequently, greater need, as well as substantial fiscal space in key emerging market countries. China, Russia, Saudi Arabia, and South Africa have introduced large packages. Emerging market discretionary measures are also more heavily weighted to infrastructure investment and less focused on income tax cuts" (Bontas et al., pg. 10).

The fiscal implications of the fiscal responses during the recent crisis have been the largest ones since the Second World War (IMF, 2010). According to the IMF, in a sample of 32 advanced economies, 44 emerging economies and 49 developing countries, 40% of the countries were running overall surpluses in 2007, while in 2009 this share has been envisaged to drop to 10%. At the same time, the percentage of countries with budget deficit exceeding 3% of GDP has increased from 20% to 70%. In the AE (G-20), the budget deficit increased from 2% of GDP in 2007 to 10% of GDP in 2009, not only being driven by the expenditure policies, but also from the lasting effect of the crisis on the revenue collection from the falling assets prices, financial services and lowered potential output. At the same time, a sharp increase in the public debt is expected to be seen, from around 70% of GDP in 2007 to above 100% of GDP in 2014. Although the debt burden for EDE is perceived to be much lesser than in AE, still, the associated risks are seen as larger. "These economies face important risks, especially from possible international spillovers. Indeed, large debt build-up in the advanced economies could lead to higher borrowing costs and crowding out of emerging markets' borrowers" (IMF, pg.9).

Although the size of the fiscal packages unquestionably was of a magnitude hardly seen before, the economic impact in mitigating the slack in the economy is difficult to be estimated precisely. Inevitably, policy stimulus is set as one of the main drivers of the gradual economic recovery in the second half of 2009. Yet, the quantitative estimates are difficult to be given. For instance, based on the previous episodes, it is estimated for the American Recovery and Reinvestment Act to have boosted GDP by 1.4 - 3.8 pp in 2009, and less in 2010 (BIS, 2009). Still, as the magnitude of the fiscal multipliers is difficult to be gauged, it is also difficult to estimate the fiscal impact to GDP. Furthermore, there is a high probability for the multipliers to have significantly changed during the recent crisis. On one hand, the argument in favor of larger multipliers is the limited access to credits, which can increase the propensity to spend out of each additional income, provided through fiscal measures. On the other hand, the increased risks and the uncertainty might provoke higher propensity to save, thus reducing the strength of the multipliers. In general, it is believed that although the fiscal stimulus was large, the effects are seen to be temporary, asking for more profound changes (to a large extent addressing the core problems in the financial system) yielding to a more sustainable growth path.

III. DATA AND METHODOLOGY

The study covers 61 countries and employs quarterly data for the 2000Q1 –2009Q3 period. Following the IMF's World Economic Outlook classification, countries are grouped as "advanced economies" and "emerging and developing economies" (AE and EDE, respectively; see Appendix, Table A.1. for the list of countries).

The variables used in the study are INTEREST, GAP, CPI_YOY, GOV_BALANCE_CA, GOV_EXP_CA, FIXED, HIGH_CA, HIGH_EXT_DEBT, HIGH_PUB_DEBT. INTEREST represents the central banks' official interest rate, GAP is the output gap and CPI_YOY represents the annual CPI inflation rate. GOV_EXP_

CA indicates the expenditures of General or Central Government, *cyclically adjusted*, and GOV_BALANCE_CA represents the balance between the *cyclically adjusted* revenues and expenditures of General or Central Government[2]. FIXED is a dummy variable for countries that have a fixed exchange rate, HIGH_CA is a dummy variable standing for high current account deficit, HIGH_EXT_DEBT is a dummy representing countries with high gross external debt, while HIGH_PUB_DEBT represents countries with high public debt.

Table 1 Variables and sources of data

Variable	Description	Source
INTEREST	The official interest rate of the central bank (the bank rate or the discount rate) at the end of the given period (i.e. the quarter) on annual basis. For some countries, the money market rate, refinancing rate or Lombard rate.	International Financial Statistics
CPI_YOY	Annual CPI inflation rate, derived from the CPI inflation index number, 2005=100.	International Financial Statistics
GAP	Output gap, derived using HP filter, factor 1600.	International Financial Statistics
GOV_EXP	General or Central Government expenditure	International Financial Statistics
GOV_BALANCE	General or Central Government Budget balance	International Financial Statistics
FIXED	Dummy for a country with a fixed exchange rate	IMF De Facto Classification of Exchange Rate Regimes
HIGH_CA	Dummy for a country with high current account deficit. It takes value of one for countries, whose current account deficit/GDP is beyond 5% in 2007.	International Financial Statistics
HIGH_EXT_DEBT	Dummy for a country with high external debt. Equals 1 for countries with gross external debt above 50% of GDP, for 2005-2007, on average.	Quarterly External Debt Statistics - The World Bank
HIGH_PUB_DEBT	Dummy for a country with high public debt, exceeding 60% of GDP, for 2005-2007, on average.	International Financial Statistics

2 The cyclically adjusted government expenditure and budget balance represent the expenditure, i.e. balance, that would emerge if the economy was on the potential. They are calculated according to the following standard formulas:

*cyclically adjusted revenues = revenues - (elasticity of revenues to output - 1) * output gap * revenues*

*cyclically adjusted expenditures = expenditures - (elasticity of expenditures to output - 1) * output gap * expenditures*

cyclically adjusted balance = cyclically adjusted revenues - cyclically adjusted expenditures.

For the elasticity of expenditures to output, we assume elasticity of 0, which implies that government expenditures do not change with the level of economic activity (i.e. a very weak social security net), whereas for the revenues, we assume elasticity of 1, which implies that government revenues increase by 1% when output grows by 1%.

Our empirical analysis is restricted to conventional policy instruments. Much of the monetary policy responses involved alternative measure to the interest rate, using the standard monetary reaction function as a partial approach to the policy responses evaluation. Still, as we are trying to estimate differences prior and during the crisis and the balance sheet policies were not dominant when trying to meet monetary targets, our approach seems reasonable. In answering our research questions, we employ standard policy reaction functions. For the monetary policy, the standard instrument is the main interest rate of the central bank or the policy interest rate. For the fiscal policy, there are more instruments that can be used, thus we employ two of them - the budget expenditure and the budget balance, both of them cyclically-adjusted. As explanatory variables, in the monetary policy reaction function we use the year-on-year inflation rate and the output gap, whereas for the fiscal policy reaction function we use only the output gap. Alongside these variables, the policy rules include lags of the dependent variable, for the purpose of better explanation of the dynamics. The three basic policy rules are given below:

Reaction function for the monetary policy	*interest rate = a1*interest rate(-1) + a2*output gap + a3*y-o-y inflation*
Reaction function for the fiscal policy 1	*budget balance = β1*budget balance(-1) + β2*output gap*
Reaction function for the fiscal policy 2	*budget expenditure = γ1*budget expenditure(-1) + γ2*output gap*

For the purpose of investigating whether monetary and fiscal policies have behaved differently *during the crisis in comparison to the period before*, we estimate the policy rules for two sub-periods. For investigation of the *differences between policies in AE and EDE,* we estimate the policy rules separately, for both groups of countries. Here, one notable distinction is the specification of the monetary policy reaction function. For AE, the specification is forward-looking, i.e. we include two leads of the inflation and the output gap, while for EDE (and for the whole sample of countries) it is backward-looking, i.e. it includes the current value of the inflation and the output gap, and two lags as well. Whether interest rate rules are forward- or backward-looking is an empirical question, and depends on the manner in which expectations are formed. Thus, for developing countries, it does not seem implausible that their future expectations are formed in adaptive manner, i.e. on the grounds of past inflation. Finally, to answer *whether certain factors have acted as constraints to the policies during the crisis,* we estimate the policy rules for the crisis sub-period, including interaction dummies that represent the constraint in the regression (e.g. cross product between the dummy for the *fixed exchange rate* and the output gap).

However, it is worth noting that our interest rate rule deviates from the rules that are usually met in the literature. Instead of the deviation of the inflation from the target, we include the actual inflation rate. The main argument for this is that we could not find data on targeted inflation for all the countries for the whole period. Not all the countries that are included in the analysis are inflation targeters (despite the fact that they might still respond to inflation), and even data for the target for some of the inflation targeting countries is not available for the whole period. Thus, by introducing the actual inflation rate we solve these problems: we use the same specifications for all of the countries, which implicitly assumes that the target for all countries for the whole period is stable (if the target is stable, results would be the same, whether the target is included or not). Regarding the fiscal policy reaction functions, they are all backward-looking, i.e. include one lag of the output gap.

We estimate the policy rules using dynamic panel methods, more precisely, the Arellano-Bover method (Arellano and Bover, 1995). Dynamic panel methods are appropriate when the relationship between the variables is dynamic in nature (see Baltagi, 2005, p.135), which is almost always the case with policy rules, which usually include a lag of the dependent variable amongst the independent variables, to capture the smoothing behavior of the policies. The Arellano-Bover method uses forward orthogonal deviations to transform the data, i.e. to remove the individual effects (for details, see Arellano and Bover, 1995 or Baltagi, 2005, Chapter 8). We chose the Arellano-Bover and not the Arellano-Bond method (which uses differencing for removing the individual effects) since the former is shown to perform better (see Hayakawa, 2009). After the transformation, the

Arellano-Bover method uses the Generalized Method of Moments (GMM) for estimating the coefficients of the regression.

Regarding the instruments, the dynamic instruments for the dependent variable, for computational reasons, are limited to the fourth lag. As for the independent variables, the instruments in the forward-looking specifications are the first, the second and the third lag, whereas in the backward-looking specifications, the third, the fourth and the fifth lag are used as instruments. As a method for assessing the validity of the instruments, we apply the J test, which actually tests whether the over-identifying restrictions for the instruments hold. We show the p values of the J test, and p values higher than 0.05 imply that the hypothesis that the instruments are valid, cannot be rejected.

Although dynamic panel methods are considered to be appropriate for panels with short time dimension, and our time dimension in some cases is rather long (up to 31), we still applied dynamic panel techniques and not panel cointegration models, since our data seemed to be stationary (see Appendix, Table A.2.).

IV. EMPIRICAL RESULTS

MONETARY POLICY REACTION FUNCTION

The summarized results of the monetary policy reaction functions are presented in Table 2[3]. The coefficients in the table refer to the sum of the coefficients of all lags and leads of a given variable (e.g. the coefficient of 0.07 for the output gap in the AE specification, for the pre-crisis period, is a sum of the coefficients of the two leads, which are 0.04 and 0.03, respectively). The significance, by analogy, refers to the joint significance of the respective coefficients.

3 The detailed results are not shown due to space limitations, but are available upon request.

Table 2 Results of the monetary policy reaction function

	All countries		Advanced economies		Emerging and developing economies	
	pre-crisis	crisis	pre-crisis	crisis	pre-crisis	crisis
INTEREST(-1)	0,75 ***	0,74 ***	0,82 ***	0,80 ***	0,78 ***	0,58 ***
GAP	0,00	0,12 ***	0,07 ***	0,40 ***	-0,03	0,17 ***
CPI_YOY	0,10 ***	-0,02	0,17 ***	-0,32	0,05 ***	0,04
Cross-sections included	44	43	18	18	26	25
Total panel observations	954	290	432	87	558	173
R-squared	0,74	0,43	0,90	0,23	0,72	0,44
Adjusted R-squared	0,73	0,42	0,90	0,20	0,72	0,42
J test p value	0,39	0,11	0,41	0,44	0,43	0,27

*** significant at 1%, ** significant at 5%

Looking at the sample of all countries, the change in the monetary policy reaction is noticeable - in the pre-crisis period the response to the output gap is insignificant, contrary to the crisis period, when the response is highly significant. Regarding inflation, before the crisis, monetary policy had significantly reacted to inflation developments, whereas during the crisis it did not. The analysis of the results of the sub-groups shows that the response of the monetary policy to the output gap in AE is significant in both periods, but considerably stronger during the crisis (five times stronger[4]) and that AE tackled inflation before the crisis, but "forgot" about it during the crisis period. On the contrary, output developments before the crisis had not appeared as an important factor for the monetary policies in EDE, whereas during the crisis, monetary policy had started responding to output. Regarding inflation, EDE reacted in the same manner as AE, before and during the crisis.

Comparing the size of the response to output in AE and EDE, the former group of countries reacted much more aggressively to prevent further decline of economic activity. The size of the reaction,

4 The magnitude of the response is given by the long-run coefficients. The long-run coefficients are calculated when the sum of all the coefficients in front of one variable is divided by (1-coefficient in front of the lagged dependent variable). For illustration, the long-run coefficient for the output for the crisis period, for AE, is 2 (0.4/(1-0.8)).

given by the long-run coefficients, for AE is around 2, whereas for EDE, it is only 0.4.

The next research question that we turn to is the degree to which the fixed exchange rate, the high current account deficit, and the high level of external indebtedness before the crisis, have constrained monetary policy during the crisis. Although we are aware about the potentially different role of these factors for AE and EDE, the analysis is done on the whole sample. The examination of the constraints is made by introduction of interaction variables.

Table 3 Results of the monetary policy reaction function with the constraining factors

	All countries, crisis period		
	fixed ER	high CA	high ext. debt
INTEREST(-1)	0,46 ***	0,80 ***	0,58 ***
GAP	0,25 ***	0,34 **	0,27 ***
CPI_YOY	0,24 ***	0,06	0,15 ***
FIXED*INTEREST(-1)	-0,13		
FIXED*GAP	-0.12 †		
FIXED*CPI_YOY	-0.54 † **		
HIGH_CA*INTEREST(-1)		-0,50 ***	
HIGH_CA*GAP		-0.30 †	
HIGH_CA*CPI_YOY		-0.07 †	
HIGH_EXT_DEBT*GAP			-0.34 † ***
HIGH_EXT_DEBT*CPI_YOY			-0.25 † ***
Cross-sections included Total panel observations R-squared Adjusted R-squared J test p value	43 290 0,30 0,27 0,24	43 290 0,08 0,04 0,66	31 209 0,41 0,38 0,29

*** significant at 1%, ** significant at 5%
† indicates that the coefficients of the interaction terms, summed with the coefficients without the interaction dummies, are jointly insignificant

Looking at the specification with the fixed ER, only one interaction variable, between the fixed ER and the inflation, appears significant (-0.54). This implies that the reaction of the countries with fixed ER to inflation is significantly different (smaller) during the crisis period in comparison to countries with flexible ER. However, if we look at the joint significance of the variables with and without dummies (e.g. the coefficient in front of *cpi_yoy* and the coefficient in front of *fixed*cpi_yoy*), which gives the response of the countries with fixed ER to inflation, we will see that their response towards inflation is insignificant[5]. For comparison, the response of the countries with flexible ER, which is given by the coefficients without the interaction dummies, is significant both for inflation and output. *Thus, we interpret this as an evidence that the fixed ER constrained monetary authorities to respond to inflation and output during the crisis.*

Looking into the role of high CA, the interaction variables with inflation and output are insignificant, which implies that countries that had high CA deficit before the crisis, compared to countries that did not have high CA deficits, did not respond differently to output and inflation. However, if we look at the joint significance of the coefficients with and without interaction dummies, they are insignificant both for the inflation and the output, implying that *countries with high CA did not respond to output and inflation during the crisis. In contrast, countries that did not have high CA deficits before the crisis responded to movements in output, but not in inflation.*

The situation is more clear-cut regarding the role of the high external indebtedness. The interaction dummies are significant and negative both for the output and the inflation, implying that countries that had high level of external debt before the crisis responded differently to output and inflation from countries that were not heavily indebted. The joint significance of the coefficients with and without interaction dummies confirms that *the countries that were heavily indebted did not react to inflation and output during the crisis, whereas countries that were not heavily indebted did react.*

To summarize, the change in monetary policy reaction during the crisis period in comparison to the period before, in both AE and

5 This looks odd, indeed, but it might be due to the sample size (290 observations), which is arguably small for GMM estimation.

EDE, is evident. The results show that during the crisis, monetary policy was actively used as instrument for output gap smoothing, while the traditional reaction to inflation did not take place. In addition, the results demonstrate that there was a difference in the conduct of the monetary policy during the crisis between AE and EDE with regards to the size of the response to output, with AE reacting much more aggressively to economic activity decline[6]. Finally, we find some evidence that the fixed exchange rate, the high CA deficits before the crisis and the high external indebtedness have constrained monetary policy reaction during the crisis.

FISCAL POLICY REACTION FUNCTION

The other instrument of the macroeconomic policy that was highly utilized during the crisis was fiscal policy. Thus, we next turn to compare the behavior of the fiscal policy before the crisis vis-à-vis during the crisis and in AE vis-à-vis in EDE, as well as to see if it has been constrained by some factors. The results of the two fiscal policy rules are presented in Tables 4 and 5.

Table 4 Results of the fiscal policy reaction function, with the budget expenditure as an instrument

	All countries		Advanced economies		Emerging and developing economies	
	pre-crisis	crisis	pre-crisis	crisis	pre-crisis	crisis
GOV_EXP_CA(-1)	0,12 ***	-0,22 ***	0,71 ***	0,02 ***	0,06 ***	-0,57 ***
GAP	0,02 ***	-0,24 ***	-0,02 ***	-0,29 ***	0,25 ***	-0,13 ***
Cross-sections included	49	46	27	27	22	19
Total panel observations	1200	304	666	177	534	127
R-squared	0,03	-0,01	0,51	-0,05	0,02	0,09
Adjusted R-squared	0,03	-0,02	0,50	-0,07	0,01	0,07
J test p value	0,62	0,62	0,58	0,77	0,59	0,76

*** significant at 1%, ** significant at 5%

6 The size of reaction, given by the long-run coefficients, for AE is around 2, whereas for EDE, it is only 0.4.

At all-countries level, budget expenditures before the crisis were even pro-cyclical (though only weakly 0.02), but during the crisis, fiscal policy turned to be counter-cyclical. For the AE sample, the budget expenditures appear counter-cyclical for both sub-periods (which complies with most of the empirical studies), but the magnitude is much stronger for the crisis period (the long run coefficient is -0.30, compared with -0.07 before the crisis). The most remarkable change is observed in the EDE sample. Fiscal policy is significantly pro-cyclical before the crisis (0.3), but turns to be counter-cyclical during the crisis period (-0.1). This confirms that the fiscal policy was used actively as a stabilization tool, in both, AE and EDE during the crisis. As regards the size of the reaction to the output gap, fiscal authorities in AE responded much stronger than authorities in EDE during the crisis (-0.3, compared to -0.1).

Table 5 Results of the fiscal policy reaction function, with the budget balance as an instrument

	All countries		Advanced economies		Emerging and developing economies	
	pre-crisis	crisis	pre-crisis	crisis	pre-crisis	crisis
GOV_BALANCE_CA(-1)	0,15	0,02	0,20 ***	-0,02 ***	0,29 ***	-0,09
GAP	0,06 ***	0,19 ***	0,12 ***	0,45 ***	0,06 ***	0,10 ***
Cross-sections included	49	46	27	27	22	19
Total panel observations	1200	301	666	174	534	127
R-squared	-0,07	-0,09	-0,05	-0,07	-0,02	-0,04
Adjusted R-squared	-0,07	-0,09	-0,05	-0,08	-0,03	-0,06
J test p value	0,55	0,97	0,58	0,67	0,54	0,58

*** significant at 1%, ** significant at 5%

Similar results are found when fiscal policy is measured by the budget balance (instead of the budget expenditure). These results show that the fiscal policy is counter-cyclical before and during the crisis, for all groups of countries[7] (at aggregate level, and separately). For all the countries, the reaction during the crisis is slightly stronger

7 In the specifications with the budget balance, counter-cyclicality is observed when the sign is positive, since this implies that higher output is followed by more positive budget balance (i.e. lower deficit).

than before the crisis (0.19, vis-à-vis 0.06). For AE, the magnitude of the reaction to the output gap during the crisis is much stronger than before the crisis (nearly four times; 0.45 compared to 0.12), while the reaction of the fiscal policy in EDE is marginally stronger (0.10 compared to 0.06).

Table 6 Results of the two fiscal policy reaction functions with a constraining factor

	All countries, crisis period expenditure	All countries, crisis period balance
GOV_EXP_CA(-1)	-0,25 ***	
GAP	-0,16 ***	
HIGH_PUB_DEBT*GOV_EXP_CA(-1)	0.66 †	
HIGH_PUB_DEBT*GAP	-0,15	
GOV_BALANCE_CA(-1)		-0,07
GAP		0,30 ***
HIGH_PUB_DEBT*GOV_BALANCE_CA(-1)		0.94†
HIGH_PUB_DEBT*GAP		-0.63 †
Cross-sections included	46	46
Total panel observations	304	301
R-squared	-0,06	-0,18
Adjusted R-squared	-0,07	-0,20
J test p value	0,76	0,81

*** significant at 1%, ** significant at 5%
† indicates that the coefficients of the interaction terms, summed with the coefficients without the interaction dummies, are **jointly insignificant**

Regarding the role of the constraints to fiscal policy during the crisis, we only explore the role of the high public debt (Table 6). Looking at the specification with the budget expenditure, the insignificant coefficient in front of the interaction dummy with the output gap indicates that governments with high level of public debt before the crisis did not respond differently to output fluctuation from governments that were not heavily indebted. Furthermore, the coefficients of the variables with and without the interaction dummy (e.g. the coefficient in front of *gap* and the coefficient in front of *high_pub_debt*gap*), are jointly significant, just like the coefficients in front of the gap, which demonstrate that the *high public debt was not a constraint for the fiscal policy*. The results of the specification with the budget balance are slightly different. The interaction term between the high debt and the output is insignificant, as well, and suggest that governments with high level of public debt did not differ from those with low level of debt in terms of their response to output developments, but the coefficients of the output and the output times the interaction dummy are jointly insignificant, *suggesting that highly indebted governments did not respond to output developments, in contrast to governments that were not highly indebted.*

To summarize, our findings point to a change in the fiscal policy during the crisis, in terms of much stronger response to output developments. Fiscal policy was counter-cyclical during the crisis in both AE and EDE, but the reaction to output fluctuation was much stronger in AE than in EDE. Finally, regarding the constraining role of the high public debt there is a mixed evidence for the ability of the fiscal authorities to support the economy during the crisis.

V. CONCLUSION

The depth and the length of the crisis have provoked sizeable and innovative policy measures, both in terms of monetary and fiscal policy. They were aimed at stabilizing the economic cycle and lessening the wide negative output gap. The manner and aggressiveness in which both policies were used as a countercyclical tools during the recent crisis, were for sure different compared to the prior to the crisis period. Although their very effects are difficult to be gauged, and probably are of a temporary nature, still it is more than certain that they have prevented larger and prolonged output drop.

In our paper we try to give a modest contribution to the literature on the recent crisis, by assessing the change in the magnitude of the monetary and fiscal reaction to the output gap, before and after the crisis. The results of the panel estimate on 61 AE and EDE, do confirm our prior finding for stronger countercyclical reaction of the monetary and fiscal policy during the recent crisis, compared to the period before. As evidenced in many other empirical studies, we also find much stronger policy reaction in AE, compared to EDE. Furthermore, our tests on the role of the fixed exchange rate, wide current account deficit and high external debt in the monetary policy reaction, verify their constraining power for stronger countercyclical reaction. On the other hand, we were not able to clarify the constraining role of the high public debt on the fiscal counter-cyclicality. As during the recent crisis public debt in many countries went beyond our chosen threshold, these results might not deviate largely from the practice.

This research does offer intuitive results in terms of the policy reaction, on the backdrop of the recent crisis. Yet, it contains flaws which can sketch the future avenues for research improvement. This mainly refers to the inclusion of the non-interest rate monetary stimulus within the monetary policy reaction function, which can provide a more comprehensive picture on the policy responses within the latest crisis.

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APPENDIX

Table A.1. Groups of countries

Advanced economies	Emerging and developing economies	Countries with: fixed exchange rate	Countries with: high current account	Countries with: high external debt	Countries with: high public debt
Australia	Argentina	Argentina	Armenia	Austria	Austria
Austria	Armenia	Belarus	Australia	Belgium	Belgium
Belgium	Belarus	Bolivia	Belarus	Bulgaria	Croatia
Canada	Bolivia	Bulgaria	Bulgaria	Croatia	eurozone
Czech Republic	Brazil	China	Croatia	Denmark	France
Denmark	Bulgaria	Croatia	Estonia	Estonia	Germany
eurozone	Chile	Denmark	Georgia	Finland	Greece
Finland	China	Estonia	Greece	France	Hungary
France	Colombia	Iran	Hungary	Germany	Italy
Germany	Croatia	Jordan	Iceland	Greece	Portugal
Greece	Estonia	Kazakhstan	Jordan	Hungary	Singapore
Iceland	Georgia	Latvia	Kyrgyz Republic	Ireland	
Ireland	Hungary	Lithuania	Latvia	Israel	
Israel	India	Macedonia	Lithuania	Italy	
Italy	Indonesia	Slovakia	Macedonia	Kazakhstan	
Japan	Iran		New Zealand	Kyrgyz Republic	
Korea	Jordan		Portugal	Latvia	
Luxembourg	Kazakhstan		Romania	Lithuania	
Netherlands	Kyrgyz Republic		Slovakia	Luxembourg	
New Zealand	Latvia		Slovenia	Netherlands	
Norway	Lithuania		Spain	Norway	
Portugal	Macedonia		Turkey	Portugal	
Singapore	Mexico			Slovakia	
Slovakia	Peru			Slovenia	
Slovenia	Philippines			Spain	
Spain	Poland			Sweden	
Sweden	Romania			Switzerland	
Switzerland	Russia			United Kingdom	
United Kingdom	Serbia				
USA	Thailand				
	Turkey				

Table A.2. Results of the unit root tests

	output gap	y-o-y inflation	interest rate	gov. balance	gov. expenditure
Levin, Lin & Chu t*	1,000	0,111	0,042	0,000	0,000
Assumes common unit root					
Im, Pesaran and Shin W-stat	0,001	0,367	0,369	0,000	0,000
ADF - Fisher Chi-square	0,000	0,025	0,016	0,000	0,000
PP - Fisher Chi-square	0,000	0,000	0,004	0,000	0,000
Assumes individual unit root					

The table shows the p values of the corresponding unit root test. Null hypothesis in all cases that there is a unit root, i.e. that a series is non-stationary

THE ROLE OF BUDGET CONSTRAINTS IN THE THEORY OF RATIONAL EXPECTATIONS, A FRAMEWORK FOR MODELLING AND DISCUSSING FINANCIAL STABILITY

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ABSTRACT

This paper extends the work on modelling with two particular objectives: first the paper revisits the rational expectations argument to propose a new method to bring models closer to reality; and second to provide a definition and a general framework for the analyses of financial stability issues in the framework of monetary policy. The paper observes that current literature has not taken full advantage of Blanchard and Kahn (B&K) solution of rational expectation models. In a practical way the paper proposes to substitute current resource identities in the model with cointegration relationships, as a way to introduce more flexibility in the model without affecting the priorities or the total number of restrictions which are necessary to solve the model in the rational expectations setup. This is done by augmenting the DSGE with the power of VECM (cointegration). The main assumption here is that agents are rational but this is true in the long run, as they experience intentional or accidental irrationalities and/or information loss in the short run. Despite allowing more flexibility, this proposal yields a more realistic and logical approach solution for the hybrid model or structural shocks proposed by other authors.

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1. INTRODUCTION

Modelling of macroeconomic behaviour has been one of the defining trends in the central banks until recently. Models are traditionally used for the benefit of monetary policy; however they have recently been adopted to cover issues of financial stability. These models range from simple single equations to the most sophisticated Dynamic Stochastic General Equilibrium (DSGE) models. The evolution within the same model categories and the "revolution" from one class of models to another has been mainly driven by the need for a better and more natural representation of the real world events. Despite such advancement, recently used models have suffered a setback, so academics and practitioners are back at the drawing board to fix the problem. The objective as always is to build better, more representative models or improve and enhance the current ones. Among other traditional models, currently the efforts are focused on the introduction of financial stability issues in the macroeconomic thinking. This paper takes a shot at this problem, after defining financial stability in terms of the broader economy.

Among others, two distinct works on macroeconomic modelling have played a very important role in development of the theory of macroeconomics and its practical application to policy design. The first approach is the work of Sims (1980) Vector Autoregressive Model (VAR) approach that tries to explain the interconnection between variables with the VAR system, which so to say, lets the data to explain the economic story and reveal relationship between variables. This could also include as a subcategory the structural and cointegrated VAR approach or the unit root econometrics.

The second approach is the DSGE modelling or the rational expectations approach, which starts form micro theoretic fundamentals to develop a model that describes economy at its largest macro-scale. One important characteristic of both these approaches is that they are build upon structural mathematic models in the form of systems of linear equations (or equations which can be reduced to the linear form, starting from a nonlinear pattern), and both rely on Gaussian methods to find a unique solution. In this respect they both need a set of restrictions which will allow for recursive substitution in the system, in order to provide a single solution to this system.[1] In principal, the problem converts into identifying and imposing a set of restrictions in the state matrix of the system, (in other words: starting from an unconstrained system, authors introduce the minimum number of constraints in the system) that will yield a single identifiable solution, making this optimization problem a constrained problem.

Despite these advances, each approach has encountered different obstacles to fully and realistically describe the economy. First, the VAR approach required that the researcher decides the structure of the economic relationship including the map and variables order of shock transmissions to the economy. This solution means that the researcher is imposing the structure of economic relationship, which in fact is like setting up a model assuming that we know the theoretic fundamentals without actually formalizing it. Another significant problem with VAR models is that these models are backward-looking and are subject to Lucas Critique.[2]

On the other hand the DSGE approach is considered a way too stylized to replicate real economic fluctuations and in the meantime very limited in the ability to generate shocks to economy. While it is all based on the micro theoretic fundaments, it is not able to explain the life as we know or at least as we observe it. In principal, this was (and continues to be) such a problem that was impossible to bring the model to data. Last but not least, this critique is extended to include the fact that DSGE failed to predict the last financial crisis. This is due to the fact that such models did not address directly or indirectly any issues that deal with financial stability.

1 In the case of VAR the solution was introduced by Sims and in the case of DSGE the conditions for a single solution were described by Blanchard and Kahn.

2 Lucas Critique highlights the fact that parameters that result from empirical inferences, which are later used in model building, might be subject to change in response to policy changes, or policy interventions. Using models with varying parameters would yield to unpredictable results. Therefore only models with stable parameters must be used to evaluate the impact of policy changes.

Ireland (2004) brings together both these approaches into a single hybrid system, which solves the above-mentioned inability of DSGE models to replicate the observed economic fluctuations in the data. Basically Ireland (2004) proposes to incorporate the VAR structure of errors (meaning adding a vector of errors, which brings more flexibility in the model and enables it to match the observed economic data) in the DSGE model. Eventually, the solution is to introduce a structure of autoregressive shocks into the model, similar to what we observe in the real life. This solution has two benefits: first it brings the models to the data by regarding every single difference between the model and the data as an estimation error, and second each error is treated simultaneously as a potential shock to economy. While practical benefits for model builders and policy makers are enormous because it practically brought DSGE models from the laboratory to the real life, this modification is motivated by a convenient assumption that economic data collection and calculation is inevitably incorporating errors of measurements, rather than founded in the economic reasoning.

This approach, however, did not solve several fundamental problems faced by DSGE models[3], the singularity issue being the most important. Due to their general design assumptions, all DSGE models have only one technological shock that drives the economy.

In response to this problem, another similar solution from a very different approach was to introduce structural shocks in the DSGE models. But this solution is arbitrary and subject to critique as well. Despite the critique, this was great, because in general it brought models to the data and in fact opened the way for a more realistic use and interpretation of results in the policy decision making. Therefore, DSGE was a very promising tool for policy design and implementation.

Yet, despite these adjustments, empirical investigation reveals that the data behaves differently from what DSGE models would assume in the setup process, and predict in policy evaluation exercises. The

3 In addition to singularity problem and poor fit, modelling challenges; incorporation of financial stability issues such as financial frictions, currency risk premia; datasets; the role of fiscal policy; invalid cross equation restrictions; measurement errors and identification.

work by Juselius and Frenchi (2007) is one very fine example which empirically shows that: "the story that the data wants to tell, is in fact very different from the RC theory" (pp. 33). In fact, they find that most of the underlying assumptions on which the DSGE model is built are rejected by the data[4]. The differences between theoretic (read DSGE) and empirical models in which data story gets the precedence (read VAR) "suggest that conclusions based on strong economic priors and many untested assumptions might say more about the faith of the researcher than the economic reality"

However, the story of Juselius and Franchi (2007) is in principal not different from the story of Sims (1980). As in Sims identification scheme, they also need to impose several restrictions, in order to find the unique solution for their model. They do so by introducing a set of cointegration restrictions (long-run theoretic relationships), which in fact is like imposing the structure to the model. After this the data does it all, and we do not understand why the economy behaves such or that way. The data do tell the story without "structural" content, meaning that we do not have a fundamental economic understanding of the observed shocks. Moreover, Lucas critique remains relevant, as it is demonstrated by the instability of parameters for two different sub-periods of the entire sample, respectively, before and after 1979.[5] To the authors "it seems obvious that the major difference (between two periods), is to be found in the degree of globalization, worldwide capital deregulation and increasing international competitiveness".[6]

These difficulties have not stopped policy makers to build and use such models for policy purposes. DSGE models are widely used in the process of policy-making in the most respected central banks in the worlds. Tovar (2009) provides a brief review of the increasing role that DSGE models are playing in the policy-making process, the nature of their limitations, and the problems and challenges faced by central banks in the use of such models. The main focus of such work is to predict the effects of policy actions undertaken by monetary authorities.

4 A brief description of these assumptions and their implications in the context of the economic behaviour is discussed latter in the paper.

5 Based on recursive tests authors find support to the existence of a structural break around 1979.

6 Johansen and Franchi (2007), pp.32

This was true until 2008 when the models failed "miserably" to predict the financial crisis.[7] Since then, the DSGE framework has experienced a setback. The Nobel laureate Robert Solow (2010), with his statement: "I do not think that the currently popular DSGE models pass the smell test" (pp.2), probably makes one of the biggest opponents of the DSGE model. His remarks with regard to: rationality, the total exclusion of conflicts of interests, incompatible expectations, and deceptions, are well appointed observations and add to the long list of critique that challenges DSGE model and the arguments against its imprudent use in policy making.

New efforts are now devoted to address some of these problems with the objective to improve and/or build alternative models. They focus on identifying the correct shocks and/or financial frictions and estimating better the values of parameters in the models using VAR-s, as in Del Negro and SchorFheide (2007) or Hall (2009). In both cases, authors try to get better and more realistic input from the data, in order to incorporate financial stability issues and bring models closer to the real world. Sims (2008) finds that there is still potential for improvement in this particular area.

Well this paper makes the point that there is still potential in the DSGE, if we were to take full advantage of several overlooked aspects of current solutions method, rational and conflicting expectations. We do this by combining the DSGE and cointegrated VAR, in a way that goes beyond the "hypothesis evaluation" used by Juselius and Franchi (2007). This paper discusses issues in the following way. Section 2 describes the DSGE setup and its solution. Section 3 discusses models and crisis; Section 4 discusses the modelling of rational expectations and discusses our proposal that transforms the existing model with a new trick without violating conditions for the solution of rational expectation models; Section 5 proposes a framework for definition of financial stability and its interaction with monetary policy; and Section 6 concludes.

7 Despite the set back, DSGE models are still used in the policy making and forecasting process.

2. THE GENERAL DSGE SETUP: THE INTUITION BEHIND THE SOLUTION

The standard DSGE model portrays the economy in the framework of the real business cycle model of Kydland and Prescott (1982); later representations of the model have incorporated prices and are known as the New Keynesian models. Currently, the efforts are focused on introducing the financial stability issues and rethinking the incorporation of the financial sector. In the simplest of such models one single agent, called the representative one, tries to chose the combination of consumption and labour to maximize his utility function, *(1)* typically represented by a constant elasticity of substitution, subject to constant returns to scale production function *(2)*.

$$E_t \sum_{i=1}^{\infty} \beta^t (C_{t+i}; H_{t+i}) \tag{1}$$

$$Y_t = A_t K_t^{\alpha} (\eta^t H_t)^{1-\alpha} \tag{2}$$

The model is completed by a set of identities, which describe capital formation *(3)*, and budget constraint or aggregate demand *(4)*.

$$K_t = I_t + (1-\delta) K_{t-1} \tag{3}$$

$$Y_t = C_t + I_t \tag{4}$$

Of all the elements of the model only the total factor productivity is assumed to follow a stochastic first order autoregressive model (5). The error $\varepsilon_{A,t}$ is the only source of stochastic movement "unpredictability" in the model.

$$A_t = \rho_A A_{t-1} + \varepsilon_{A,t} \tag{5}$$

The model is a collection of dynamic equations that result from the optimization procedure of the above problem. First order conditions of the Lagrangian of the dynamic system are comprised by the utility function, production function, resource constraint and laws of motion *(3) & (5)*. The model is organized as a system of linear first difference equations *(6)* below. The solution to this dynamic system is at the same time the solution to the agents' utility maximizing problem in time.

$$\begin{cases} y_t = a_t k_t^{\theta} h_t^{1-\theta} \\ \ln(a_t) = (1-\rho)\ln(a) + \rho\ln(a_{t-1}) + \varepsilon_t \\ y_t = c_t + i_t \\ \eta k_t = (1-\delta)k_t + i_t \\ \gamma\, c_t h_t = (1-\theta)\, y_t \\ \dfrac{\eta}{c_t} = \beta E\{(\dfrac{1}{c_{t+1}})[\theta(\dfrac{y_{t+1}}{k_{t+1}}) + 1 - \delta]\} \end{cases} \tag{6}$$

The lower case variables represent the original model after it is first normalized by the gross rate of labour augmenting technological process η. Since the later is considered to grow with time (bearing a time trend), this procedure is required to make the model stationary.

The next step requires log-liberalizing the dynamic relationships of (6) around the steady state of the model (which yields also the solution for the model), with the log linearization, due to the fact that the model is non linear. After the log-linearization, the model (6) transforms into the following system of linear difference equations:

$$\begin{cases} y_t = a_t + \theta\, k_t\, (1-\theta)\, h_t \\ a_t = \rho\, a_{t-1} + \varepsilon_t \\ (\eta/\beta - 1 + \delta)\, y_t = [(\eta/\beta - 1 + \delta) - \theta(\eta - 1 + \delta)]\, c_t + \theta(\eta - 1 + \delta) i_t] \\ y_t = c_t + h_t \\ \eta k_{t+1} = (1-\delta)k_t + (\eta - 1 + \delta)\, i_t \\ -\eta/\beta\, c_t = E(c_{t+1}) + (\eta/\beta - 1 + \delta) E_t y_{t+1} - (\eta/\beta - 1 + \delta) k_{t+1} \end{cases} \tag{7}$$

The interpretation of the final solution of the model yields that at the steady state all the variables grow simultaneously at a constant rate equivalent to the labour augmenting technological progress. In the mean time, the steady state is only function of the deep structural parameters *(a, β, δ, θ, ϱ, η)* of the model, which are invariant of policy shifts. One important observation in the model above only the level of capital and the level of technology are known at the beginning of each period (meaning are carried over from previous period), the rest of the variables are determined within each period. These two groups of variables are called predetermined and non-predetermined variables, respectively.

"Rational expectations" is one of the fundamental assumptions of the modern macroeconomic modelling, and a fundamental requirement for this model. It was Blanchard and Kahn (1981) who provided the mathematical condition that yielded the conditions for the solution of rational expectations models. Mathematically speaking, rationality means that the matrix of coefficients of the system of equations that describes the model *(7)* above has as many linearly independent vectors as there are predetermined variables in the model. In other words, the rationality requires that the number of stable (less than one) unit roots in the system (in the matrix of coefficients) is equal to the number of predetermined variables. This condition, according to Blanchard and Kahn (1981) (referred as B&K) is necessary to yield a single and uniquely identified solution for the model, which falls on the steady state or along a steady state path.

This would mean that there are two independent (predetermined variables) in the model as there are two different processes that drive the model. In general, our simple model must have a deterministic trend (the labour augmented technological process) that usually is embodied in the behaviour of capital and a stochastic trend that emerges from the random shock in the productivity function.

If this model were to represent the economy reasonably well, then the observed behaviour of economic variables in the real word must be similar to the predictions of the model. Moreover, this can easily be tested. The first such test failed as researchers tried to bring the models to the data. Due to rigidity of the theoretic model, it failed to fit and replicate the data generating process, as the data are subject to various and frequent shocks that the model could not accommodate because of the singularity issue. As it is specified above, Ireland

(2004) provided the solution by augmenting the model with a series of random stochastic shocks, assuming that they would follow an AR (1) process in the short run. While the argument for such addition is justified by measurement errors rather than found in the principles of economic theory, it allows the model to fit the data. This solution is in fact a shortcut that permits the model to fit the data but does not solve the problem fundamentally.

The theoretic setup presented above and the assumptions, on which it is based, imply that the time series of economic variables that are represented in the model must satisfy a set of specific individual or simultaneous restrictions. These restrictions emerge from the rational expectation solution of the theoretic model; from the structural economic relationship and exogeneity assumptions that are observed in the system *(7)*; and from the statistical properties of the parameters and variables of the model. These restrictions are formalized by Juselius and Franchi (2007) and tested by the same authors using data for US economy with the use of Cointegrated VAR. While the Juselius and Franchi (2007) authors fully discuss all the set of restrictions that derive from the theoretic setup, we would only refer to the set of exogeneity and stationary assumptions, as they are of the primary interest from the point of view of rational expectations. According to Juselius and Franchi (2007), the rational expectation solution of B&K implies the following restrictions:

- Exogeneity assumptions require that the evolution of α_t and k_t is the driving force to the system and is weekly exogenous. This assumption relates to the fact that both capital and technology are predetermined in the context of rational expectations.

- Stationary assumptions require:

  a. that y_t, c_t and k_t are trend stationary, with identical linear growth rates, driven by the labour augmented technological progress. This would further imply that any linear combinations of y_t & c_t and y_t and k_t are as well stationary.

b. that h_t is stationary. The stationary of h_t resulting from the fact that since the linear combination of output and consumption is stationary than the linear combination of output, consumption and labour is stationary only if labour is stationary.

In principle, the above assumptions are used by Juselius and Franchi (2007) to work out the identification scheme that represents the correct number of stationary and non stationary relationships in the CVAR model for the US economy.

In the findings, Juselius and Franchi (2007) conclude that these assumptions are not supported by the data. They find that linear combinations in *(a)* above are not stationary; labour was found to be nonstationary as well. The weak exogeinity of capital is strongly rejected by the data, meaning that a cumulated shock to capital is not one of the driving forces in the model; it is rather the shocks to consumption that has been the driving force of the model. This is completely at odds with the theory prediction.

We believe that the story told by the data can be easily accommodated in the theoretic model naturally. For this, we would like to discus the intuition behind the rational expectations, from the point of view of latest financial crisis. One main problem with a model like this is the restriction of the shock to only productivity shock, a shortcoming that is the Achilles heel of the model. We would start the argument with an intuitive description of the rational expectations.

3. WHY DO MODELS FAIL TO PREDICT CRISIS: INTUITIVE DESCRIPTION OF RATIONAL EXPECTATIONS

“Rational expectations” is one of the fundamental assumptions of the modern macroeconomic modelling. Models assume that agents make rational choices, but the question remains: Are agents really rational? It seems that the answer to this question might depend more on the moment rather than on our understanding of the agent’s behaviour. Ten years ago the answer seemed to have been yes. Economists were so sure about it that even invented a name to define the collective set of economic behaviour that was not explained by the traditional common knowledge and understanding, calling it "the new economy". In the light of the recent unpleasant experiences of full blown crisis, an easy tentative answer for the rationality can be: agents simply aren't rational. Solow (2010) articulates "Clearly they (agents) do not always behave in this rational way, and systematic deviations are worth studying". After all, anything that ends up in a crisis has to be irrational, and this imposes a strong problem for the DSGE models. A model that is designed with a rational agent in mind will not yield reliable and predictable results in a real world full of irrational ones. So it is important to discuss this fundamental institution of modern macro-modelling in the context of real world and in the models.

Beyond the rigorous explanation given in the theoretic setup (which we will discuss later), the standard economic text book will define rationality a set of choices or decisions (made in time) under the assumption that the agent has all the information about past and future events and uses all this information in the best possible way to maximize its utility; all this is based on a set of constant fundamental parameters that describe his preferences. For this agent to be irrational it means that he either does have only a subset of the entire information set and does his best to optimize or that he has the entire information set but is not able to process the information correctly, or both conditions are satisfied simultaneously.

In the context of current crisis, it must have taken a large number of irrational decisions from all agents that created the environment (the bubble) for crisis. Then all of sudden some of the agents become rational and did in fact stop supplying additional resources to support irrational choices of the irrational agents, causing the later to default on their financial obligations. What can cause that "on" and "off" rationality behaviour in some agents? Based on the above explanation, this could either result from the extension of the agents set of information to the true set of information or because the agents start to process this information. As long as crisis happens, the agent has to do either the one or the other or both of them simultaneously. *The agent can not remain irrational, even in case he dies he learns the notion of rationality in the last period. With or without his intention he will become rational.*

This intuitive description must fall within the framework of the B&K solution. In order to process the information along the same way as B&K describes in their paper, a model builder will have to build a system of m first difference equations where $m \in R$ represents the number of the variables in the system out of which r are known in period t (the set of predetermined variables in the economy), and the remaining $u = m - r$ are not predetermined variables.

In this R^m space there is only one single point (the steady state) and a single line that goes through this point (the steady state path) that can guaranty stability. The condition, defined by Blanchard and Kahn is necessary to put our agent on the steady state or along a steady state path. As long as the agent is on the steady state or on the steady state path, there is no other possibility but to stay there or converge at the steady state equilibrium of the model. Therefore, once there, the rational agent has no way to end up in crisis. In other words, identifying the steady state path and placing the representative agent there the author excludes the possibility of a crisis. Simply in such model, a crisis can not emerge without a foreign disturbance. This foreign disturbance is referred to as a shock. Once the shock is observed, our agent will be taken away from the steady state or steady state path, eventually leading him toward starvation or eating his economy. However, we do not have a mechanism inside the model that explains why, how and when this agent will pull the trigger to start the crisis. Yet, real life data reveal that agents make consistent errors every period. Could it also relate to the fact that agents follow a consistent goal in the long run, but different goals in the short run? Moreover, in spite of these consistent errors they do not usually and frequently end up in crisis. Why exactly is that?

The definition of rationality described above explains how irrational agents get themselves in trouble. In order to do so they would need to jump out of the steady state path. Therefore, in order to introduce instability in the model, the model builders would have to implement a structural shock in the model that can literally create this jump.[8]

Basically this is the direction in which several authors are going; currently the trend is to introduce financial instability in the model. Hall (2009) is a good example of this work. However, as in the case of Ireland (2004), these shocks which are usually called financial frictions, are not founded on theoretic arguments as the reasons behind their emergence and size are not well understood. Moreover, to prevent the crisis they have to come back either to the same steady state path or to a new one depending in the nature of the shock. DSGE model and its rational expectation solution do not have a mechanism to explain these patterns of behaviour.

4. SOLUTION OF RATIONAL EXPECTATIONS MODELS: A DISCUSSION OF THE B&K CONDITIONS IN PRACTICAL TERMS?

It is essential, however, to highlight an important observation, that the formal B&K conditions with regard to the number r of independent vectors is similar to the condition that a VAR process has r cointegrated relationships. In the cointegrated VAR literature, this is the same as saying that the underlying VAR process has as many cointegration relationships as there are predetermined variables in the system, and the rest of the columns $u = m - r$ (the number of predetermined variables) is represented as a linear combination of the first r columns. In other words, the requirement proposed for DSGE solution is not different from a VAR system constrained to have as many cointegration relationships as there are predetermined variables in the system. In addition, it requires that the corresponding coefficients of the loading matrix for the predetermined variables are 0 (meaning that the predetermined variables are weakly exogenous).

We believe that there are two particular elements of the DSGE and in general macro modelling, which have impaired the ability of the models to perform better or enable them to become more

8 This is a mandatory practical solution that provides the necessary mechanisms that allow models to fit the data and explain the crisis.

realistic or more stretchable, so that they can fit the observed data and economic trends. First is the number and second the nature of constraints that are required to find a unique solution for the system of linear difference that describes the behaviour of the economic variables in the model.

In a standard Gaussian decomposition for the solution of systems of equations the standard procedure takes a system of equations, describing the behaviour of a set of n variables, in the R^n space, and projects it in the R^m space by means of assumption that the first u variables (where $u = n - m$ with $1 \leq u < n$) are either representation of deterministic constants in R^N or a linear combination of any two or more well defined elements in the solution space in R^M. From here the modeller applies the B&K procedure to solve the model and find the unique solution Z in the form of an *(1 x m)* vector in R^m, given the condition that first u relationships is given by Ω (in the form of a *1xu vector)* the set of known constants or linear combination of known constants (in other words identities). Therefore, the solution in R^N is given by a X an ($1xn$) vector as follows:

$$X = Z \cup \Omega \tag{8}$$

Let's discuss a bit the nature of restrictions starting with the notion of rationality in the real life and the way it is portrayed and applied in the DSGE models. As described above, rational models try to optimize given a rational agent, implying that some of the future variables are known at time t–1, the rest of the variables are expressed as linear combination of the predetermined yielding solution of the problem at time t (now). The solution is guaranteed by the fact that markets clear in period t (now) as implied by the budget constraint, which is represented in the form of an identity where income y_t equals the sum of consumption c_t and investment i_t (with the assumption that savings equal investment). This restriction in the form of an identity is consistent with the requirement that prices adjust immediately, as it requires that all markets clear. However, such adjustment is not observed in reality.

This is recognized by the modellers who have proposed the introduction of different market frictions and/or imperfections in the form of sticky prices and wages, intermediate goods market, asymmetries in information etc, in the modelling in order to make models behave as they would in the real world. However, again these are arbitrary decisions forcefully implemented in models. The modelling work again is based on the assumption that markets clear at each discrete moment in time. We, however, observe that it is possible that markets do clear in the long run, but must not do so in the short run.

The intuition is as follows: if output equals the sum of consumption government expenditures and private investments, then finding the value of the last three automatically gives the value of output. If the model builder can figure *n-m* such identities, then he can reduce the computational burden by reducing the number of estimated coefficients in the model. This is of course an efficient solution but it comes at a huge cost. It requires that the agent is being rational at each period, given that the market clears each period.

However based on our personal experiences we can't help asking the following questions: Is aggregate demand or resource constraint an identity? It surely is in the national accounts from the accounting point of view. By definition, GDP measures everything that is being produced and sold in the markets. However, total production must not be equal each period with what is sold in the markets. This is very similar to measurement errors mentioned by Ireland 2004. It is easily logical to assume that a farmer could misjudge market supply and produces few extra bushels of wheat that he could not deliver in the market; or how for some reasons his tractor broke down at the very end of the period and part of the production is not delivered in the market. These differences between production and market supply will not be accounted as part of GDP and therefore the choice of capital labour and leisure and raw materials used in the production process, given current technology, would not be consistent with the calculated GDP. The same is true, if someone consumes part of the output that is produced by personal resources (consuming a fraction of its own production). This will not show either in the consumption or the GDP statistics, yet given used resources and production function, the figures will not add up to what the model calls rational choice. One can think of many more reasons (exogenous factors, like weather conditions, accidents, etc.) for which the consumption of labour and capital will not be consistent with the reported or forecasted output. Under such circumstances our agent will be pushed away from its equilibrium by random forces outside the system (since they operate in the R^{n+1} with the extra dimension representing for example the weather).

Second even if it is an "identity", could the errors in budget constraint become intentional? There are several situations under which the agents can intentionally (endogenous factors) generate similar situations as the farmer above. In the real life we have the agent that makes an investment that is a half build factory which was an investment but is not part of the production process yet. In this respect output Y_t and investment I_t are not bound in a uniquely identified relationship as generated by the production function. In a different situation, a consumption smoothing agent might borrow few dollars from the future and consume more than what is possible by at time t, given current resources. Therefore consumption will increase faster than the increase in output and investment which will grow with the same trend as before. In all above examples the level of savings will be different from the level of investment and therefore, an error will emerge in the budget constraint. Our rational agent will intentionally jump away from the steady state or the steady state path. The only way to stay away from crisis our agent must converge to a steady equilibrium (regardless whether is the old equilibrium or a new one) or the corresponding steady state path. Taking another page from the Cointegrated VAR literature, the occurrence of this convergence hints to the existence of an error correcting mechanism that prevents our agent from total catastrophe. In other words, despite moving away from its equilibrium bearing "location", our agent does not face a crisis (otherwise we could say he is financially stable) because there exists a strong enough *error correction mechanism* that brings the agent back to the equilibrium bearing "location".[9]

Usually models have accommodated this consumption smoothing behaviour via introduction of debt and the additional restriction that corrects its outstanding stock and debt service to zero as time t

9 "Equilibrium Bearing Location" as in the set of all points that represent the steady state path in the phase diagram of the corresponding model.

$\rightarrow \infty$. The shocks that are generated in the extra dimensional space R^x where $x \in R$ such that $x>n$ and $R^n \cap R^x = R^n$ or $R^n \subset R^x$, can be approximated by the autoregressive VAR errors, which are used by Ireland's measurement errors. The AR structure is essential for the stability condition of the system.

However, we can introduce these shocks to our one sector, one representative agent economy in the same way that we would introduce a current account deficit, assuming that due to consumption smoothing or external shocks our agent will experience an error (a current account deficit or surplus) in his budget constraint. The sustainability condition of this deficit requires that at the end of time the current account position must be equal to zero.[10] Therefore, assuming that budgetary position is sustainable is equivalent to saying that the budget constraint $y_t = c_t + i_t$ is an identity in the long run, but can experience sustainable deficits/surpluses in the short run. These sustainable deficits/surpluses are not different from an error (shock) ε_t with $E(\varepsilon_t) = 0$ or in the extreme case of permanent sustainable level of debt $E_\infty(\varepsilon_t)$ = to whatever sustainable level. Trehan and Walsh (1981) and Taylor (2002) respectively prove that this is indeed the case.

Intuitively, this would mean that occasionally the agent can increase/decrease c_t or i_t or deviating from the steady state trajectory or the steady state path at a given moment t in time with a *"strong commitment"* that in the next v periods (exactly at time $t + v$) where $1 \leq v \leq \infty$, the agent will sacrifice consumption (slow down consumption) to increase investment in order to return to its equilibrium growth rate implied by the steady state or the steady state path exactly at time $t + v$. Mathematically, the fact that the shocks ε_t ,are stationary around "0" or whatever sustainable non zero level, makes y_t, c_t *and* i_t cointegrated with restricted long run coefficients equal to 1, and the "strong commitment" an error correction mechanism with v deciding the speed of returning to the long run equilibrium. This procedure of unit root testing as described by Trehan and Walsh (1981) and Taylor (2002) is a standard procedure in testing the sustainability of current account or other similar constrained problems.

10 Following Taylor (2002) the zero condition can become a sustainable level of debt depending on the constant growth rate of the economy as it reaches its steady state equilibrium.

In this respect "budgetary deficits" (the discrepancy between savings and investments) and "budgetary surpluses can emerge and disappear during "short" periods of time v in response to a jump from the steady state path in favour of consumption or investment, respectively. In the light of the above discussion, the choice of the modeller of a "budget constraint identity" and the reduced system that results from this assumption is not only more restrictive than the original choice of the representative agent preventing the model to fit the data, but can also yield to incorrect inferences assuming that B&Q are satisfied, while in fact they might be violated, yielding incorrect conclusion on the stable solution.

4.1. NEW CONTRIBUTION

Now, if we were to assume that the first u relationship does not represent identities and therefore Ω in the equation (8) above does not represent a set of deterministic constants but a set of random variables such that any $\omega \in \Omega$ is known to be distributed in time as $N(\mu,\sigma^2)$ which would be the case if any of the first S relationships were in fact bound in a cointegration relationship with one or more elements of $z \in Z$ rather than an identity, we can still use the same logic above to linearly project our original R^N space into the R^M space without losing information. In this specific case the rank of the matrix that describes the system in R^n is r assuming that the rank of the R^m is r.

From here it would be easy to abstract our R^m solution to the identical R^n space by augmenting the matrix of the R^m space with an additional row and column that will incorporate the cointegration relationship while substituting Z for X preserving the identical solution to the R^n space. So in practical terms any DSGE in a R^n space can be solved by first projecting it linearly in the R^m space and find the general unique solution of the system in R^m. Later we can abstract it in R^n by augmenting Z with Ω. This would not affect the B&K solution as long as the number of stable roots in R^n and R^n remains the same.

If one were to adopt the definition of identity rather than the cointegration relationship, the context of the B&K condition (or solution) requires only "long run rationality", rather than "single period rationality". This formulation makes a considerable difference with the current state of solution since it allows our representative agent to "disregard" some information or "stop" making rational choices in the short run (read each period) without compromising the overall solution of the system in the context of long run rationality. In other words, as long as the B&K conditions are satisfied and the budget constraint is a cointegration relationship, which would be to say that income, consumption and investment share the same stochastic trend, any external shock or irrational choice or the pursuit of a second objective (any deviation from this trend of the variables above) in the short run will be corrected by the ECM back to its equilibrium conditions in the long run. Therefore, for any irrationality that emerges in the system, B&K makes sure that the system corrects it appropriately. Bottom line agents can become irrational in the short run but rational in the long run. This looks closer to the real word. In addition, the very existence of such error correcting mechanism guaranties that whenever the agent will move away any equilibrium or equilibrium bearing position, it (ECM) will start the correction action to bring him back to the sustainable and unique equilibrium. In this respect the existence of ECM will make our agent financially stable, in other words, in the presence of ECM he can not face a crisis in spite of endogenous or exogenous shocks in the system. It is the existence of cointegration relationship among the non predetermined variables that guaranties the presence of the ECM, and hence, the presence of the error correcting mechanism, which will prevent the agent from total catastrophe.

On the other hand, by adopting the definition of identity, one will forego the opportunity to identify possible situations that will violate the very B&K condition in the current rational expectations models. By its virtue as an identity the budget constraint excludes the possibility of the emergence of an additional stochastic trend (e.g. in consumption) in the system and therefore the presence of an additional stable unit root in the matrix. If a separate stochastic or time trend develops in consumption, the DSGE models would not be able to incorporate the new trend, but will however incorporate the resulting shocks as measurement errors. Therefore assuming that, the B&K condition, which is satisfied for the reduced system is simultaneously satisfied for the original system as well, might yield incorrect conclusions regarding the existence of a unique and stable solution for the system.

4.2. CAN DATA SAY ANYTHING ABOUT THIS?

It is reasonable to assume that if the above arguments have any merits, then these problems must be evident in the data. At this point it is very interesting to discuss what Juselius and Franchi (2007) have observed in section 6 of their paper, as they allow the data to speak freely.

The first conclusion that emerges from their empiric investigation of the entire period 1960-2005, is that they observe strong evidence of a structural break in the data at around 1979. This is also supported by the fact that the assumed stable relationships, respectively consumption income and production, behave very differently in the first and second period.

Despite a reasonably well behaved consumption income framework during the first period, different from the prediction of the theoretic model that consumption income ratio must be stationary, the authors find that it exhibits pronounced persistence and needs to be combined with another variable to achieve stability.

The behaviour of consumption-income and capital-labour rations suggests that US investment was primary financed by domestic savings in the first period. There is evidence that during the second period US reliance on foreign savings has increased.

Their results show that there is much more dynamic in the system that what is predicted by the theoretic model with both capital and output equilibrium correcting to income consumption ratio and to savings ratio respectively, in the first period. These dynamics increase in the second period to include a significant adjustment of labour supply to consumption-income relation. In particular they find that shocks to consumption are one of the main driving forces in the system, which is totally at odds with the assumptions of the theoretic models that assign this role to total factor productivity. In addition, shocks seem to be more demand than supply driven, again at odds with theoretic predictions that assign a leading role to supply; while consumption must adjust, otherwise its explosive root will make the system unstable. In the first period the equilibrium correcting behaviour of capital to both savings rate and production function adds to the stability of the system, whereas the poor and inadequate adjustment toward equilibrium is a dominant characteristic of the second period.

Based on all this evidence Juselius and Franchi (2007) conclude that DSGE tells a "structural" story but with very little empirical content. To us it seems, however, that the existence of a cointegration relationship in the budget constraint might accommodate at least some of the observed inconsistencies.

5. FINANCIAL STABILITY, MONETARY POLICY AND THEIR INTERACTION

The recent crisis took us all by surprise and did in fact leave a big puzzle behind. While today we have a good understanding of the phenomenon and events that lead to the crisis, it is evident that we do not have a clear understanding why such financial imbalances grew unnoticed by the authorities that are mandated to safeguard financial stability. Despite the existing early warning systems in place, it is clear that authorities and mainstream academics did not have a universal, updated, and practical framework and a suitable set of tools to identify the emergence of financial stability issues in the presence of financial innovation. Since the crisis, the central banks which are mandated with the objective of price stability are also required to define and explicitly or implicitly include financial stability in the set of objectives. Providing a definition and incorporating it in the framework of policy analysis and decision-making, is however proving very hard.

Well, the way in which the banking community and academics are dealing with the possible and suggested solutions to financial stability problem, shows how difficult it is to define it. Currently, we are calling for more regulations, meaning either impose new rules or tighten the existing ones. Either one or the other converges to some quantitative measures of financial sector indicators, capital, total liabilities and/or assets, etc., just to name a few. This way of thinking portrays financial stability more as a scale problem within the banking supervision area rather than a broader and deeper phenomenon that relates to agents' rational choices. However this does not address one of the fundamental problems of the crisis. Gordon (2009) observes: "Blinders' first finger points to the core of the initial problem, gullible consumers who signed up for mortgages that they did not understand and could not afford" (pp.5). This is an important aspect of financial stability that relates to the economic behaviour and incentives of the supposedly rational agents, but that is not getting much attention. It is sure a reminder that understanding and addressing the problems of financial sector is only part of the solution. The same is happening in modelling. None originates from the micro fundamentals that characterize the agent's behaviour. Is financial stability a quantitative element modelled as indicative percentage or ration of financial sector balance sheet or a qualitative element founded in the microeconomic behaviour? Answering this question correctly might be the first step toward the correct definition.

One way to think of this question is to approach the problem in a different way. Assume that we do not have a financial system in the picture, meaning in a model without financial system. Can financial instability arise in a model like this? If we were to define financial stability by the ability of the agent to stay in the steady state, or steady state path than in the presence of random exogenous and endogenous shocks to non predetermined variables, we would observe instability taking over and the agent would either starve to death or eat the entire economy. In other words, this behaviour would be unstable. Therefore, instability can emerge in the model without the presence of the financial sector. In the absence of a correcting mechanism every exogenous or endogenous shock would end up in crisis, in other words the agent would be financially unstable. Since the answer to the question above is yes, then definitively, the financial stability is not a scale problem within the area of banking or financial supervision, but a totally different much broader problem that originates at the micro behaviour.

This pursue of scale, ratios and frictions are probably one of the reasons why the highly stylized micro-based rational models were not useful in the detection of mounting problems in the financial stability or in the understanding of the mechanisms behind it. To this day, researchers are still struggling to identify shocks, understand them and justify their artificial integration in a reasonably acceptable way

What is of most importance it seems that we do not have a consensus on the role and incentives that monetary policy could have played in the current financial crisis. In fact we do not have a framework to study this relationship among the areas of monetary policy, banking supervision and financial stability. Financial frictions and other shocks that researchers are incorporating their models are not well understood and therefore not related to monetary policy.

Yet we know very well that monetary policy has a strong and deep effect on agent's economic decision-making and its economic incentives. As the interest rates go south, people are more prone to borrow and increase their consumption and investments individually or simultaneously will exceed current output. Short run budget constraints will be broken, but will still be sustainable as long as everybody is willing to correct these deficits in the future, in other words, as long as everybody has an inner commitment in the error correction mechanism to correct this short term excesses to the point where they are financially stable in the long run. This interaction becomes more obvious in the case when a financially stable agent has opened a financial gap with a strong commitment to close it in the next v periods. Under such circumstances, a monetary policy rate change will affect the outstanding debt and its service and therefore the size of the existing financial gap will also change. This change will affect the agent's ability to close it in the next v periods and will potentially jeopardize the financial stability situation of the agent. It is due to this fact that we propose to define and model financial stability with the existence of an error correcting mechanism in the agents' behaviour, which would imply that income, consumption and investment are bound together in a cointegration relationship in the long run. The suggested definition provides a mechanism to link financial stability with the general framework of monetary policy and its decision-making.

6. CONCLUSION

This paper combines two important and contemporary topics of economics and policy making, the issues that surround the financial stability and macroeconomic modelling. Both are discussed form the point of view of rational expectations. Rational expectations have played an important role in understanding and application of economics and economic policies in the real world. Despite its appeal the models that are built in this framework, are highly stylized to fit the data and accurately represent their generation process. In addition, current rational expectation models suffer from the absence of a reliable framework that deals with the problems of financial stability. Therefore, such models are being improved in several directions.

The literature is developing in several directions to include financial frictions, structural errors, etc. However, one important feature is that in order to incorporate financial stability, all these models need the presence of financial market in the models in one way or the other. Different from this research, we have adopted the view that financial stability is an economic phenomenon that can arise in the absence of financial market in the model.

This paper discusses the problems of financial stability and modelling from the point of view of rational expectations. After analyzing the structure of DSGE model and the B&K condition for solution of rational expectation models, we propose to transform the conditions of budget constraint from an identity into a cointegrated relationship.

Taking these two conditions together we have the opportunity to relax the budget constraint moving from a discrete one to a continuous one, assuming that it has to hold in the long run rather than each period. This will permit representative agent to endogenously generate shocks to consumption, and/or investment, and accommodate external shocks in the short run, without compromising the stable equilibrium in the long run. This is achieved by the presence of the error correction mechanism in the model.

The advantage of such proposed solution in this paper toward the one presented by other authors is that here we try to develop a method which can introduce endogenous shocks in the model innovation to the hybrid model that can bring model to the data based on reasonable economic theory and not on convenient measurement errors and unexplained structural shocks that are implemented in the models without much content. The proposed solution is able to accommodate several "odd" trends that are observed in the data by Juselius and Franchi (2007).

While this process is more realistic and provides a reasonable and formal way to introduce errors in the DSGE not just as measurement errors, it represents an opportunity to naturally incorporate (y, c, i) shocks into the model. This will allow models to fit the observed trends in the data unmatched by theoretic models. Assuming a cointegration relationship, the model builder can attach the observed trend to any of the variables allowing the other two to adjust, simply by shifting the position of the "cointegration bearing row" to the state matrix of the model, so that it corresponds to the desired variable in the vector of explanatory variables.

However, the main element of this proposed solution relates to the fact that the cointegration structure provides a framework for the definition of Financial Stability, relating it to the rational behaviour of the representative agent. Most importantly, it outlines the principles that show how monetary policy interacts with and influences of financial stability.

The bottom line is that different from the current practice, the original solution given by B&Q allows irrationalities in the short run without affecting rationality assumption in the long run. Therefore, the proposal here is to substitute this budget constraint with a long run relationship in the form of identity, meaning that the budget constraint is satisfied in the long run as an identity not necessarily every period. For all the period during which the intra-temporal constraint is not satisfied, the error correcting mechanism will bring it back to its own equilibrium. This means that each time when the agent makes one or few irrational choices in the short run, there exists an ECM, which brings him back to the equilibrium steady state path, making him financially stable.

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INFLATION AND FINANCIAL DEPTH IN ALBANIA

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ABSTRACT

This paper discusses the relationship between financial depth and inflation in Albania. We test whether there is a nonlinear and non-monotonic relationship between these variables with the model constructed by Khan, Senhadji and Smith (2001). The model is estimated over the period 1996-2009. Empirical results indicate that financial suppression and international trade play a significant role on the development of the financial sector; however, empirical findings do not support a threshold relationship between inflation and financial development in Albania over the period 1996-2009.

I. INTRODUCTION

Macroeconomic theory suggests that permanent and predictable change of inflation rates should not have any impact on the long-run rate of real economic growth. However, many empirical studies find that sustained—and, therefore, likely predictable— high rates of inflation can have adverse consequences for long-run level of real activity. Barro (1995) for instance, concludes that permanent increases of inflation rates have a negative impact on the long-run real growth. Andres and Hernando (1997) also find for OECD countries that even low or moderate inflation rates have a temporary negative impact on growth rates, leading to significant and permanent reductions in per capita income.

The newest approach to the relationship between growth and inflation is financial sector mediation. Particularly, recent theories suggest that increases of inflation rate interfere with the ability of the financial sector to allocate resources effectively, and affected financial activity may either enhance or impede economic growth. An increase in the rate of inflation drives down the real rate of return not just on money, but on assets in general. The result will be that lower real returns from assets stimulate credit market friction. As it is expected, financial market agents will protect their investment by rationing the credit to the costumers. This process becomes more severe as inflation rates increase. The final impact will be lower lending, less efficient resource allocation with a negative effect on investment and economic growth (Boyd, Levine and Smith, 1996).

On the other side, it is well established both empirically and theoretically, that higher degree of financial activity in the short run and more rapid financial development in the long run are really beneficial for economic growth. Development of financial sector improves channelling funds from lenders to borrowers, enhancing liquidity, investment and growth. Therefore, understanding inflation impact on financial sector contributes also to clarifying the link between inflation and economic growth.

The aim of this paper is to study for the first time the relationship between inflation and financial depth in Albania. We follow the methodology presented by Khan, Senhadji, and Smith (2001). Financial depth is used as a proxy for financial development, which may be affected by several other factors beside inflation, such as: GDP per capita, the degree of openness and the share of public consumption in GDP as a measure of financial repression. According to this model, the relationship between inflation and financial progress is characterized by non-linearity. The authors hypothesize that a rise in inflation has a weak positive effect on financial depth when the initial rate of inflation is low, and a negative effect at initially high levels of inflation. If this hypothesis is true, then there is an inflation threshold in relationship between financial depth and inflation. This inflation threshold can be regarded as an optimum rate of inflation with respect to financial development. The impact of the other variables is clear. A rise in GDP per capita and the degree of openness are likely to enhance financial depth, while a rise in financial repression seems to have an opposite result.

The remainder of this paper is organized as follows. Section 2 reviews literature on inflation and financial depth relationship. Section 3 describes financial development in Albania, its main characteristics and trends. Section 4 portrays the data we use, while section 5 presents model specification and describes estimation technique. Section 6 provides estimation results and section 7 concludes.

II. INFLATION AND FINANCIAL DEPTH-LITERATURE REVIEW

As already noted, financial development is important to facilitate and promote economic growth, becoming one of the major linkages between inflation and economic growth. In this section, we review some of the literature regarding the relationship between inflation and financial development, which has gained a lot of interest in the research area. Many authors have addressed this issue and have provided different channels of transmission of developments from inflation rate to financial development. These channels suggest that the relationship between inflation rate and financial development is either positive or negative depending on the initial level of inflation.

For example, Boyd, Levine, and Smith (1996) suggest that at sufficiently low rates of inflation there is no adverse selection problem in credit markets because high rates of return induce each type of borrowers to self-select. Under sufficiently low inflation, "natural borrowers" find it more attractive to take advantage of high rates of return and decide not to invest their own funds. But if there is a slight rise in the rate of inflation, then "improperly behaving" "natural borrowers" are induced to substitute away from cash into investments in physical or human capital. The relationship between inflation and financial depth in this case is positive.

Earlier work from Stiglitz and Weiss (1983) presents the same relationship from another perspective. According to their model, adverse selection problem becomes more severe as real interest rates go up. A rise in real interest rates induces low risky investors to give up investment opportunities and not to apply for a loan, since high return projects are usually more risky. Banks will prefer to lend only to the low risky borrowers and therefore, resort to borrowers screening via credit rationing. Although credit rationing becomes more severe as interest rates go up, this is not the case throughout the whole range of interest rates. The authors suggest that at low interest rates risky borrowers will constitute only a small share of those applying for loans. Therefore, given these conditions, credit rationing either will not exist at all or will not be substantial for financial activity. Again, the relationship between inflation and financial depth in this case is suggested to be positive up to a certain level of interest rates (inflation).

From another perspective, higher inflation rates may also adversely affect financial depth. Ball (1992) and Ball and Mankiw (1995) suggest that higher inflation raises inflation uncertainty, which increases credit risks; thus even previously 'high quality borrowers' get treated with precautions. To assure that credits are paid back, banks may resort to more severe credit rationing, which lowers financial depth. Boyd, Levine and Smith (1996) mentioned above, also agree that the major impact of higher inflation on financial depth goes through market frictions. Higher inflation rate reduces financial depth due to ever-worsening endogenous frictions arising in the process of allocating credit and capital. This is because financial institutions incur more costs to select "higher quality borrowers" out of those applying for loans when inflation is rising. Therefore, inflation has a negative impact on financial development.

By summarizing, we can conclude that it appears that the impact of inflation on financial development could be either positive or negative, depending on the severity of inflation. The relationship between these two variables appears to be nonlinear.

Using a large cross-country sample, including both industrialized and developing countries, Khan, Senhadji and Smith (2001) examine this nonlinear relationship between financial progress and the rate of inflation. The authors use financial depth as e proxy for the degree of financial developments and try to identify several factors affecting financial activity. Different measures of financial depth are used to measure financial development in order to identify the best responder to inflation shocks. Their findings suggest that inflation may have different impact on financial depth, depending on whether the initial rate of inflation is high or low. A rise of initially low inflation may not lead to harmful consequences for financial activity. On the other hand, a rise in the rate of inflation that is initially high, may substantially depress financial development and reduce financial depth:

$$\uparrow\pi \rightarrow \uparrow fd \quad \text{if } \pi \leq \pi^*$$

$$\uparrow\pi \rightarrow \downarrow fd \quad \text{if } \pi > \pi^*$$

where π^* is inflation threshold, and *fd* is financial depth

The result of the study conducted by Khan, Senhadji and Smith (2001) suggest that threshold rates of inflation range from 3-6% depending on the measure of financial depth that is used. Furthermore, Barnes (2001) extends the study on this relationship by including also economic growth. He finds that below an inflation level of 14%, there is a positive relationship between growth and financial development, and above 14%, there is no relationship; below 14%, there is a positive relationship between inflation and growth, and above-negative, the relationship between financial development and inflation was not found significant.

III. FINANCIAL SECTOR DEVELOPMENT AND INFLATION IN ALBANIA

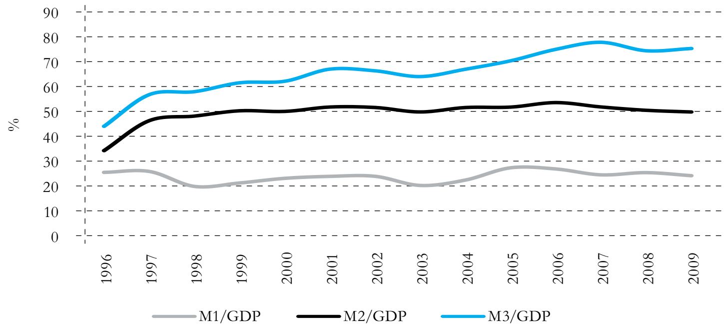
Assessing a country's financial development is not an easy task to do. Traditional measures of financial deepening may not be able to provide a broad and clear view of actual progress and none of the indicators provides definite answers. While authors such as McKinnon (1973) and Shaw (1973) consider that the establishment of positive real interest rates is a first step for financial development, this is only a base from which the financial system can be developed to produce more refined prices. Positive interest rates stimulate financial saving growth, thus also financial development and economy's monetization. At the beginning, banks are the centre of the financial system, but over time the relative importance of financial markets for instruments, like bonds, equity, and commercial bills, rises.

In his comparative analysis of financial development between countries, Lynch (1996) uses different indicators of financial development, which can be grouped as quantitative and structural measures. In this section, we analyze the financial development in Albania using some of these indicators.

Quantitative indicators based on monetary and credit aggregates are the traditional measures of financial development and deepening. These indicators reflect saving developments and credit intermediation in a country. The ratio of Money and GDP is the simplest indicator of monetization in the economy. Narrow money increases in line with economic transactions, while broad money should rise at a faster pace, if financial deepening is occurring.

Figure 1 presents the development of Money/GDP indicators of three measures of monetary aggregates. The initial values for 1996 for these indicators are low, ranging from 26% of GDP in the case of the M1 monetary aggregate to 45% of GDP for M3. However, during the course of the years, broad money has expanded rapidly, while narrow money has contracted. At the end of 2009, M1 ratio to GDP is around 25%, while the ratio of M3 to GDP has expanded to around 76%. These developments suggest that saving mobilization through the banking sector in Albania is successful. Narrow money has been stable as a proportion of GDP, while broad money (in terms of GDP) increased faster, suggesting that financial deepening in Albania is occurring.

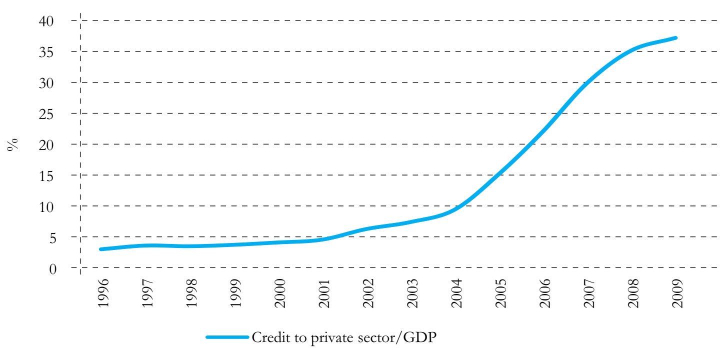
Figure 1: Monetary aggregates to GDP (percent)



Source: Bank of Albania, INSTAT

The ratio of private sector credit to GDP is another indicator of financial deepening. According to Figure 2, which presents the development of this indicator over the period 1996-2009, financial deepening in Albania is significant. During 1996, credit to private sector was around 3% of GDP, and up to 2000, it registered slow annual growth rates. Starting from 2001, credit ratio to GDP increased rapidly, reaching the level of 37% by the end of 2009. The global financial crisis had an impact on credit growth in Albania, which lowered from 53% annual growth in 2007, to 44% in 2008 and only 25% in 2009. This is the reason why credit ratio to GDP increased by a slower pace during 2008-2009 (from 35% of GDP in 2008 to only 37% of GDP in 2009).

Figure 2: Credit to private sector to GDP (percent)

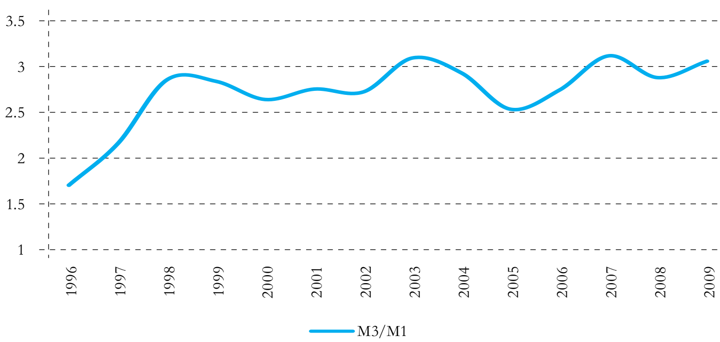


Source: Bank of Albania, INSTAT

Structural indicators also provide good measurements of financial development. They are designed to help analyze the structure of the financial system and determine the importance of its different elements. These indicators include: the ratio of broad money to narrow money and interest rates development.

Figure 3 presents the ratio of broad money to narrow money over the period 1996-2009 in Albania. If saving deposits increase (broad money) more rapidly than transactions balances (narrow money), then there is financial development. This ratio has almost doubled during this period, thus financial deepening in Albania appears to be significant. In 1996, M3 was 1.7 times larger than M1 while at the end of 2009, M3 ratio to M1 increased to 3.

Figure 3: Ratio of broad money to narrow money



Source: Bank of Albania, INSTAT

As already stated, real positive interest rates are a precondition for financial development. Even though empirical findings of real interest rates and total saving in the economy are not consistent, authors such as Fry (1995) and Dornsbusch and Reynoso (1989), suggest that there is a positive relationship between real interest rates and financial savings.

Table 1 Real interest rates for deposit and lending, inflation rates in annual terms

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Inflation	12.8	33.0	21.6	0.4	0.0	3.2	5.2	2.4	2.9	2.4	2.4	2.9	3.4	2.2
Int.rates deposits	3.7	-3.3	1.1	12.8	7.8	4.0	2.5	4.9	2.6	2.0	1.9	1.7	2.2	3.2
Int.rates lending	6.8	-1.9	12.8	25.3	24.5	13.0	9.9	10.8	10.7	11.3	11.3	10.6	9.5	11.4

Source: Bank of Albania, INSTAT

According to Table 1, real interest rates in Albania over the period 1996-2007 are positive, apart from the crisis of 1997 which was characterized by unusually high inflation rates. Real interest rates of lending are better protected from inflation being considerably over 10%. These results support the thesis that financial development in Albania is significant and progressive.

However, another important aspect of financial markets is their responsiveness of prices to changing economic conditions. Efficient financial markets facilitate adjustment to changing expectations about economic conditions, thus interest rates are flexible. Market-oriented financial systems should exhibit lower real interest rate volatility and higher nominal rate volatility than systems with controlled rates, *ceteris paribus*. Table 2 presents the volatility development for nominal and real deposit and lending rates.

There are some conclusions that merge from Table 2: first, real interest rates volatility is higher than nominal interest rates volatility. Thus, real interest rates change mainly due to inflation development. Second, real lending volatility is higher than real deposit rate volatility. These findings do not support a good financial progress in Albania as the other indicators did. Lower volatility in nominal terms indicate that financial sector in Albania is not flexible.

Table 2 Volatility of interest rates for deposits, lending and inflation

		Deposit interest rates volatility		Lending interest rates volatility		Nominal volatility minus real volatility	
	Inflation volatility	Nominal	Real	Nominal	Real	Deposit	Lending
		(1)	(2)	(3)	(4)	(1) - (2)	(3) - (4)
1996	5.9	2.3	3.8	1.9	4.6	-1.5	-2.7
1997	7.4	5.4	5.5	7.9	7.1	0.0	0.8
1998	11.5	3.8	8.5	5.8	8.5	-4.7	-2.7
1999	2.3	2.7	1.8	0.7	2.1	0.9	-1.3
2000	1.8	0.6	2.3	2.3	3.5	-1.7	-1.2
2001	1.1	0.0	1.2	2.1	2.8	-1.1	-0.7
2002	1.7	0.5	2.1	1.0	2.3	-1.6	-1.3
2003	1.0	0.8	1.7	1.6	2.6	-1.0	-1.0
2004	0.8	0.3	0.6	1.6	2.1	-0.2	-0.5
2005	0.7	0.4	0.8	0.8	1.3	-0.4	-0.5
2006	0.7	0.2	0.8	0.8	1.3	-0.6	-0.5
2007	1.0	0.3	0.8	0.7	1.0	-0.6	-0.3
2008	0.8	0.5	1.2	0.7	1.1	-0.7	-0.4
2009	0.5	0.3	0.5	0.6	0.9	-0.3	-0.3

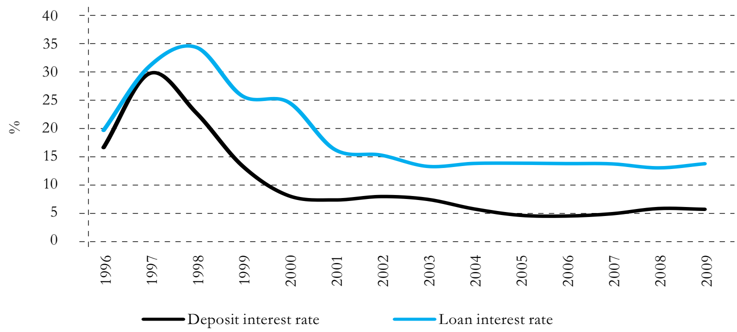
Source: Bank of Albania for monthly figures

Note: Volatility is measured as standard deviation for each year.

Also, financial system in Albania reflects high transaction costs of financial intermediation. These financial intermediation transaction costs cannot be easily evaluated accurately; however, bank interest rate margins are often used to estimate them.

Figure 4 depicts that even though there is a downward trend of interest rate of deposits and loans, the margin does not appear to narrow, which might indicate that the Albanian banking system appears to not be fully competitive.

Figure 4: Bank interest rate margins for average deposits and loans

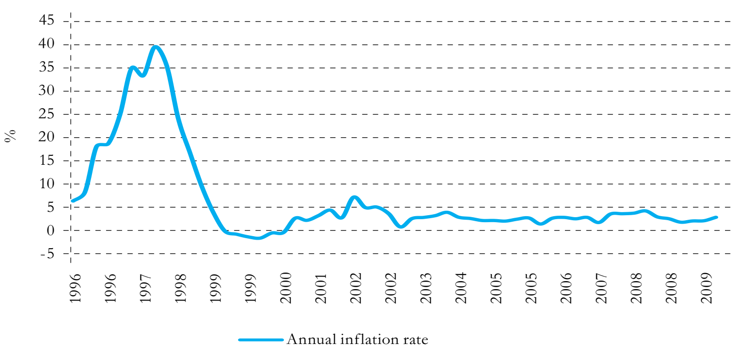


Source: Bank of Albania

In conclusion, we can say the financial deepening in Albania appears to be significant, even though some interest rate developments indicate that full progress is yet to be achieved. Important elements of these developments are also stable prices and precautionary monetary policy.

Inflation developments are presented in Figure 5 below. After the crisis of 1997, inflation rates have been low and stable. The current object of the Bank of Albania is to keep annual inflation at the level of 3±1 pp. This target has been achieved up to the end of 2007. These developments indicate that monetary policy has contributed to financial development by keeping inflation low and within the target.

Figure 5: Annual inflation rates



Source: Bank of Albania

IV. MODEL DESCRIPTION AND ESTIMATION TECHNIQUES

The existence of a threshold level for inflation is estimated using the model presented by Khan, Senhajdi and Smith (2001):

$$fd = \gamma_1 \left(1 - d_t^{\pi*}\right)\left(\frac{1}{\pi_t} - \frac{1}{\pi *} \right) + \gamma_2 d_t^{\pi*}\left(\frac{1}{\pi_t} - \frac{1}{\pi *} \right) + \phi' X_t + e_t \qquad (1)$$

$$d_{it}^{\pi*} = \begin{cases} 1\, if\, \pi_t > \pi * \\ 0\, if\, \pi_t \leq \pi * \end{cases} \qquad t=1.........t \qquad (2)$$

where *fd* is the financial depth indicator, π_t is inflation as measured by CPI indicator, $\pi *$ threshold level of inflation, $d_t^{\pi*}$ is a *dummy* variable that takes the value 1 if inflation is higher than threshold level $\pi *$ and 0 otherwise, X_t is a vector with control variables including: logarithm of GDP per capita, (log(gdp)), degree of openness (open), ratio of government consumption and GDP (C_g).

When the rate of inflation is lower than the expected threshold level, the model estimates only γ_1, while if the inflation rate is above the expected threshold level, the model estimates γ_2. Given that inflation enhances financial depth when $\pi \leq \pi *$, and reduces it when $\pi > \pi *$, we expect a negative estimation for γ_1 and a positive estimation for γ_2.

In order to capture the relationship between inflation and financial depth as explained above, inflation enters the model in inverse form; so that at higher initial inflation rates, a marginal increase in inflation has less of an impact on banking development. This form of relationship between inflation and financial depth is represented by a hyperbole and the function of the relationship is discontinued at the threshold level of inflation $\pi *$. To take this into account, $1/\pi *$ is subtracted from $1/\pi_t$ allowing for a continuous relationship between inflation and financial depth, even for the threshold level. At the zero value for inflation, the relationship is discontinued. However, the inflation values considered in this study are mainly positive with some negative figures. According to Khan, Senhajdi and Smith (2001), zero values for inflation are extremely rare, hence this does not pose a restriction to our model.

A. ESTIMATION METHOD

If the threshold value of inflation π^* is known, the model could be estimated by OLS. However, π^* is not known and it has to be estimated together with the other regression parameters. In this case, nonlinear OLS needs to be applied. However, given that the regression is non-differentiable in π^*, Chan (1993) and Hansen (1997) recommend estimating threshold parameters by least squares. This is called conditional OLS and it is explained below.

For every possible value of π^*, the model is estimated using OLS, thus obtaining the sum of squared residuals (SSR) as a function of π^*. Threshold level of inflation is obtained by choosing the value of π^*, which minimizes the sum of squared residuals. This may be represented as follows:

$$\pi^* = \arg\min_{\pi} \left[S_1(\pi)\right] \text{ where } \pi = \pi, \ldots\ldots\ldots \overline{\pi} \tag{3}$$

Generally, threshold level of inflation may be searched between the highest and the lowest inflation figures for the period taken in consideration. The search range in our case is $[0.1\%, 39.3\%]$, with an increment of 0.1% ($\Delta\pi^* = 0.1\%$). In simple words, we will search for a threshold inflation between the values π^*: $\{0.1\%, 0.2\%, 0.3\% \ldots\ldots 39.3\%\}$.

B. TESTING THE SIGNIFICANCE

Once we obtain a value of threshold inflation, it is important to test whether the estimate is statistically significant. According to Hansen (1996), if the threshold level of inflation was known a priori, then a standard Wald test could be applied with an approximate χ^2 null distribution. Since the threshold level of inflation is not identified under the null hypothesis, classical test cannot be used as the distribution is non-standard. Therefore, we should make use of a test, which does not require prior knowledge of inflation threshold. Hansen (1999) suggests using the bootstrap method to simulate an empirical distribution of the following likelihood ratio test:

$$LR_0 = \frac{S_0 - S_1(\pi^*)}{\sigma^2}$$

where S_0 and $S_1(\pi^*)$ are the sum of squared residuals (SSR) for zero and alternative hypothesis respectively:

H_0: $\gamma_1 = \gamma_2$ threshold inflation is not statistically significant
H_1: $\gamma_1 \neq \gamma_2$ threshold inflation is statistically significant

Also, σ^2 is the variance of residuals for H_1 hypothesis. In other words, S_0 and $S_1(\pi^*)$ are SSR with and without a threshold level for inflation. The hypothesis will test whether the relationship inflation-financial depth without threshold inflation is statistically significant from the case of a relationship with threshold estimation. The bootstrap estimation used to generate the distribution of the likelihood ratio test provides an approximation of the p-value of the test.

C. BOOTSTRAP TESTING

In order to test the statistical significance of the threshold inflation without making any distributional assumptions, we apply bootstrapping. Bootstrapping is a simulation technique used to obtain the empirical distribution of parameter estimates and in our case, the distribution of the log likelihood test. If we are able to obtain repeated samples from the population (from which our data were sampled), then we can construct an empirical sampling distribution of the test estimation. This is what bootstrapping does. In bootstrapping, the sample is resampled "to approximate what would happen if the population were sampled" (Manly, 1997). Then, a random sample of *n* observations is taken with replacement, and is used to estimate equation no.1, with and without inflation threshold. This process is repeated a number of times and the log likelihood ratio tests computed from the simulated data are used to make inferences from the actual data. The distribution function of the log likelihood statistics computed by simulating the data approximates the true distribution of the statistic, and the p-value obtained provides the probability that the HO hypothesis holds. This process is carried out following the steps suggested by Hansen

(1999). The author recommends the following technique to test for the significance of the threshold estimation:

- Draw (with replacement) a sample of n size out of the original distribution of each of the variables.
- Using this sample, estimate the model under H0 and H1.
- Calculate the bootstrap value of the likelihood ratio statistic.
- Repeat this procedure 999 times.
- Calculate the percentage of draws for which the simulated statistics exceeds the actual one.

The last step provides us the p-value, which is given below:

$$p^*(L\hat{R}) = \frac{1}{B}\sum_{j=1}^{B} I(LR_j^* \rangle L\hat{R})$$

where I(·) is the indicator function, $L\hat{R}$ is the statistical value of log likelihood ratio test based on the sample $x = \{x_1, x_2 .... x_\tau\}$ and LR_j^* the value of the same statistic based on the bootstrap sample $x = \{x_1^*, x_2^* .... x_{rT}^*\}$.

The bootstrap p-value can also be written as $p^*(L\hat{R}) = 1 - \hat{F}^*(\hat{\tau})$:. The null hypothesis may be rejected when $p(L\hat{R}) < \alpha$ and $F^*(\tau)$ is the empirical distribution function of.

The number of bootstrap samples *B* is such that α (*B* + 1) is an integer (for example B=999 and α=0.05). However, the literature suggests that the penalty for using a small number of bootstrap samples is loss of power, not loss of exactness. The value B=999 is generally expected as a good level for the power of the test.

V. DATA DESCRIPTION

The relationship between financial depth and inflation in Albania is analyzed using quarterly data for the period 1996-2009. Data sources are Bank of Albania and INSTAT. Financial depth is estimated as the ratio of domestic credit to private sector and GDP. Such an indicator measures the attractiveness of financial institutions (in our case of banking institutions) for domestic borrowers. A well-developed financial system will supply its customers with good services and attractive offers. Therefore, a well-developed financial system is supposed to have a high ratio of credit to private sector to GDP.

Credit to private sector to GDP ratio is preferred to other indicators suggested by the literature. For example, the ratio of M3/GDP does not always indicate the financial development of a country. As Lynch (1996) states, China has a larger ratio of M3 to GDP than Australia, and almost the same level as Japan; however, no one would claim that the financial development of China is the same as these two countries. In our case, the evolution of broad money ratio to GDP is different than that of domestic credit. The former indicates a steady growth rate starting from 1996, while the latter shows an impressive growth after 2000. Therefore, we choose to use the latter indicator as the greatest development in the banking sector in Albania is after 2000, with the privatization of the state-owned banks and opening of many other new banks.

Khan, Senhadji and Smith (2001) suggest that financial depth may be determined by other variables beside inflation rate. This hypothesis is tested using some control variables such as:

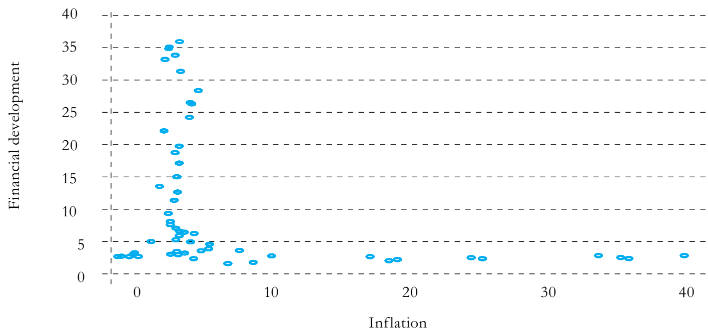
- *The degree of openness*, which is measured as the ratio of trade flow volume (export plus import) and GDP. Economic theory suggests that country's openness to trade may enhance financial depth. As Khan, Senhadji and Smith (2001) state, openness in goods trade may be related to openness to trade in financial services, thus influencing financial development.

- *The degree of financial suppression*, which is estimated as the ratio of government consumption and GDP. A high level of government suppression is generally associated with a high tax burden to economic agents, thus also to financial sector. Also, high government consumption may be financed through issuing government bonds, which are expected to crowd out private investments. The final result will be a reduction of financial depth.

- *Real activity of the economy*, which is measured as real GDP per capita. We include the measure of real activity as a control for the fact that the level of economic development influences financial depth. A higher real activity of the economy enhances the need for financial services. This indicator is also a good proxy for other variables that may affect financial depth.

Figure 6 plots the financial development indicator against inflation. It appears that there is a nonlinear relationship between inflation and financial development, which "flattens" at high inflation rates.

Figure 6: Without instrumental variables



Source: Bank of Albania

VI. ESTIMATION RESULTS

With financial depth, *fd*, as a dependent variable, we estimate 393 regressions to compute the threshold level of inflation. In the first version of the model, financial depth depends on inflation, government consumption and GDP ratio and trade openness. Per capita GDP results insignificant for the financial development. Figure 7 given in the Appendix depicts corresponding sums of residuals as a function of inflation threshold. The residual sum is minimized at 5.1%, which is the proposed estimation of inflation threshold. Table 3 presents the main estimation results of inflation threshold.

The effect of inflation on financial development for inflation rates below or above 5.1% is given by gamma 1 and gamma 2 coefficients. Since gamma 1 coefficient is positive, it suggests that if the initial level of inflation is below 5.1%, a marginal rate of price increase will harm financial depth, but the coefficient is insignificant. On the other hand, gamma 2 coefficient is statistically significant but it has the wrong sign. This implies that once inflation exceeds 5.1%, further increases appear to be associated with significant further improvements in financial development. Therefore, even though the results suggest that the relationship between inflation and financial market performance is nonlinear, the relationship is in contradiction with the prediction of the theory. Bootstrap testing provides a high p-value, thus confirming that the threshold inflation-financial development (nonlinear) model does not fit statistically better than the linear one. Inflation threshold of 5.1% is statistically insignificant.

Table 3 Estimation results

Variable	Financial depth
Gamma 1	0.79
Gamma 2	-32.1*
Trade openness	0.66***
Financial repression	-3.09***
Inflation threshold	5.1%
R2	0.65

Note: * statistically significant for α=10%.
*** statistically significant for α=1%.

Having established that there appears to be no threshold effect and a direct relationship between inflation and financial depth in Albania, the next step is to analyze the relationship between other macroeconomic variables and financial development. The results confirm that trade openness and financial repression provide the expected effect on financial development. This is important as the study gives some insight on various factors affecting financial depth in Albania.

According to the estimation, financial repression (the ratio of government consumption and GDP) affects negatively financial depth. The coefficient is high and statistically significant. These results suggest that there is crowding-out effect on credit to private sector in Albania, which provides a basis for further research work on this area.

On the other hand, country's trade openness has a positive impact on financial depth, confirming the theoretical view that international trade of goods and services enhances financial development.

A. CORRECTING FOR POTENTIAL ENDOGENEITY OF INFLATION

In order to correct for potential endogeneity problems, the model is reestimated using instrumental variables for all potential endogenous variables, including inflation, GDP per capita and the degree of openness. Khan et al. (2001) argue that lagged variables are a good choice of instruments. In our case, the model is reestimated with the first lag of these variables as instruments, and then the bootstrap procedure is used to test the hypothesis of an inflation threshold. Table 5 presents the estimation results of the second version of the model for inflation threshold with instrumental variables.

Table 4 Estimation results with instrumental variables

Variable	Financial depth
Gamma 1	0.26
Gamma 2	-83.9***
Trade openness	1.01***
Financial repression	-5.4***
Inflation threshold	5.1%
R2	0.52

Note: *** statistically significant for α=1%.

According to the second estimation, inflation threshold is again 5.1%. This model explains a smaller part of financial depth compared to the first version. The results are similar to the first version of the model. Gamma 1 and Gamma 2 coefficients have the wrong sign, and bootstrapping confirms again that there appears to be no threshold effect in the relationship between inflation and financial depth in Albania.

The rest of the results are similar to the original one. We find that higher government consumption crowds out the ratio of domestic credit to GDP, thus more severe financial suppression depresses financial depth. Trade openness supports financial intermediation, and per capita GDP again is not statistically significant. The only difference between the model with instrumental variables and the first version is that the impact of the variables on financial depth is stronger.

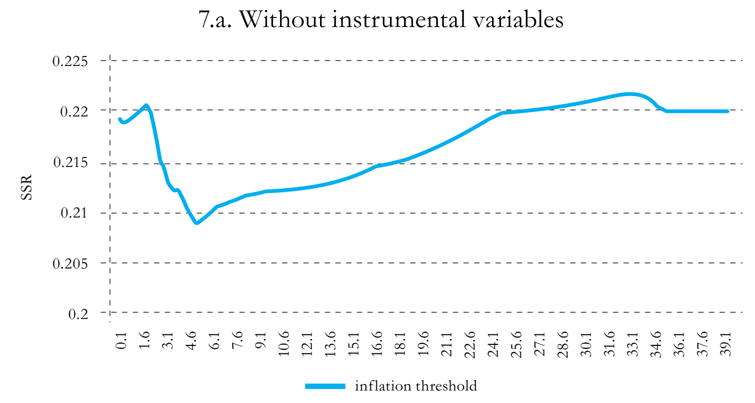
Even though we focused our research on developments of the private sector credit and inflation, we checked whether other measures of financial depth, such as the ratio of broad money to GDP and the ratio of domestic credit to total credit, would perform better. The results are the same. Empirical findings do not support a threshold relationship between inflation and financial depth in Albania. There might be several reasons for these results: even though the relationship inflation-financial depth appears to be hyperbolic, other possible forms of the relationship could be applied; short series of data could also be a problem, which is emphasized by the fact that financial depth in Albania basically started after 2000 with the privatization of the banking system and the entrance of several foreign large banking groups.

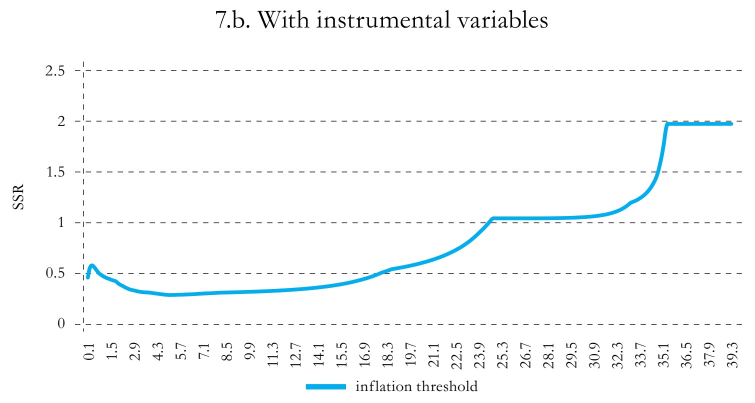
V. CONCLUSIONS

This paper examines the issue of the existence of threshold effects in the relationship between inflation and financial depth over the period 1996-2009. The empirical results suggest that there is no threshold relationship and inflation appears to not directly affect financial development.

However, financial depth appears to be affected by other macroeconomic variables. There is a positive and significant relationship between trade openness and financial depth suggesting that the openness of the Albanian economy is important to enhance financial deepening. On the other hand, financial repression as measured by government consumption has a negative and significant impact on financial development. As this is the first paper dealing with the factors affecting financial depth in Albania, it would be interesting to further research on these results. This would be particularly interesting as Dushku (2010) concludes that financial depth enhances economic growth in the long run. Therefore, determining the factors, which have an impact on financial depth, also helps to understand economic growth progress.

Figure 7 Sum of squared residuals as a function of threshold inflation (figure a), and including instrumental variables (figure b)





Source: Bank of Albania

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BULGARIA'S EXPORT PRICES AND PRICING-TO-MARKET BEHAVIOUR

Emilia Penkova
*Peter Sinclair**

ABSTRACT

The paper tests for potential pricing-to-market for the export industries of textiles and machinery in Bulgaria, at eight-digit level over the period 1998-2008. Panel estimation is undertaken and a fixed-effects linear model is estimated. The empirical evidence reported here offers new evidence for Bulgaria that has not been investigated before. The observed evidence of price discrimination is mainly in exports to the EU, where export prices are relatively stable in local currency in the destination markets. There is no evidence for pricing-to-market for exports to the Balkan and the new EU member countries.

JEL classification: C23, F14, P20.

Keywords: pricing-to-market, transition economies, panel data

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The views expressed in the paper are those of the authors and not necessarily of the institutions mentioned above.

1. INTRODUCTION

The incorporation of imperfect competition into trade theory in mid-1980s has led to a growing body of empirical research, which supports the existence of pricing-to-market (henceforth PTM) behaviour. A partial list of studies includes inter alia Krugman (1987), Froot and Klemperer (1989), Knetter (1989, 1993, 1994), Marston (1990), Kasa (1992), Gagnon and Knetter (1995) and Gil-Pareja (2000).

The studies of PTM reveal an important feature of the competitive process in the traded goods market, more particularly, how the failure of traded goods prices to respond to exchange rate changes affects the international competitiveness of exporting firms. The empirical evidence on PTM is, however, mainly limited to advanced economies such as United States, Japan and Germany, prompted by the large trade imbalances among the three countries during the 1980s. Knetter (1989) and Marston (1990) present substantial highly disaggregated industry-level evidence that Japanese and German exporters use destination-specific mark-up adjustment to stabilize local-currency prices of exports, although for Japan most of the evidence is based on pricing to the US. Knetter (1993) finds strong evidence of differences in PTM behavior across a number of export industries for US, UK, Germany and Japan. Gagnon and Knetter (1995) also examine mark-up adjustment by Japanese, German and US exporters using panel data on disaggregated car exports and find that Japanese exporters offset approximately 70% of the effect of exchange rate changes on buyers' prices through mark-up adjustment. Also, Gil-Pareja (2000) tests for asymmetries in PTM behavior for selected export industries in several EU member states[1].

The aim of the paper is to test for potential PTM behavior for the export industries of textiles and machinery in Bulgaria at eight-digit level over the period 1998-2008. These industries have been selected as they are more open to trade and undergo strong competition. The analysis is at highly disaggregated level to avoid spurious aggregation problems. The empirical evidence reported here offers new evidence for Bulgaria that has not been investigated before and it also reveals

1 Belgium, France, Germany, Italy, the Netherlands, Spain and the United Kingdom.

important features of the relationship between exchange rates and export goods prices in the context of the trade competitiveness of the new EU member countries.

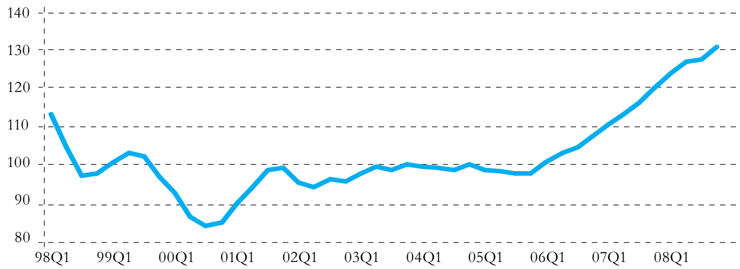
The optimal response of a firm's export price to changes in currency values depends on a variety of factors. These factors operate through two channels: through the impact the exchange rate has on marginal cost, and through the impact the exchange rate has on mark-up of price over marginal cost. Krugman (1987) labeled the destination-specific adjustment of mark-ups in response to exchange rate changes as "pricing-to-market" (PTM). In other words, PTM occurs when sellers reduce mark-ups to buyers whose currencies have depreciated against the seller, thereby stabilizing prices in the buyer's currency[2]. The notion of "pricing strategies" is, however, sensible only if firms operate in an imperfectly competitive environment, or export market segmentation is a necessary condition for the existence of price discrimination in general and PTM in particular[3]. Possible reasons why prices are not equalized across buyers in different markets could be: geographic factors, product heterogeneity, incomplete information, transportation costs and trade barriers, or this is a form of third degree price discrimination. It is possible that PTM involves some second degree discrimination as well – i.e. buyers facing a non-linear pricing schedule.

The selected period of the empirical analysis (1998-2008) of Bulgarian exports is characterized by a trend of real exchange rate appreciation of the exporting country (see Graph 1.1), which is usually explained by the successful real and nominal convergence of the country with the Euro zone.

2 Knetter (1993) refers to it as local currency price stability.

3 The reasons for segmentation are, however, not addressed in the theoretical models.

Graph 1.1 Real Effective Exchange Rate of Bulgaria, based on ULC (1999=100)



Source: European Commission, Price and Cost Competitiveness, May 2009

Note: The REER index is calculated relative to a basket of 36 industrial countries.

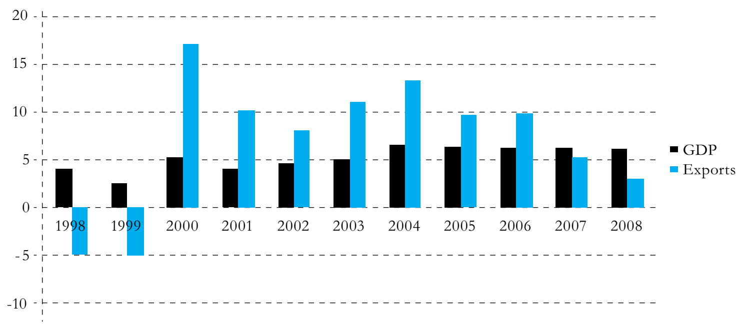
Evidence of PTM for Bulgarian exports over the period of investigation may reveal some useful information on industry strategies. For example, what is the adjustment pattern in the selected industries: do they adjust prices to the real exchange rate appreciation, so they can maintain competitiveness? Evidence on this point might provide some information about the economic objectives in determining industry behavior.

The structure of the rest of the paper is as follows. Section 2 provides some stylized facts about exports over the period 1998-2008. Section 3 presents the theoretical framework. Section 4 introduces the empirical model. Section 5 describes the variables and the sources of data. Section 6 shows the estimation results. Section 7 offers some concluding remarks, and finally the geographical structure of Bulgarian exports, the empirical results and the description of codes are presented in the Appendix.

2. STYLIZED FACTS ABOUT BULGARIAN EXPORTS OVER THE PERIOD 1998-2008

A Currency Board Arrangement was implemented in mid-1997 by fixing the national currency to the Deutsche Mark (and since 1 January 1999 – to the Euro). Since the adoption of the currency board, GDP and exports growth have been strong (see Graph 2.1). The main exporting partner of Bulgaria is the EU, which accounts for around 50% of total exports in 2008. The Balkan countries are the second important partner and their share is around 25% of total exports in 2008. The respective share of the new EU member countries is around 14%.

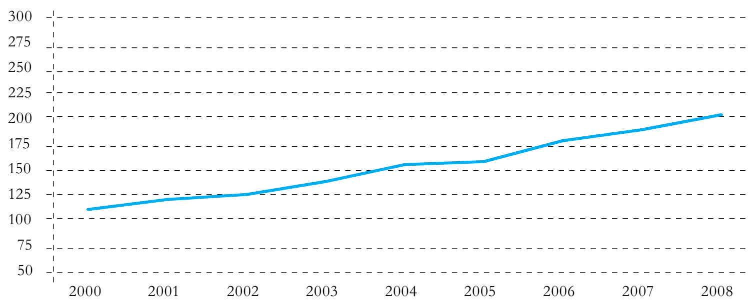
Graph 2.1 Real Growth Rates of GDP and Exports



Source: Bulgarian National Bank

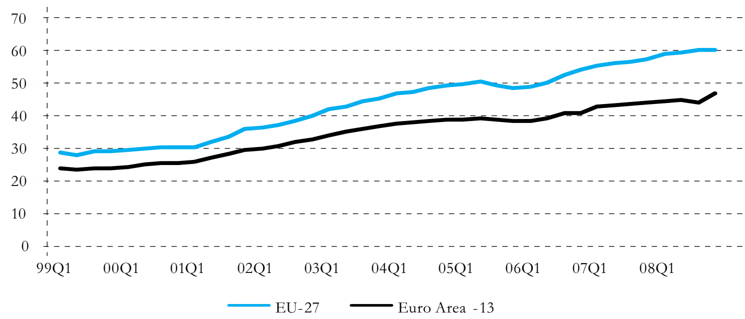
During the period of observation there is a sustainable increase in the share of Bulgarian exports in world exports (see the Graphs 2.2 and 2.3). Furthermore, the important role played by the EU as a main trading partner is evident by the significant increase of the share of Bulgarian exports in the EU27 imports, which was 0.28% in 1999, compared to 0.59% in 2008.

Graph 2.2 Share of Bulgarian Exports of Goods in World Exports (1999=100)



Source: European Commission, AMECO database, last update 22 April 2009

Graph 2.3 BG exports' share in total EU imports (annualized)



Source: EuroStat

The exports of investment goods to the EU increased over the period of investigation (see Table 2 in the Appendix) from 10% (share of total exports) in 1998 to 17% in 2008. The export of investment goods is also relatively high to the new EU member countries; it accounts for 15% of total exports in 2008. As for the exports of investment goods to the Balkan countries, it had a relatively constant share over the period of investigation - around 5%.

The exports of textiles to the EU registered a decrease over the period 1998-2008 from 11% to 8% due to the fierce competition in this industry; however, the share of textiles to the EU is still relatively high. As for the new EU member countries and the Balkan countries, the share is relatively low – 0.6% and 0.2%, respectively.

3. THEORETICAL FRAMEWORK

The paper follows the model of price discrimination and the panel data empirical framework introduced by Knetter (1989). The use of disaggregated product categories allows us to assume that exchange rate changes are exogenous to the export industries, and consequently the analysis is partial equilibrium in nature. Consider a firm that produces goods for sale in n separate destination markets, indexed by i. The profits of the firm are given by:

$$\prod(p_1,......,p_n)=\sum_{t=1}^{n}p_iq_i(e_ip_i)-C\left(\sum_{i=1}^{n}q_i(e_ip_i),w\right) \tag{1}$$

where p is the export price (i.e. price in the exporter's currency), e is the exchange rate per unit of exporter's currency deflated by the price level in the destination market, q is quantity demanded (a function of the export price relative to the price level in the destination market), w is an index of input prices in units of the exporter's currency, and C is the total cost function. The first order conditions for profit maximization imply that the firm equates the marginal revenue from sales in each market to the common marginal cost. Alternatively, the export price to each destination is the product of the common marginal cost (c) and a destination specific mark-up:

$$p_{it}=c\left(\frac{\varepsilon_{it}(e_{it}p_{it})}{\varepsilon_{it}(e_{it}p_{it})-1}\right) \qquad i=1,.....,n \tag{2}$$

where ε_{it} is the absolute value of the elasticity of demand in the foreign market with respect to changes in price or this is the perception that the firm has about the value of the elasticity of demand with respect to the destination currency price in market i in period t. Equation (2) shows that the firm's optimal export price to each destination in period t depends on two factors: the common marginal cost and the mark-up of price over marginal cost, which may be common or destination-specific.

4. THE EMPIRICAL MODEL

The empirical framework adopted here follows the one introduced in greater detail in Knetter (1989, 1993). The motivation comes from a simple model of price discrimination by a monopolist selling to several export destinations (equation 2). Price changes to any destination will consist of two components: (1) changes in marginal cost, and (2) changes in the mark-up of price over marginal cost. As we assume that total costs of the firm are independent of the market of sale, therefore, marginal cost is the same for all destination markets but can vary over time (ct) due to changes in quantity produced, technology, or input prices. Destination-specific adjustment of mark-ups occurs in response to changes in variables that are unique to each destination. Knetter (1993) argues that the most important destination–specific explanatory variable is the exchange rate between the exporter's currency and the currency of the destination market. He admits that other factors such as changes in income in the destination market may also play a role[4], however, he considers them of secondary importance. An interesting area for further research would be to investigate how the inclusion of quality factors could affect the estimated relationship[5]. However, here we are concerned with exports of Bulgaria and the lack of disaggregated data on demand and quality factors lead us to follow Knetter (1993) and estimate the following equation:

$$\Delta p_{it} = \theta_t + \alpha_i \Delta e_{it} + u_{it} \tag{3}$$

This is a fixed-effects linear model, where Δ is the first difference operator, p is the log of export price in units of the exporter's currency, e is the log of the bilateral exchange rate (expressed as units of the buyer's currency per unit of the exporter's currency adjusted by the Producer Price Index in the destination market), i and t index n destination markets and T time periods, respectively, and θ_t and α_i are parameters to be estimated. The intercept term is allowed to vary due to effects that are constant across industries but vary over time (the θ's). The primary underlying factor that accounts for such movements is marginal cost of the exporters. It is also possible that some common movement in prices is due to changes in the mark-up over marginal cost and is common to all destination markets. The time effects will be treated as fixed. The model allows for the slope coefficients to vary across destinations, which is crucial for capturing PTM.

We cannot determine with confidence the time-series properties of the variables because of the short-time dimensions of the data. However, if they are non-stationary, level regressions will be spurious.

4 We included GDP of the destination markets in the estimated empirical equation (as a proxy for domestic demand); however, it was in all cases insignificant and very often with the wrong sign.

5 We could assume that the issue of quality is solved by considering the data set at the highly disaggregated 8-digit level.

As can be seen from equation (2), the economic insights[6] and the unit root results about the properties of the variables reported in previous research[7], lead us to perform estimations in first differences.

The empirical estimation is at a very highly disaggregated (eight-digit) level to eliminate the issue of heterogeneity and quality.

5. DATA

The data used in this study are based on the annual value and quantity of exports to selected destination countries for textiles and machinery at eight-digit level. The destination markets are EU countries: Germany, France, UK, Italy; new EU member countries: Czech Republic, Hungary, Poland; and Balkan countries: Greece, Macedonia and Turkey. The sample period is 1998 to 2008 and the data are obtained from the Bulgarian National Bank. The exchange rate series, used as an independent variable, is expressed in units of the buyer's currency per unit of the exporter's currency, and is based on the annual average nominal exchange rate collected from Eurostat. The nominal rates are adjusted by dividing by the Producer Price Index (except for Macedonia and Turkey where CPI is used) in the destination market. The reason for this adjustment is that the optimal export price should be neutral with respect to changes in the nominal rate that correspond to inflation in the destination market. The Producer Price Indices and the Consumer Price Indices are annual averages collected from Eurostat. Marginal costs and mark-ups are not observed directly[8], but common movements in prices due to changes in marginal cost or common mark-up changes are accounted for by including a full set of time dummies in the model. The specific industries selected and the data sources for the unit-value data are listed in Description of the Codes at Eight-Digit Level (p.18). It should be noted that the criterion for selection of the destination countries and industries was the availability of data. This suggests that sampling is not random and as a result caution should be taken in drawing inferences about other trading relationships.

6 We are interested in the change of the mark-up in response to the change of the exchange rate.

7 Knetter (1993), Gagnon and Knetter (1995) and Gil-Pareja (2000).

8 Knetter (1989) discusses the disadvantages of using available data to proxy for marginal costs.

6. ESTIMATION AND EMPIRICAL RESULTS

PTM is a phenomenon about divergence between prices of goods sold to one particular market and to other market. For this purpose, panel estimation is undertaken and a fixed-effects linear model is estimated.

The inference about PTM evidence depends entirely on the interpretation of the estimated coefficient of α (equation (3)) which is as follows: a value of zero means that the mark-up to a particular destination is unresponsive to fluctuations in the value of the exporter's currency against the buyer's; therefore, changes in currency values would be fully passed through to the buyer; negative values of α imply that mark-up adjustment is associated with local currency price stability; positive values of α correspond to the case in which destination-specific changes in mark-ups amplify the effect of destination-specific exchange rate changes on the price in units of the buyer's currency. Furthermore, we also need to test if this coefficient can be constrained across destinations.

The empirical estimation follows three stages. First, for each industry, the regression equations for the different destinations are estimated jointly, imposing the cross-equation restrictions. Tables 3-5 (p.13-15) present the estimated values of α when it is constrained to be the same across destinations. Second, an F-test is undertaken only for a significant coefficient to test if it is the same across destinations. Third, tests by Giovannini (1988) have been employed to disentangle deliberate, ex-ante price discrimination from the ex-post outcome of exchange rate shocks. According to these tests, if price discrimination is the source of ex-ante PTM, then deviations from the Law of One Price should be predictable, whereas if pre-set prices and exchange rate volatility are the source of ex-post PTM, then deviations from the Law of One Price should be unpredictable.

PTM appears to be an important phenomenon for eight exporting industries to the EU: six industries in textiles (out of eleven) and two industries in machinery (out of four). These industries are: men's trousers, women's jackets (knitted or crocheted), women's jackets (excl. knitted or crocheted), women's skirts (excl. knitted), women's blouses, women's garments of cotton, parts of pulley tackles and hoists and valves. There is no exporting industry to the new EU member countries and to the Balkan countries for which PTM is important.

The negative values of α imply that mark-up adjustment is associated with stabilization of local currency prices. For example, a value of –2.9 (Bulgarian exports of men's trousers to the EU) means that in response to a 10% depreciation (appreciation) of the buyer's currency, the Bulgarian exporters would reduce (increase) their mark-up by 29% relative to the mark-up charged to other destination markets. We receive a positive value of α for three industries. These are: women's jackets, women's garments and valves. Positive values of α imply that destination-specific mark-up adjustment amplifies the effect of exchange rate changes on the local currency price. This finding of "perverse" PTM is not necessarily implausible. Measurement error might bias α upward. It may also be due to heterogeneity either within the sector or within the market of consumers. For example, when an exchange rate movement causes an exporter to raise prices, he may lose sales to his most price-elastic consumers first, or, he may lose sales of products that face the highest price elasticity of demand[9].

The issue of pre-set pricing and invoicing decisions is an important one especially for countries in transition. If prices are set in foreign currency, which is quite often the case in Bulgaria (often they are in euro), then the pass-through will be nil and PTM will be complete. That is why for the industries for which we find evidence of PTM we employ Giovannini (1988) tests to see if the measured PTM is due to ex-ante price discrimination or it is simply the ex-post outcome of exchange rate shocks. The main idea is that if price discrimination is the source of ex-ante PTM, then deviations from the Law of One Price should be predictable. The test projects the log of relative price on information available at t-1. The information set includes lagged values of the dependent variable, and the logs of the countries' producer price index, the countries' industrial production, and the bilateral exchange rate. All variables are expressed as deviations from deterministic trends. The null hypothesis is that all coefficients but the constant term are equal to zero. The results are in Table

9 In the case of "normal" PTM, the price elasticity of demand increases with the price charged.

6 (p.16). They show that in most cases with very few exceptions: women's jackets for Germany-Italy and women's garments of cotton for Germany-Italy, the observed PTM is not due to ex-ante price discrimination but it is ex-post outcome of exchange rate shocks.

A lag of the exchange rate change has also been included in the equation (3) as an attempt to incorporate dynamic considerations. Whether and how much the price is adjusted in response to an exchange rate change depends critically on how long the latter is expected to last. However, there is no industry for which the long-run price response is significant. Therefore, over the period of investigation there is no evidence of long-term PTM.

In summary, there is some evidence of price discrimination for Bulgarian exports over the period 1998-2008, which is mainly to the EU.

On the one hand, the ex-ante price discrimination can be rationalized in the following ways: First, the EU is the main trading partner of Bulgaria, and instead of passing through the exchange rate changes into export prices firms reduce mark-ups to keep onto their markets shares in the EU countries. Second, there are several arguments that may justify the preference for price stability: the desire by an exporter to appear stable and respectable, the general uncertainty about competitors' reactions to price changes, and the direct cost of making frequent changes.

On the other hand, the ex-post PTM is a result of the invoicing in euro which is an outcome of the euroization in Bulgaria and the credibility of the currency board that played a crucial role for the strong GDP and export growth in the country over the period of observation.

In searching for reasons to justify the lack of empirical evidence for Bulgarian exporters to price-to-market in the Balkan and the new EU member countries, we need to emphasize that despite an increase in the share of Bulgarian exports in these countries, they play a secondary role for the Bulgarian trade, after the EU countries. Also, as a whole, these markets are smaller compared to the EU and this may suggest that firms do not experience so much competition, and are not that willing to reduce their mark-ups when there is a real exchange rate appreciation of the Bulgarian currency, or they exhibit a different pattern of adjustment.

7. CONCLUSIONS

The current empirical analysis reveals new insights into the concept of PTM by expanding the countries for which it can be applied. In particular, comparisons across destination countries in relation to PTM by producers from Bulgaria have not been undertaken before. The paper has documented that export price differentials across destinations for very detailed products exist and are sensitive to exchange rate changes. Furthermore, with this paper we shed some light on the ambiguity in the relationship between "market power" and PTM. The previous research has been focused mainly on the big advanced economies, such as USA, Germany and Japan, searching for evidence of PTM resulting from "market power", as we would expect to have substantial PTM when the exporting firm has a great deal of monopoly power. The same result can, however, be observed when exporting firms have relatively small share of the foreign market and thus less influence over the equilibrium price.

PTM is an important strategy for the new EU member countries in the context of the ongoing orientation of trade flows towards the EU countries and trade competitiveness in the EU, especially when we observe appreciation of their real exchange rate. This suggests that future research should attempt to include more countries and analyze the effect of exchange rate changes not only on their export but also their import prices. Furthermore, the empirical analysis can be extended in several different ways. First, tests for PTM between export and domestic markets could reveal more evidence of PTM. Second, PTM can occur due to hysteresis in trade volumes. For example, in the presence of hysteresis in export quantity adjustment through entry or exit, a firm with a longer planning horizon could price-to-market and give more emphasis to market share. Finally, non-parametric methods could be employed to address non-linearities between exchange rates and price changes, or PTM could be due to a second degree segmentation as well.

Table 1 Geographical Structure of Bulgarian Exports

Shares of Total Exports

	EU excl. Greece	Balkan countries incl.	New member countries
1998	48.30%	22.00%	6.70%
1999	48.60%	23.10%	5.20%
2000	48.40%	28.30%	4.70%
2001	51.90%	24.70%	5.90%
2002	52.90%	24.70%	6.40%
2003	52.80%	25.90%	6.70%
2004	52.30%	25.70%	8.00%
2005	50.80%	27.00%	8.70%
2006	51.70%	27.30%	10.30%
2007	51.70%	28.80%	11.60%
2008	50.30%	27.70%	13.60%

Source: Bulgarian National Bank

Shares of EU Exports

	Italy	Germany	France	UK
1998	27.10%	22.00%	7.10%	5.30%
1999	28.60%	20.20%	9.30%	5.20%
2000	29.30%	18.60%	9.90%	4.90%
2001	28.80%	18.40%	10.80%	5.10%
2002	29.20%	18.10%	10.10%	5.50%
2003	26.50%	20.40%	9.60%	4.80%
2004	25.00%	19.50%	8.60%	4.80%
2005	23.50%	19.30%	9.10%	4.30%
2006	19.60%	18.70%	8.10%	5.00%
2007	19.90%	19.90%	7.70%	4.80%
2008	16.90%	18.30%	8.10%	4.20%

Source: Bulgarian National Bank

Shares of New Member Countries Exports

	Poland	Hungary	Czech Republic
1998	19.70%	11.60%	5.50%
1999	14.30%	12.10%	7.40%
2000	11.30%	11.70%	6.90%
2001	11.40%	11.00%	7.20%
2002	11.30%	10.50%	7.60%
2003	12.30%	12.40%	8.40%
2004	12.60%	10.80%	7.30%
2005	12.50%	8.90%	5.80%
2006	14.40%	8.80%	6.60%
2007	14.20%	9.10%	6.10%
2008	14.00%	7.00%	6.70%

Source: Bulgarian National Bank

Share of Balkan Countries Exports

	Greece	Turkey	Macedonia
1998	40.10%	36.10%	8.30%
1999	37.40%	31.80%	11.50%
2000	27.50%	36.20%	8.00%
2001	35.50%	32.70%	8.90%
2002	37.30%	37.80%	9.00%
2003	40.00%	35.30%	7.90%
2004	38.70%	38.90%	8.10%
2005	34.90%	38.80%	7.40%
2006	30.40%	39.40%	7.50%
2007	31.60%	39.70%	7.30%
2008	35.60%	31.80%	8.30%

Source: Bulgarian National Bank

Table 2 Structure of Exports of Textiles and Investment Goods by Trading Partners (of total exports)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
EU											
Textiles	11%	14%	14%	17%	18%	19%	17%	14%	12%	10%	8%
Investment goods	10%	12%	11%	11%	12%	12%	12%	14%	15%	17%	17%
New member countries											
Textiles	0.10%	0.20%	0.20%	0.20%	0.40%	0.50%	0.70%	0.70%	0.70%	0.60%	0.60%
Investment goods	40%	13%	15%	13%	17%	18%	15%	23%	21%	14%	15%
Balkan countries											
Textiles	0.10%	0.20%	0.30%	0.30%	0.40%	0.60%	0.50%	0.40%	0.30%	0.20%	0.20%
Investment goods	5%	5%	4%	4%	5%	5%	6%	5%	6%	5%	6%

Source: Bulgarian National Bank

Table 3 Bulgarian Exports to EU- Constrained Estimates of α from equation 3

Product Code and Description	α	F statistic
Textiles		
61103091– men's jerseys	-0.895 (1.998)*	2.416
61103099– women's pullovers	-0.694 (2.196)*	2.180
61045300– women's or girls' skirts (knitted or crocheted)	-1.341 (1.778)**	1.150
62034919– men's trousers	-2.947 (1.924)**	4.620*
62043100– women's or girls' jackets (knitted or crocheted)	-0.771 (2.178)*	7.925*
62043390– women's jackets	0.926 (2.517)*	6.858*
62044100– women's dresses	-3.030 (2.455)*	0.895
62045200– women's or girls' skirts (excl. knitted or	-0.953 (1.747)**	6.038*
62063000– women's or girls' blouses (excl. knitted or	-0.865 (1.712)*	6.604*
62114390– women's or girls' garments of cotton	1.063 (1.920)**	3.590**
62179000– clothing accessories	-5.345 (2.886) *	1.150
Machinery		
84311000– parts of pulley tackles and hoists	-6.97 0 (3.737)*	4.542*
84812010– valves	0.744 (1.780)**	4.433*
85030099– parts for electric motors	0.1 (0.0 78)	
85322500– fixed electrical capacitors	2.514 (0 .937)	

Note: T-statistics are given in parentheses.

* Significant at 5% level.

** Significant at 10% level.

*** Constraint rejected at 5% level for significant α.

Table 4 Bulgarian Exports to Balkan countries- Constrained Estimates of α from equation 3

Product Code and Description	α		F statistic
Textiles			
61061000– women's or girls' blouses	-0.242	(0.13 4)	
61091000- t-shirts	-0.219	(0.345)	
Machinery			
84099900– parts for diesel or semi-diesel engine	0 .231	(0.244)	
84224000– wrapping machinery	0.860	(1.630)	
84229090– parts of wrapping machinery	0.844	(0 .233)	
84311000– parts of pulley trackles and hoists	-1 .177	(1.972)*	1.841
84312000– parts of trucks	0.383	-0.5	
84314300– parts of sinking machinery	-1.79	(1.4 46)	
84522900– sewing machines	-0.742	-0.824	
84223000– machinery for filling bottles	-0.522	-0.45	

Note: T-statistics are given in parentheses.
* Significant at 5% level.
** Significant at 10% level.
*** Constraint rejected at 5% level for significant α.

Table 5 Bulgarian Exports to New EU member countries- Constrained Estimates of α from equation 3

Product Code and Description	α		F statistic
Textiles			
61091000– t-shirts, knitted or crocheted	-1.893	-0.706	
61102091– men's or boy's jerseys	-1.991	-0.628	
Machinery			
84099900– parts for diesel or semi-diesel engine	-1.015	-0.473	
84272019– works trucks	-0.239	-0.754	
84311000– parts of pulley tackles and hoists	-0.45 6	-1.213	
84822000– parts suitable for use with electric motors and generators	-0.245	-1.089	
85030099– fire alarms and similar apparatus	-0.205	-0.345	
85311030– taper roller bearings	-0.197	-0.234	

Note: T-statistics are given in parentheses.
* Significant at 5% level.
** Significant at 10% level.
*** Constraint rejected at 5% level for significant α.

Table 6 Tests for ex-ante price discrimination

Code and description	R^2	Wald test -probability
62034919 – men's trousers		
Germany-UK	$R^2=0.70$	F(0.7140)
Germany-France	$R^2=0.80$	F(0.3420)
Germany-Italy	$R^2=0.30$	F(0.9856)
Italy-UK	$R^2=0.75$	F(0.4328)
Italy-France	$R^2=0.80$	F(0.3650)
France - UK	$R^2=0.85$	F(0.2188)
62043100 – women's jackets (knitted or crocheted)		
Germany-UK	$R^2=0.87$	F(0.3850)
Germany-France	$R^2=0.91$	F(0.2693)
Germany-Italy	$R^2=0.99$	F(0.0102)*
Italy-UK	$R^2=0.85$	F(0.2345)
Italy-France	$R^2=0.80$	F(0.3750)
France - UK	$R^2=0.77$	F(0.6031)
62043390- women's jackets (excl. knitted or crocheted)		
Germany-UK	$R^2=0.79$	F(0.5518)
Germany-France	$R^2=0.51$	F(0.9042)
Germany-Italy	$R^2=0.74$	F(0.6513)
Italy-UK	$R^2=0.78$	F(0.4328)
Italy-France	$R^2=0.80$	F(0.5231)
France - UK	$R^2=0.96$	F(0.1342)
62045200 – women's skirts (excl. knitted)		
Germany-UK	$R^2=0.90$	F(0.3039)
Germany-France	$R^2=0.67$	F(0.7530)
Germany-Italy	$R^2=0.53$	F(0.8918)
Italy-UK	$R^2=0.88$	F(0.3500)
Italy-France	$R^2=0.80$	F(0.2780)
France - UK	$R^2=0.92$	F(0.2427)
62063000 – women's blouses		
Germany-UK	$R^2=0.90$	F(0.3184)
Germany-France	$R^2=0.86$	F(0.4091)
Germany-Italy	$R^2=0.89$	F(0.3295)
Italy-UK	$R^2=0.77$	F(0.5910)
Italy-France	$R^2=0.85$	F(0.2340)
France - UK	$R^2=0.90$	F(0.3020)

62114390 – women's garments of cotton			
Germany-UK		R^2=0.81	F(0.5148)
Germany-France		R^2=0.91	F(0.2645)
Germany-Italy		R^2=0.99	F(0.0430)*
Italy-UK		R^2=0.75	F(0.6360)
Italy-France		R^2=0.80	F(0.2437)
France - UK		R^2=0.70	F(0.7141)
84311000 – parts of pulley hoists	*tackles and*		
Germany-UK		R^2=0.71	F(0.6998)
Germany-France		R^2=0.96	F(0.1167)
Germany-Italy		R^2=0495	F(0.9378)
Italy-UK		R^2=0.80	F(0.5679)
Italy-France		R^2=0.75	F(0.2349)
France - UK		R^2=0.36	F(0.9728)
84812010 - valves			
Germany-UK		R^2=0.24	F(0.9937)
Germany-France		R^2=0.99	F(0.0420)
Germany-Italy		R^2=0.89	F(0.3421)
Italy-UK		R^2=0.80	F(0.4328)
Italy-France		R^2=0.49	F(0.2287)
France - UK		R^2=0.67	F(0.7513)

* Significant at 5% level.

** Significant at 10% level.

6104 53 00	Women's or girls' skirts and divided skirts of synthetic fibres, knitted or crocheted
6106 10 00	Women's or girls' blouses of cotton, knitted or crocheted
6109 10 00	T-shirts, singlets and other vests of cotton, knitted or crocheted
6110 20 91	Men's or boys' jerseys, pullovers and cardigans, knitted or crocheted
6110 30 91	Men's or boys' jerseys, pullovers, cardigans, waistcoats and similar articles, of man-made fibres, (excl. lightweight fine knit roll, polo or turtleneck jumpers and pullovers and wadded waistcoats)
6110 30 99	Women's or girls' jerseys, pullovers, cardigans, waistcoats and similar articles, of man-made fibres, knitted or crocheted
6203 49 19	Men's or boys' trousers and breeches of artificial
6204 31 00	Women's or girls' jackets and blazers of wool or fine animal hair
6204 32 90	Women's or girls' jackets and blazers of cotton
6204 33 90	Women's or girls' jackets and blazers of synthetic fibres
6204 39 19	Women's or girls' jackets and blazers of artificial fibres
6204 41 00	Women's or girls' dresses of wool or fine animal hair
6204 51 00	Women's or girls' skirts and divided skirts of wool or fine animal hair
6204 52 00	Women's or girls' skirts and divided skirts of cotton
6206 30 00	Women's or girls' blouses, shirts and shirt-blouses of cotton
6211 43 90	Women's or girls' garments, of man-made fibres
6217 90 00	Parts of garments or clothing accessories, of all types of textile materials
8409 99 00	Parts suitable for use solely or principally with compression-ignition internal combustion piston engine "diesel or semi-diesel engine"
8422 40 00	Packing or wrapping machinery, incl. heat-shrink wrapping machinery
8422 90 90	Parts of packing or wrapping machinery
8427 10 10	Self-propelled works trucks powered by an electric motor
8427 20 19	Works trucks, self-propelled, with a lifting height >= 1 m, non-powered with an electric motor
8431 10 00	Parts of pulley tackles and hoists (other than skip hoists), winches, capstans and jacks
8431 20 00	Parts of fork-lift trucks and other works trucks fitted with lifting or handling equipment
8422 30 00	Machinery for filling, closing, sealing or labelling bottles, cans, boxes, bags or other containers; machinery for capsuling bottles, jars, tubes and similar containers; machinery for aerating beverages
8431 43 00	Parts for boring or sinking machinery
8452 29 00	Sewing machines, industrial type
8481 20 10	Valves for the control of oleohydraulic power transmission
8503 00 99	Parts suitable for use solely or principally with electric motors and generators, electric generating sets and rotary converters
8531 1030	Fire alarms and similar apparatus
8532 25 00	Fixed electrical capacitors, dielectric of paper or plastics

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ALBANIA'S CURRENT ACCOUNT DEFICIT AND POLICY IMPLICATIONS

Ilir Vika

ABSTRACT

This paper tries to assess the current account norm in Albania. For this reason, we have followed the accounting framework developed by Lane and Milesi-Ferretti (2206), as well as the empirical framework that is based on panel data estimations. The "equilibrium" levels suggested by these methods are often dissimilar, thus the size of current account adjustment needs to be carefully interpreted. The paper aims to shed light also on possible implications that recent external deficit deterioration might have for monetary policy in concert with fiscal policy.

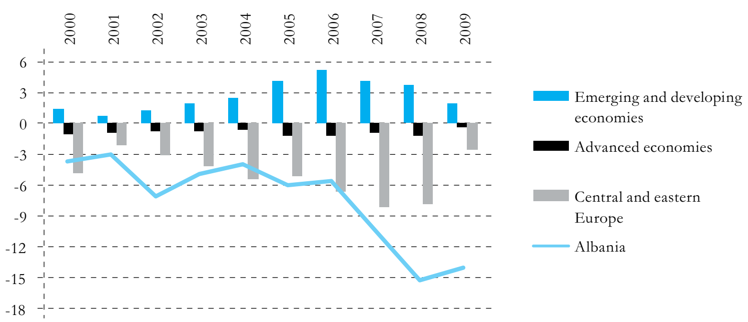
Disclaimer: Discussion Papers are considered as preliminary work that aim at stimulating debate and critical comments. Therefore, they express the views of the author and do not necessarily represent those of the Bank of Albania. I have benefited from invaluable comments by Altin Tanku, Erald Themeli and Eglent Kika (at the Bank of Albania), as well as from participants at the "4th Workshop on Economic Research in Southeastern Europe", organized by the Bank of Albania in November 2010.

1. INTRODUCTION

The Albanian current account balance has deteriorated substantially in recent years. As a matter of fact, statistical figures indicate a widening of external deficit in double-digit levels during 2007-09, which are several percentage points above historical records, and also much higher than average figures for developing economies and countries in Central and Eastern Europe. For that reason, the deepening of current account deficit in Albania has raised questions whether its size can be explained by fundamental factors, or quick stabilizing measures are needed to bring it down.

About half of the current account deficit in the last decade has been covered by foreign direct investments. However, the external sector sustainability might face a hard time with gross foreign debt increasing from 23.6% in 2004 to 38.2% of GDP in 2009, and a fall in short-term debt coverage by reserves from 520 to 165% during the same period.[1] Further, the galloping year after year growth of bank loans in addition to recent increases in budget deficits call the attention to restrain or adjust the current account deficit.

Graph1: Current account balance (% of GDP)



Source: IMF World Economic Outlook, October 2010

The performance of national savings and investments, divided into public and private sectors, gives the impression that large

1 Source: Bank of Albania's Balance of Payments Bulletin 2009, and author's calculations.

capital inflows in recent years have encouraged private consumption growth (by 6 pp of GDP) as well as public investment rise (about 2.5 pp). With the burden of principal and investment income payments rising quickly, improving the trade balance is essential to stabilize and reduce the external position in percent of GDP.

Assessing the sustainable or "normal" level of the external deficit serves, thus, as an additional measure among other indicators of financial stability to understand whether an external adjustment is necessary. One approach for assessing the current account norm is based on the Lane and Milesi-Ferretti's (2006) accounting framework, in which external balance adjustment not only depends on the size of the external position and economic growth, but also on expectations about the rate of return on foreign assets and liabilities. A more sophisticated method for estimating the norm uses econometric regressions on panel data to identify the long-run relationship between current account and its determinants.

Tanku, Ruçaj and Frashëri (2007) assess the current account sustainability in Albania by means of unit root testing. The authors adopt the procedure as proposed by Trehan and Walsh (1991), and Taylor (2002), and modify it to suit a developing country that is characterized by considerable inflows of remittances. After testing for stationarity in the current account during 1994Q1-2006Q4, TRF conclude that current account deficit in Albania is sustainable and does not call on drastic measures from monetary and financial policies.

In this paper, we have relied on the two above-mentioned approaches, i.e. the accounting and empirical frameworks, to form a more realistic picture about the external position sustainability. The simple structure of the accounting framework makes its implications easily comprehensible. It also provides quick evaluation about the external balance sensitivity to output growth and a fall in the relative foreign debt return. While the evaluation derived from the accounting framework serves as a valuable benchmark, econometric techniques rely on empirical regressions on various direct or indirect determinants of the current account, which are not necessarily restricted to the theoretical structure.

The assessment of the Albanian current account benchmarks according to these approaches suggests us that the deficit deepening in recent years is unsustainable. For that reason, this paper discusses in a compact section on the sacrifices that are needed should Albania undertake measures to adjust its deficit, and particularly the short-term implications for monetary and fiscal policies.

The paper is structured as follows. Section 2 briefly describes the accounting framework proposed by Lane and Milesi-Ferretti (2006); next, it analyses the dynamics of external adjustment by means of sensitivity tests, and then makes projections about future trade and current account balances. Section 3 evaluates the current account benchmark using estimates from selected studies, which have paid particular attention to estimating these norms for the Eastern European economies. Section 4 tries to identify the factors that have led to deficit deterioration by estimating a model of the trade balance, with the aim of shedding light on the role of economic policies to bring down deficit. Section 5 makes the concluding remarks.

2. THE ACCOUNTING FRAMEWORK

Based on Lane and Milesi-Ferretti (2006), the balance of payment identity at time *t* can be rewritten to express the change in net foreign assets as follows:

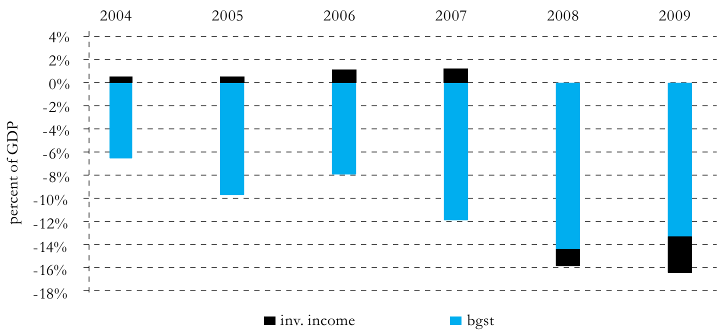
$$b_t - b_{t-1} = ca_t + k_t + kg_t + z_t - \frac{g_t + \pi_t}{(1+g_t)(1+\pi_t)} b_{t-1} \tag{1}$$

where b_t represents net foreign assets expressed in domestic currency; ca_t, k_t and z_t are the current account, capital account, and errors and omissions, respectively; kg_t represent capital gains/losses on net foreign assets (including here the exchange rate revaluation effects), derived from changes in the stock of net foreign assets less net cross-border financial flows (including reserves). All indicators are deflated by GDP, hence expressed in small letters; g_t denotes real GDP growth, while symbol π_t indicates domestic inflation.

The last term in equation (1) can be used to make a rough computation about the required current account balance that would stabilize the external position of the economy. For instance, if a country is expected to have an annual nominal growth of 9% and its current account deficit stands at 6% of GDP, net foreign liabilities have to stabilize at about three-forth of GDP (excluding capital transfers, capital gains and errors).

If the current account balance remains constant, increases in foreign liabilities will require an improvement of trade balance such that it can compensate for higher interest payments. Investment income component in Albania was shown positive during the 2004-07 period, and has since turned negative to the worsening of the current account deficit. As Graph 2 shows, the bulk of foreign deficit results from the negative balance of goods, services and current transfers (*BGST*).

Graph 2: Investment income



Let us separate investment income item from the current account,

$$CA_t \equiv BGST_t + \underbrace{i_{At}A_{t-1} - i_{Lt}L_{t-1}}_{invest.income} \tag{2}$$

where the $BGST_t$ term now consists of the remaining items in the current account; A and L are foreign assets and liabilities respectively, while i_A and i_L denote their nominal yields. Let us define κ_{At} (κ_{Lt}) as the ratio of capital gains to foreign assets (liabilities) at the beginning of the period, such that $\kappa_{At}A_{t-1}$ - $\kappa_{At}L_{t-1}$ = KG_t. Then, the real rate of return on foreign assets (expressed in domestic currency) will equal

$r_{At} = \frac{1+i_{At}+\kappa_{At}}{1+\pi_t} - 1$, and in the same way, we find the real rate of return on foreign liabilities r_{Lt}. By substituting equation (2) in (1), the latter can be rewritten as:

$$b_t - b_{t-1} \equiv bgst_t + \frac{r_{Lt}-g_t}{1+g_t} b_{t-1} + \frac{r_{At}-r_{Lt}}{1+g_t} a_{t-1} + k_t + z_t \qquad (3)$$

The above structure reflects some important notions. The first term on the right-hand side shows that trade balance surplus improves the net external position. In the same way, if liabilities yield a return rate that exceeds economic growth ($r>g$), net external position will again increase. In this case, a debtor country would need to improve its trade balance to ensure against everlasting liabilities to GDP. Lastly, differential rate of returns on foreign assets and liabilities (r_A-r_L) would be important if financial integration is high.

Equation (3) can again be rewritten such that aggregates are splitted into their respective "debt (D)" and "equity (E)" (where E includes portfolio investment and FDIs):

$$b_t - b_{t-1} \equiv bgst_t + \frac{r_t^{EA}-g_t}{1+g_t} a_{t-1}^E + \frac{r_t^{DA}-g_t}{1+g_t} a_{t-1}^D - \frac{r_t^{EL}-g_t}{1+g_t} l_{t-1}^E - \frac{r_t^{DL}-g_t}{1+g_t} l_{t-1}^D + k_t + z_t \quad (4)$$

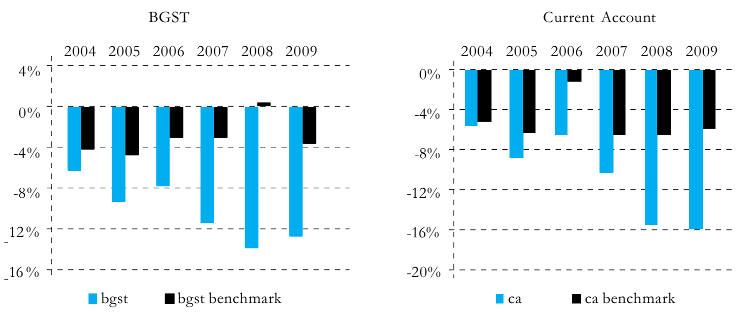
There are several factors that explain the return rate differential between foreign assets and liabilities. The exchange rate is one of them and can often have considerable effects, which may be different depending on the net position. For a small developing country like Albania, foreign debt and external assets are typically denominated in foreign currency, while the investment item (incl. portfolio and FDI investment) in foreign liabilities are denominated in domestic currency. Exchange rate depreciation, in this case, can have negative implications the higher the external debt in foreign currency, but they can be positive if assets exceed debt.

ASSESSING THE TRADE AND CURRENT ACCOUNT NORMS

In this subsection, we attempt to assess a reasonable norm for the trade balance (including transfers and remittances) and current account in Albania, which would stabilize net external position. The domestic economy is assumed to grow at about 3.6% in the post-global financial crisis period. Considering the dominant role in the region, Eurozone data is taken as a proxy for the international economy. Other simplistic assumptions include: real average rate of return on debt assets (r^{DA}) is equal to the real yield on two-year government bonds in the Eurozone; real rate of return on equity assets (r^{EA}) is 1 pp higher than Eurozone growth; real rate of return on debt liabilities (r^{DL}) is 1.5 pp above the return on debt assets, reflecting the default risk premium plus the exchange rate risk for lek-denominated securities; finally, return on equity liabilities (r^{EL}) is about 1 pp higher than domestic economic growth.

Net capital flows in the form of grants for investment in the public and private sectors amounted to around 1% of GDP during the 2007-09 period; therefore, this ratio is for simplicity projected to stay at this level in the analysis. Similarly, the errors and omissions item is projected to retain its average ratio of 1.6% of output. Annual capital gains, on the other hand, are shown more volatile and thus are assumed to equal zero in the next period. Lastly, assets and liabilities in equation (4) are defined as stabilized at the previous year level ($a_t=a_{t-1}$; $l_t=l_{t-1}$). Also, to assess the trade ($bgst^s$) and current account (ca^s) balances in line with stabilized net foreign assets to GDP, it is assumed that $b_t = b_{t-1} = b^s$.

Graph 3: Actual vs. Benchmark Levels of BGST and Current Account



Source: Bank of Albania

Graph 3 shows deviations of actual trade and current account deficits from their computed norms. The deterioration in the net external position in recent years seems to have been associated with substantial divergences from stabilizing norms of both, the trade balance (above 11 pp) and the current account balance (around 9 pp). Further, a glance at the graph suggests us that developments in the external position are more related to movements in the trade balance, implying that the necessary deficit correction should come from improvements in the latter.

THE SENSITIVITY OF NORMS

It is of interest to also assess the sensitivity of our computed norms if economic growth and the rate of return on debt instruments differ from the baseline levels. Table 1 presents the results for three optimistic scenarios in 2011. The first scenario gauges the impact of a 1 pp reduction in debt returns. The second scenario tries to measure the effects of doubling economic growth to 6%, which is often perceived to be the potential domestic growth. The last scenario assesses the sensitivity of norms to simultaneous changes in previous scenarios.

The trade and current account balances appear to be negatively affected in our scenarios. If the difference in debt returns is narrowed by 1 pp, it will widen the trade deficit that would stabilize external position by 0.3% of GDP. The current account norm does not change in this case as evidenced from equation (1). Next, faster economic growth is shown to lower the current account norm by 0.77% of GDP and have a minor impact on that of trade deficit. Also, the combined shocks do not seem to considerably change the "normal" level of trade balance. This implies that the size of adjustment should be bigger to improve the external balance.

Table 1 Sensitivity of BGST and CA norms

Scenarios	Effects on BGST	Effects on CA
a) difference between debt returns narrows by 100 bps	Negative, lowers BGST by 0.3% of GDP	No change (as in eq. 1)
b) domestic econ. growth rises from 3.6 to 6%	Negative, lowers BGST by 0.08% of GDP	Negative, lowers CA by 0.77% of GDP
c) both (a) and (b) happen simultaneously	Negative, lowers BGST by 0.3% of GDP	Negative, lowers CA by 0.77% of GDP

Apart from the sensitivity to initial assumptions, it is relevant to gauge the response to changes in the exchange rate. With the exception of equity liabilities, the rest of net foreign assets in the small economies of the Eastern Europe are considered to be mostly denominated in foreign currencies. *Ceteris paribus*, a (sudden) change in the exchange rate by s percent would change the ratios a_t and l_t in equation (4) by $v_{At}a_t s$ and $v_{At}l_t s$, respectively, where v_{At} (v_{Lt}) is the ratio of foreign assets (liabilities) in foreign currency to total assets (liabilities). In this case, the net foreign asset position as a function of the new exchange rate would change by $(v_{At}a_t - v_{Lt}l_t)s$ percent of GDP [i.e., $b_t(E^*) = b_t(E) + (v_{At}a_t - v_{Lt}l_t)s$].

The results indicate that trade and current account norms are hardly sensitive to foreign exchange movements. A (sudden) lek depreciation of 10% would worsen the external position by only 0.18% of GDP, while the reactions of ca_t and $bgst_t$ norms appear more neutral (Table 2). The marginal sensitivity of these norms should not come as a surprise, if we recall that the size of debt liabilities is just above that of foreign assets.

Table 2 Effects of 10% depreciation

	Net foreign assets	BGST	CA
Norm	-25.25	-2.15	-4.25
Exch. rate effect	-0.18	0.04	-0.01

Note: In % of GDP.

It has been clear in the analysis that sustainability of net foreign assets b^s is a crucial factor for the assessment of trade and current account balances. Nevertheless, the choice for b^s is to some extent arbitrary, since in reality, there is no explanation why an economy has to stabilize NFAs and components at the actual ratios, which in Albania are generally lower than in the Eastern European economies.

Table 3 presents the sensitivity of *ca* and *bgst* norms to various levels of foreign liabilities and their structural changes. The trade balance norm seems to be very responsive to the structural composition (scenario 1 vs. 3) and somewhat less to the external position level (scenario 1 vs. 2 and 4). On the other hand, the current account norm appears immune against structural changes, but reacts to different levels of external position.

Table 3 Sensitivity to alternative levels and structure of net foreign assets

Scenarios	(1)	(2)	(3)	(4)
Equity assets	1	2	15	60
Debt assets	28	55	28	60
Equity liabilities	24	47	37	60
Debt liabilities	30	60	30	60
Net foreign assets	-25	-50	-25	0
	Norms			
BGST	-2.1	-1.5	0.5	-0.7
CA	-4.2	-5.7	-4.2	-2.8

Note: All numbers are in % of GDP.

Table 4 Composition of net external position (% of GDP)

	2003	2004	2005	2006	2007	2008	2009
Net foreign assets	-4.6	-5.2	-7.6	-12.9	-16.6	-25.3	na
Equity assets	0.0	0.1	0.1	0.2	0.4	1.2	na
Debt assets (incl. reserves)	27.0	28.5	29.1	31.5	29.5	27.5	na
Equity liabilities	7.1	10.6	13.0	20.0	22.0	23.4	na
Debt liabilities	24.5	23.2	23.7	24.7	24.5	30.5	na
Real growth	5.8	5.7	5.7	5.4	6.1	7.7	3.3

3.THE EMPIRICAL FRAMEWORK

The current account (CA) is determined by the difference between national savings and investment. Therefore, the estimation of current account norm through econometric techniques uses a set of variables that influence the long-term savings and investment position. The current account has been considered in the empirical literature as smoothing consumption. For Nason and Rogers (2006), the current account deficit reflects expectations for increasing net output in the future; therefore, in their model of the current account balance, they focus on the variables that are useful for predicting net output changes. On the other side, the intertemporal approach proposed by Sachs (1981) and extended by many others treats the current account behavior from the savings-investment perspective, where domestic consumption is smoothed across time by lending or borrowing from abroad.

To estimate the equilibrium or the "normal/structural" current account level, we can make use of econometric regressions with panel data, which use time series data for a large number of countries. Using a large database enables us to get better estimates for the long-run relationship between current account balances and economic fundamentals. In our analysis for Albania, we have borrowed the estimated parameters from other research studies undertaken in important institutions (including the parameters in the analysis of macroeconomic balance by the Consultative Group for Exchange Rates (CGER) at the IMF, and particularly from papers that were focusing on the Eastern European economies.

Before presenting the empirical estimates generated by different authors, let's take a look at expectations about the long-run relationship between the current account and its potential determinants, as are commonly assumed in the empirical literature.

Fiscal balance. Improvement in the government budget balance increases national savings and thus is expected to have a positive impact on the current account. It is only in the case of full Ricardian equivalence – where private savings fully compensate changes in public savings – that the current account would not be affected by fiscal balance developments. The impact of the latter depends on the ability of private sector to fulfill its liquidity needs. A more developed financial system and with few liquidity restraints would allow for more compensation of private savings, thus reducing fiscal effects on current account.

Demographics. Demographic indicators gain importance because of their influence on national savings. A higher percentage of inactive and economically dependent population lowers domestic savings and hence the current account. The impact of demographic changes is typically captured by the following three proxy variables: *population growth*, *the old age dependency ratio* (which in the case of Albania has been constructed as individuals above the age of 65 to those between 14-65), and *the young age dependency ratio* (constructed as young people (14-) to those between 14-65 years old).

Net foreign assets (NFA), deflated by GDP. A country's wealth, proxied by the NFA level can affect current account in two opposite directions. On one side, relatively high NFAs allow for maintaining a substantial trade deficit without jeopardizing the country's solvency. On the other side, rising NFAs may imply higher income flows from abroad, which would improve the current account balance. The reaction of the latter would thus depend on the relative size of these effects, though empirical findings have often favored the second view. The NFA variable enters the model with its value at the beginning of the period in order to avoid the possible causality from CA to NFA.

Fuel balance, in percent of GDP. Increases in fuel prices lead to the current account deterioration of a net fuel importing country, *ceteris paribus*, hence a positive relationship.

Investment, in percent of GDP. Higher investments often have an inverse relationship with the current account, since higher demand is usually associated with falling net exports.

Income per capita. Low income countries normally import physical and financial capital to build infrastructure and speed up its economic convergence, which initially intensify their current account deficit. As the economy develops, income per capita grows and encourages current account improvement.

Economic growth. Real growth tends to worsen the CA balance if the country is growing faster than its trading partners that are at similar development stage, and if growth is supported by foreign financing. In addition, if higher economic growth is perceived as permanent, households are likely to increase consumption to the detriment of savings.

Financial integration, measured as the sum of foreign assets and liabilities in percent of GDP. Some may argue that a developed financial system should encourage more savings. Others view that such a sophisticated system reflects credit restraints and has thus lower savings. In fact, there is no clear theoretical explanation for the impact of financial integration on domestic investment.

Trade integration, constructed and economic openness in percent of GDP. Again, the impact of this variable is ambiguous. Economic openness is typically used as a proxy of trade barriers, but it can also reflect foreign capital attractiveness to the domestic economy.

Income per capita squared, often enters the model to control for a possible nonlinear relationship between per capita income and current account. This variable is useful for a low income country that has limited access to foreign capital markets, as opposed to a more developed economy.

Civil liberties. Sound institutions, enforcement of law and well-functioning of markets should attract investments and facilitate access to international capital markets.

Foreign direct investment (FDI), measured as FDI inflows deflated by GDP. Growing FDIs are likely to enlarge imports, thus worsening the current account deficit.

Remittances, deflated by GDP. Money sent by emigrants often makes an important income source, which may be spent or saved.

The long-term relationship between current account and its fundamental determinants is estimated by econometric techniques that use panel data for a large number of countries consisting of advanced and developing economies. The large and diversified sample is likely to increase the accuracy of the current account model in the long run.

The model parameters for the purpose of our analysis have been derived from two recent studies by Rahman (2008) and Ca' Zorzi, Chudik and Dieppe (2009) (henceforth ZCD), who have focused their attention on the Central and Eastern European economies. Nevertheless, the elasticities and explanatory power of their models are similar to other findings on the current account determinants, such as IMF (2008), Chinn and Ito (2007), Chinn and Prasad (2003), and so on.

The database of regressions by ZCD consists of 172 countries with time series data since 1980, while Rahman includes 21 industrial and 38 developing countries with data during the 1971-2006 period. To avoid the cycles and data fluctuations, the authors have used 4-year non-overlapping averages, which enable 4 observations for transition economies, whose statistical data start from the beginning of the 1990s. The filtration of short-term dynamics of the data in this way reduces the biasness that results from not taking into account the dynamics of individual countries, and enables the finding of longer-term links among variables by avoiding cyclical and temporal factors.

In fact, ZCD have done a huge empirical work in an attempt to include an optimal number of the current account determinants and testing at the same time for the sensitivity of parameters to various model specifications. This has comprised over 8000 different models, which have at the end been compared and selected on the basis of minimizing the problem of omitted variables, better parsimonious regressions, as well as pure statistical AIC and SBC criteria. Since there is the possibility that none of them might be true, the authors have applied the Bayesian estimation that deals with the problem of parameter and model uncertainty by attaching various probabilities to the models and then weighting them accordingly.

Table 5 Estimated elasticities from selected current account regressions

	(1)	(2)	(3)
Fiscal balance	**0.290**	**0.230**	**0.220**
Relative income	0.004	0.003	-0.006
Population growth	-0.729	-0.650	-0.630
Fuel balance	**0.113**	**0.390**	**0.440**
Initial NFA	**0.038**	**0.023**	**0.028**
Economic growth	0.055	**-0.140**	**-0.179**
Old age dependency	-0.049	-0.040	-0.040
Young age dependency	**-0.074**		
Investment	**-0.148**		
FDI inflow		**-0.610**	
Investment climate			**-0.010**
Civil liberties	**0.007**		
Openness	0.014		
Financial integration	0.001		
Relative income squared	0.001		
Adjusted R-squared		0.56	0.54
No. of observations	1512	246	246

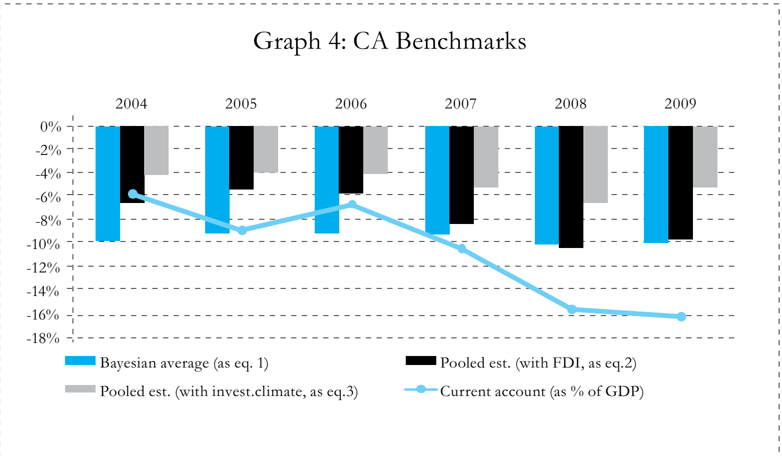
Notes: Coefficients in column (1) are based on Bayesian method, Table 11 in ZCD (2009); Coefficients in (2) are based on Pooled estimation, Table 4 in Rahman (2008); FDI in column (2) is replaced by investment climate; Pooled estimates on the 4-year non-overlapping averages. Robust estimates are reported in bold.

Table 5 presents the model parameters that were borrowed to calculate the current account norm for Albania, which have been generated by pooled OLS estimations. Column 1 contains the coefficients derived from the Bayesian method by ZCD (2009), based on 1512 observations. Whereas coefficients in the next two columns correspond to the findings by Rahman (2008), that were generated from two regressions specially built for 13 emerging European countries, in an effort to test for heterogeneity among these countries with similar economies in the rest of the world.

A quick view at the coefficients reveals that almost all common variables in the three equations have a clear positive or negative impact on the current account. The magnitude of the coefficients is also not so different (for instance, net foreign assets vary from 2.3% to 3.8%). However, relative income and particularly economic growth show nonconformity (forming a contrast from +5.5% to -17.9%), although it is only coefficients with negative sign (hence, in line with expectations) that are statistically significant.

Parameters before government budget and fuel balances are statistically significant and their magnitude suggests a sizeable link with the current account. Somewhat similar relationships are shown for domestic investment, foreign direct investment, and demographic factors. While civil liberties and economic openness have modest effects, financial integration seems to have a very limited explanatory power.

Applying the coefficients to the Albanian indicators, we can calculate the levels where the current account balance is heading to in the medium run. As it is shown in Graph 4, different models provide various norms for the current account equilibrium. The CA norm based on equation (3) parameters seems more conservative than the other two, maintaining an average ratio of -5% of GDP in the years between 2004-09. In comparison, the CA norm following the Bayesian estimates appears two times lower than the previous one and firms at around -10% of GDP. Equation (2), which involves the inflow of foreign direct investment, provides an unsteady equilibrium movement, where the CA deficit consistent with its fundamentals intensifies by -3.5% of GDP in recent years to reach the benchmark suggested by the Bayesian approach.



These benchmarks help us form an idea about the current account level that would be in harmony with its fundamental determinants. Actual CA balance has apparently been not so divergent till before 2007, while it has since then worsened and deviated by 5.5 to 9.5 percentage points from the benchmarks suggested by fundamental factors.

Table 6 displays the individual contribution of these factors. About half of the low benchmark as suggested by the Bayesian method (eq. 1) looks to be determined by domestic investments. Young age dependency that is involved in this regression is noted to have also played an important role. Similar to investment impact, the inclusion of FDI inflows has turned out to be an important factor in determining the current account norm as in equation (2). However, the contribution of net foreign assets is shown more limited and similar in all three equations. The fiscal balance performance accounts for a considerable contribution in all benchmarks, while fuel balance and economic growth show strong effects in equations (2) and (3). To summarize, the fall in the CA norms in recent years has been apparently led by developments in the government budget, international investment position, FDI inflows, and the fuel balance.

Table 6 Contributions to CA Benchmarks (% of GDP)

Eq.	Year	Fis.	Rel. in.	Pop.	Fuel	NFA	Ec.	Old age	Yng. age	Inv.	FDI	Inv. Clim.	Civ. liber.	Open.	Fin. int.	R. in. sq.	Avg. CA Norm
(1)	04-07	-1.12	0.08	-0.29	-0.36	-0.24	0.29	-0.64	-2.89	-5.62			0.03	1.02	0.07	0.37	-9.3
	08-09	-1.82	0.09	-0.38	-0.50	-0.79	0.27	-0.68	-2.61	-5.42			0.03	1.17	0.08	0.50	-10.0
(2)	04-07	-0.88	0.06	-0.26	-1.25	-0.15	-0.74	-0.52			-2.69						-6.4
	08-09	-1.44	0.07	-0.34	-1.74	-0.48	-0.69	-0.56			-4.81						-10.0
(3)	04-07	-0.85	-0.12	-0.25	-1.41	-0.18	-0.95	-0.52				-0.04					-4.3
	08-09	-1.38	-0.13	-0.33	-1.96	-0.58	-0.88	-0.56				-0.04					-5.9

Note: Contributions to the CA norms are calculated as average value of the variable multiplied by coefficients in Table 5.

4. TRADE BALANCE RESPONSIVENESS TO LIQUIDITY AND POLICY IMPLICATIONS

The previous sections on trade and current account benchmarks pointed to a considerable divergence of actual deficits from their structural levels. They could continue to remain at such large negative values in the future and thus create abnormal imbalances if not kept under control. For that purpose, it is important to identify the factors that might have caused the external balance deviation, in search of shedding light on the efficacy of economic policies on reducing external deficit.

The selected coefficients from different studies in the section on empirical framework show the elasticities of current account with regard to the long-term determinants of savings and investment, which were generated using panel data regressions that involved developing and regional economies. These elasticities were used to form an idea about the sustainable level of current account in Albania. But in reality, actual CA balance might deviate from its estimated benchmarks, due to cyclical and short-term factors, as well as the structure and economic policies that might affect domestic exports but not necessarily savings and investment.

The size of the external deficit primarily reflects the unsatisfactory performance of national savings, but its deterioration in recent years suggests it may be driven by the credit boom in the second half of the past decade (Table 7). In the period between 2001-04, annual growth of bank credit to households and enterprises averaged 0.8% of GDP, while their cumulative growth in the five subsequent years was 7.8 and 14.1% of GDP, respectively. The credit surge, especially to private enterprises, should have encouraged the expansion of exports and demand for foreign goods and services. Albanian exports and domestic demand for imports grew on average 1.5 to 2 times faster from the mid-2000s till the time of global financial crisis, whose contagious nature affected the Albanian foreign trade in 2009.

The fiscal stance, in addition, appears to often influence the external sector performance. The gradual consolidation of government budget in the first half of the past decade and fiscal relaxation in recent years have been associated initially with positive, and lately with negative developments in the current account. In the other years, this relationship might have been eclipsed by the rapid credit growth, which has largely surpassed changes in the fiscal balance.

Table 7 Selected Economic Indicators

	2001	2002	2003	2004	2005	2006	2007	2008	2009
	percent of GDP, unless otherwise indicated								
Trade Balance (G&S)	-23.0	-26.1	-24.7	-22.3	-24.6	-23.6	-26.7	-26.7	-25.2
Current Account	-7.4	-9.5	-6.9	-5.8	-9.0	-6.6	-10.6	-15.5	-15.5
Investment	38.4	37.9	40.5	37.2	37.0	39.0	38.7	38.2	38.5
Gross national savings	31.0	28.4	33.6	31.4	28.0	32.4	28.1	22.7	23.0
Credit to private sector	4.8	6.2	7.3	9.3	15.7	22.4	29.8	35.4	37.6
Fiscal balance	-6.9	-6.1	-4.9	-5.1	-3.5	-3.3	-3.5	-5.5	-6.9
Real GDP growth (%)	7.9	4.2	5.8	5.7	5.5	5.4	5.1	8.1	3.3

Source: INSTAT, and Bank of Albania and staff estimates.

The recent negative external deficit in Albania is substantially away from normal ratios that were evaluated in the previous sections. In the future, the Albanian economy will face the challenge of being able to reduce its deficit toward sustainable levels without jeopardizing growth and employment. If investment behavior is shown more balanced and does not seem to have led to external balance divergence from norms, the medium-term policies should then focus on restructuring the private sector, with the intention to increase national savings, and turning the country in a more attractive destination for export-oriented FDIs. In the meanwhile, short-term economic policies should aim at keeping demand under control, so that negative balance with the rest of the world does not increase abnormally.

In this regard, fiscal and monetary policies should be harmonized and calibrated on the basis of their efficacy to control domestic demand. Next, our analysis will attempt to arrive at a trade-off between the size of fiscal contraction and credit growth restraint. Because the bulk of current account deficit resulted from a negative trade balance, our attention will focus on identifying the link between fiscal and credit developments and the trade balance movements.

For this purpose, we have estimated an empirical model for trade balance, along the lines of Kanda's (2006) model for Bosnia and Herzegovina. The static general equilibrium approach used by Kanda (2006) to identify the variables of interest and their impact on trade balance is an adaptation of the liquidity effect model as developed by Lucas (1990), Fuerst (1992), and Christiano & Eichenbaum (1995). In this model framework, a small open economy is represented by a household comprising four agents – a consumer, a firm, a bank, and the government – who is endowed with a fixed amount of capital and loanable funds, but may also receive grants and aid from abroad. The consumer owns the capital stock, while financial funds and aid are used by the bank. The firm rents capital from the consumer, and both of them purchase local and imported goods. On the other hand, the government relies on income taxes from the consumer but also transfers income to the latter. At the end of the period, the household pools all the resources again in a common place and pays debts. Another assumption in this framework is that exported and imported goods are imperfect substitutes, and the domestic economy is so small that its export and import prices are determined by foreign trading partners in foreign currency.

The trade balance (TB) is estimated in a reduced-form model as a linear function of bank credit flows to private enterprises (CFE), credit flows to households (CFH), fiscal income (FR), fiscal expenditure (FE), terms of trade (TOT), and capital stock (CAP). The GMM method is employed to control for possible effects of endogeneity among the variables. To capture the data dynamics, the explanatory variables have initially entered the model with several time lags, while statistically insignificant regressors were eventually removed. The final equation was specified as follows:

$$TB_t = CFE_{t-1} + CFH_{t-1} + FR_{t-4} + FE_t + TOT_t + CAP_{t-1} + c + s_1 + s_2 + s_3$$

and instrumental variables include:

$CFE_{t-1} + CFH_{t-1} + FR_{t-4} + FE_{t-2} + FE_{t-3} + TOT_t + PFUEL_t + EUR_{t-3} + CAP_{t-1} + c + s_1 + s_2 + s_3$, where PFUEL represents fuel prices, EUR is the lek/euro exchange rate, whereas *c* and s_1, s_2, s_3 are the constant term and seasonal dummies, respectively.

Credit to households and fiscal expansion are expected to have a negative influence on trade balance. On the other hand, the net impact of credit to enterprises is ambiguous as it may give rise to export supply as well as demand for imported intermediate goods and services. A priori, better terms of trade are likely to improve the external trade balance, but in reality, the response will depend on the price elasticity of exports and imports and the export dependency to imported inputs. In the same way, growth of capital stock may foster both export supply and import demand.

Our econometric analysis covers the 2001Q1-2010Q3 period. The ADF test for unit roots indicates that all variables are integrated of order one $I(1)$ (except CAP that is $I(2)$), therefore they enter the equation in first differences.

The regression results in Table 8 show that all variables are statistically significant and have the expected sign. Our model specification seems to explain to a high degree developments in the balance of goods and services.[2] The test of overidentifying restrictions suggests that instrumental variables are exogenous, so the model does not suffer from problems of misspecifications. The good model fit is reinforced by its satisfactory performance in predicting the trade balance. For the last four quarters in the sample, the mean absolute percent error (MAPE) indicator was 2.8% of actual values. The Theil inequality coefficient (which falls between 0 and 1, with zero indicating a precise forecast) was only 0.017, and its ratios of biasness (0.116), variance (0.330), and covariance (0.553) point out the good predictive ability of the model to forecast the mean and variance of net exports.

2 Various estimations that used the real effective exchange rate as an explanatory variable instead of terms of trade showed similar responses with regard to policy-related indicators.

Table 8 Regression Results (2001Q1-2010Q3)

Dependent variable: d(Trade Balance)	
Variables	GMM Coef.
C	-14453.5***
d(Credit flow to enterprises (t-1))	-0.7560***
d(Credit flow to households (t-1))	-1.3970***
d(Fiscal expenditure)	-0.2513**
d(Fiscal revenue (t-4))	1.1565***
d(Terms of trade)	461755***
d(Capital stock growth (t-1))	1.2190***

Adj. R^2: 0.74

Test of overidentifying restrictions (Chi^2 p-value,3df): 0.61

No. of observations after adjustment: 39

*Note: ***, ** and * imply statistical significance at 1%, 5% and 10%, respectively.*

The estimated parameters in Table 8 suggest that credit flows to households have a larger negative impact on trade balance than that of lending to enterprises. This draws the inference that the restriction of monetary policy for that reason would be more effective if it targets credit growth to households rather than enterprises.

The model also suggests that net exports are more responsive to bank credit growth than to government spending performance. The weaker link between fiscal and trade deficits prioritizes credit restriction as a more preferable policy to adjust the external trade imbalance. To manifest the relative strength of fiscal and monetary policies, the estimated regression is employed to make the 2011 forecasts for net exports. Assuming that the tax burden is already high, we rely on government spending cutback as the only fiscal policy option. On the other hand, effects of bank loans are evaluated in total, and by retaining the same proportions of lending to households and enterprises as they were in the last two years. The obtained results show that a fiscal expenditure curtailment by 1% of GDP leads to balance of trade improvement by 0.25% of output. In comparison, a contraction of bank credit flows of 1% of GDP is expected to shrink the trade deficit in 2011 by 1.28% of GDP. Obviously, the credit tightening policy looks more effective in terms of its magnitude and timeliness.

Nevertheless, the monetary policy power might be mitigated in the face of capital account liberalization and the prevalence of foreign banks in Albania. The latter often maintain excess liquidity reserves and can also access ample liquidity funds from their parents. The administrative measures, such as capital controls, raising the required reserves, credit ceilings, etc, are generally thought of as undesirable. Not only would it revert the financial liberalization process to date, but also the efficacy of such policies is mixed as the experience in many countries has shown. At the best, they would control credit growth in the short run, whereas the longer-term effects would be more limited and distort the financial market. Consequently, to avoid their undesirable and side effects, the administrative measures can only be temporary (Hilbers et al., 2005). In the same way, the prudential and supervisory measures – such as the eligible criteria for credit restrictions (e.g. loan-to-value and debt-to-income ratios), the guide to adequate bank margins in loan decision making, restriction for foreign currency loans to borrowers with income in foreign currency or those well-hedged, the rules on credit concentration in certain sectors or risk in certain credit categories (e.g. households vs. enterprises and mortgage vs. consumer loans) and so forth – might aid in slowing down credit growth, but to achieve that, monetary/ fiscal policy actions should first be wise and cautious.

On that account, a large duty in the short run falls also on prudent fiscal policies, which through their impact on national savings should help contain the external deficit. A discreet fiscal stance should additionally take into account all the supportive policies that may have led to the high credit demand (like subvening the interest rates or state warrants for mortgage loans), with the intention to get rid of the factors that may create excess borrowing.

In the longer run, however, bringing deficit back to norms would require profound structural reforms in the tradable sector. The role of exports in this respect would double in order to overcome the pressing for higher imports that come from improved income and wage pressures, in spite of sluggish credit and investment.

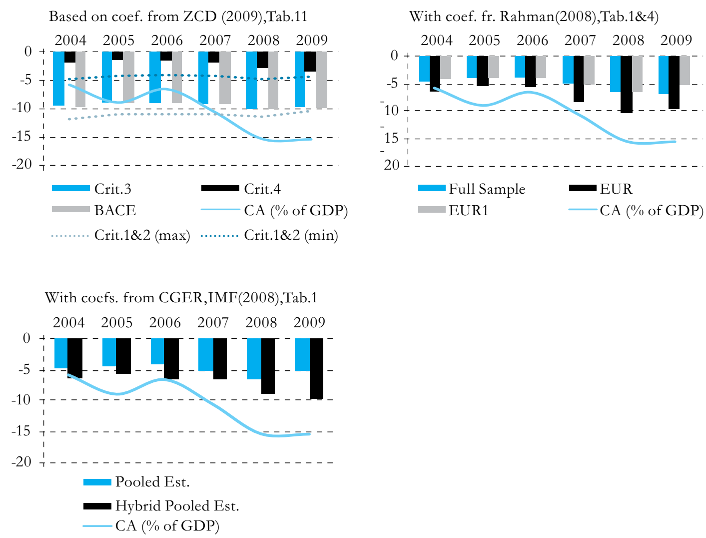
5. CONCLUDING REMARKS

In the past decade, Albania has experienced relatively high growth rates that were often, particularly in recent years, associated with worsening of the external sector deficit and large capital inflows. The evaluated trade and current account benchmarks in this paper signal that actual levels of the deficits are unsustainable and their adjustment will be pressing in the medium term.

To form an idea about the current account equilibrium, we have applied two alternative methods, which are the external sustainability approach and the structural current account approach. Of course, none of them is complete as each has its own conceptual difficulties. The CA norm determined in the first method is particularly affected by the normative choice of net external liabilities. On the other hand, the second approach that applies panel data regressions is sensitive to model selection (Graph 5). As Ca'Zorzi et al. show through numerous empirical estimations, uncertainty from model selection according to different criteria is quite high. The authors find that not all coefficients are consistent with ex-ante expectations, and in addition to that, important country-specific factors may not be captured by a generalized model. Bearing in mind the difficulties that come from the respective assumptions and measurements of these methods, the prescript for the size of deficit adjustment toward evaluated norms should be reticent and circumspect.

Despite these, the difficulties with estimating CA norms do not make them ineffectual: by all assessments, the years between 2007-09 evidence considerable deficit divergence from normal levels. The recent strong increase in consumption, supported by the credit boom, seems to be the catalyst of the deficit exacerbation. If the Albanian economy is to reflect on improving its external balance, it will need to start sacrificing its aggregate demand, especially in the short run. Monetary policy actions could take the lead to lend a hand in this respect. However, if one considers the uncertainties connected with its administrative and prudential measures to target credit growth, it is necessary that prudent fiscal policies assume a sizeable burden of demand restraint. But having said that, in the medium term, domestic economy needs to embark upon intense restructuring or largely reorient its resources intending to improve national savings and promote exports.

Graph 5: Sensitivity of CA norms to various model specifications



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THE IMPACT OF THE FINANCIAL CRISIS ON THE MONETARY TRANSMISSION MECHANISM: A CASE OF AN EMERGING MARKET ECONOMY

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ABSTRACT

The aim of this paper is to show implications of the current financial crisis for the monetary transmission mechanism (MTM) and its effectiveness in Poland, which is an inflation targeting emerging market economy. MTM depends on the monetary policy, but also on structural features of the economy. Financial crisis could affect both. Our results based on the Polish data suggest a change in the monetary policy rule and a significant drop in the overall monetary policy effectiveness. Unlike disturbances in the interest rate pass-through, which reflect increased perception of risk and result from the financial crisis, the more pronounced role of credit market imperfections and the weakening of the exchange rate channel can be viewed as typical phenomena in the current phase of the business cycle. However, the magnitude of the crisis, the likely changes in the regulatory framework and adjustments in macroeconomic policies can result in the deeper evolution of the MTM.

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1. INTRODUCTION

Monetary transmission has recently gained a new wave of interest (e.g. Boivin et al. (2010), Cecioni and Neri (2010)), but papers addressing a question of a potential impact of the current financial crisis are scant, especially for emerging market economies. We would like to partially fill this gap – the aim of this paper is to show implications of the current financial crisis for the monetary transmission mechanism and its effectiveness in Poland, which is an inflation targeting emerging market economy. Poland has both standard and non-standard features of such economy. Emerging markets are usually open economies with less developed financial sector, but on the other hand, they depend heavily on foreign capital. Poland is less financial and trade opened than other European emerging markets; also, it is a significant recipient of funds related to the European Union's Cohesion Policy. Therefore, financial crisis in Poland may manifest itself in a different way and can have different outcomes than in developed economies, but also to some extent, than in other emerging market economies.

The transmission mechanism crucially depends on the monetary policy. In the sharp phase of the financial crisis – after the Lehman Brothers default, many central banks changed monetary policy from the short-term interest rate control to liquidity management and more pronounced role of output stabilization. Higher liquidity preference of banks resulting from a sharp increase of uncertainty brought about problems with transmission from the monetary policy instrument to the money market rates and retail rates.

Owing to the openness of emerging economies, the exchange rate usually plays a significant role in the transmission mechanism. During the financial crisis, increased global uncertainty caused massive capital outflows and these in turn led to a rapid depreciation of domestic currencies. The impact of depreciation can be twofold: on one hand, increasing competitiveness it can stimulate output, but on the other – dampen real sector activity via credit channel. Depreciations lead to a deterioration in borrowers' balance sheets, especially in dollarized economies and when central bank credibility is low (Caballero and Krishnamurthy (2004)). Tornell and Westermann (2002) stress that in the middle-income countries, the balance sheet effect and depreciations mostly affect non-tradable sector, which is more bank dependent than the tradable sector. In Poland, the exchange rate depreciation rather sustained than depressed domestic demand. There are at least three underlying reasons: (i) the share of corporate sector debt denominated in foreign currency is relatively low – it amounts to 25%. Balance sheets of the corporate sector, though affected by exchange rate impact on loans, seemed to suffer more from firms' involvement in speculations on further exchange rate appreciation (options); (ii) the aforementioned broader indicator, i.e. the level of financial openness of Poland, measured as gross stocks of foreign assets and liabilities to GDP, which in 2008 reached the level of 116.6%, remains relatively low comparing to either Czech Republic (147.4%) or Hungary (173.5%), let alone the euro area (264.5%); (iii) central bank credibility, though not very high, increases steadily. Inflation targets, though not credible for consumers, are credible for commercial banks. However, the probability of future inflation being within the NBP target is characterized by a positive trend both in the case of banks and consumers (Łyziak et al. (2007)).

Financial crisis and exogenous negative demand shock led to an exceptionally deep contraction in the real sector in many emerging markets. Poland did not experience a formal recession – GDP growth remained low but positive. Nonetheless, various measures of output gap were negative and big in absolute terms. As suggested by Adrian et al. (2010), the role of the interest rate spread or output gap may vary across different phases of the business cycle; the same applies to the exchange rate pass-through (e.g. Correa and Minella (2006)). While during recessions the relationship between inflation and demand is close to linear as labour market is relatively competitive, during expansions capacities are utilized at high levels and increasing them is costly (constraint capacity models). Thus, inflation becomes more sensitive to demand pressure. We try to shed some light on the role of cyclical factors in the monetary transmission disturbances observed during financial crisis.

The paper is structured as follows. We start with a description of stylized facts: to pin down the analysis we present the main characteristics of the Polish economy, stressing those that have the largest impact on the way the crisis manifests itself – e.g. openness, the role of financial sector, degree of euroization of private sector debt and exposure of the economy to sudden stops. Then, we present data and the estimation method. The next section provides empirical results, and the last one concludes. Graphs and tables are displayed in the Appendix.

2. STYLIZED FACTS. MONETARY AND OTHER POLICIES DURING FINANCIAL CRISIS

Poland is a small open economy with a floating exchange rate regime pursuing inflation targeting. This gives an important role for the exchange rate channel in the monetary transmission mechanism, which is also characteristic for many emerging market economies (Mohanty and Turner, 2008). Still, Poland remains less open in terms of trade and financial linkages than countries of the region[1]. The main features of the Polish economy, other Central and Eastern European countries and the euro area are shown in Table 1.

Despite a steady growth, Poland is characterized by a relatively low level of financial intermediation and banking sector development. In 2008, the ratio of bank assets to GDP reached 82%, while the share of bank loans (deposits) to (from) non-financial sector to GDP amounted to 47% (39%)[2]. Table 2 provides the main characteristics of the Polish banking sector.

Bank loans remain the most important source of external financing for firms. Access to alternative sources of funds is limited – capitalization of the stock market is relatively low (21% of GDP as of 2008) and commercial papers market is weak[3]. Large firms,

1 The degree of trade openness of the Polish economy is similar to that of the euro area, but two times smaller than of the Czech Republic and Hungary. Financial openness is more than two times lower than that of the euro area, and significantly lower than of the Czech Republic and Hungary (Mohanty and Turner (2008)).

2 In the euro area, the Czech Republic and Hungary bank assets to GDP amounted to 346%, 109% and 110%, share of bank loans to non-financial sector: 106%, 55%, 54%, and share of bank deposits from non-financial sector: 75%, 62% and 36%, respectively (Financial system development in 2008, NBP).

3 Outstanding amount of long- and short-term debt securities issued by non-financial firms in 2008 amounted to 2.2% of GDP vs. 20.5% in the euro area.

which have relatively easier access to the capital market, finance their investments mainly from internal sources and only about 10% of funds comes from the domestic bank loans.

The concentration level of the Polish banking sector is low and decreasing since 2002 as a result of a rapid development of small and medium-sized entities. As in other Central and East European countries, the share of foreign investments in this sector is large[4].

There are some mismatches in the banking sector. High growth rate of loans to the non-financial sector[5] and dynamic development of non-bank financial institutions which absorbed households' savings, has led to accruing of a funding gap, with the ratio of loans to the non-financial sector to its deposits at the level of 108% in 2008, which, however, is still fairly low and close to the euro area average (111%)[6]. The maturity mismatch has been driven by two opposite tendencies: an increase in the share of short-term deposits in total deposits of households (reaching 94% in 2009), as households moved their longer-term savings to investment funds and insurance companies, as well as lengthening of the average maturity of loans, mainly due to a dynamic rise of demand for loans for housing and increased firms' borrowing for investment and real property during 2004-2008[7]. The maturity mismatch halted at the beginning of 2009, once the banks, concerned about the economic prospects, tightened credit conditions while non-financial sector reduced its demand.

Another feature of the Polish banking sector is the significant role of loans denominated in foreign currency[8]. In the case of firms, their share has been decreasing since 2003 together with a narrowing interest rate disparity between WIBOR and EURIBOR. In contrast, the fraction of households' loans denominated in foreign currency has

4 The ownership structure is stable with about 20% of total assets being controlled by the state, 5% by domestic and 70% by foreign investors; 5% of assets is attributed to cooperative banks (Financial system development in 2008, NBP).

5 Indebtedness of households reached 48% of the disposable income (2009), but is much lower than in the euro area (81%).

6 Financial system development in 2008, NBP.

7 The share of short term-loans in total loans decreased from 32% in 2002 to 12% in 2009 in the case of households and from 30% to 25% in the case of firms.

8 In 2009, foreign currency loans amounted to 40% of total household loans and 25% of firms' loans.

been constantly growing, mainly as a result of a high demand for long-term loans for housing. The household sector seemed to play on euro adoption and long-term zloty appreciation. Also, households downplayed exchange rate volatility and considered mostly interest rate disparity. The process slowed down in 2006, when the central bank introduced a regulation tightening conditions for this type of loans. Also, banks changed their credit policy in the aftermath of the financial crisis.

Financial crisis induced a transitory change in the monetary policy. Facing a sharp increase in uncertainty and turbulences in foreign and domestic financial markets, and a significant increase in cash holdings of households, the central bank – which prior to the crisis focused on controlling the overnight money market interest rate (POLONIA) – put in place various measures aimed at liquidity management. The crisis brought uncertainty about financial soundness due to massive write-downs and losses of the banking sector in both the US and the euro area and led to a fall in the unsecured transactions. In Poland, banks reduced limits on such transactions (Figure 1 shows the volume of overnight transactions). It should be stressed however, that as in many emerging markets, Poland's banking sector exhibits structural excess liquidity. During the financial crisis, it alleviated the negative effects of the confidence loss. As shown in Fig. 1, there is a clear-cut fall in the overnight transactions in October 2008. Transactions remained subdued throughout 2009 in spite of a significant increase in the free reserves of banks; they started to rebuild only in 2010. A downward trend in the overnight transactions started in the first half of 2008, well before the Lehman Brothers collapse. Then, the central bank tightened monetary policy owing to inflation exceeding the targeted level of 2.5%. It is therefore understandable that lower free reserves led to a lower level of interbank transactions. Starting from November 2008, NBP gradually lowered its interest rate from 6% to 3.5% in June 2009.

Slightly before, in mid-October 2008, NBP introduced Confidence Package, i.e. a set of measures aimed at providing banks with liquidity in domestic and foreign currency and at expanding possibilities for banks to obtain liquidity by broadening collateral in operations with the NBP. The central bank started repo and swap operations (due to surplus liquidity, before the financial crisis, it conducted only absorbing operations). Through repo, it added liquidity for maturities up to 6 months, whereas through swap operations, NBP provided the banking sector with Swiss francs, US dollars and euros. The latter operations were mostly used by domestically-owned banks, which found it difficult to finance themselves in foreign markets, opposite to those that could be financed by their mother-institutions.

In addition, in January 2009, NBP pursued an earlier redemption of its 10-year bond, issued in 2002 to absorb structural surplus liquidity. Finally, in May 2009, the central bank reduced the reserve requirement ratio from 3.5% to 3%.

The provision of liquidity drove short-term rates in the unsecured market to the levels below the NBP's policy rate, i.e. the reference rate (Fig. 2). On the other hand, it helped reappearing of transactions, but mainly for maturities up to one week. This is well-illustrated by spread behaviour. Spreads between interest rates of various maturities and POLONIA rocketed first at the end of 2007 reflecting disturbances in the world markets due to the first stage of the subprime crisis. This was a transitory phenomenon and then spreads went down. They increased sharply once again after the Lehman Brothers failure. Their increased level persisted in 2009, but while those between WIBOR1W and POLONIA stabilised, those between POLONIA and longer rates got even larger. This is especially visible in the case of WIBOR3M, even though this rate to some extent is impacted by the central bank's repo operations (Fig.3).

Government policies, addressed to tackle the disturbances the financial crisis brought about, involved four groups of measures. The first one was supposed to stabilise the banking sector through the extension of household deposit guarantees and a possibility of getting a transitory state aid in mortgage debt repayment for those who got unemployed due to the financial crisis. The second group was aimed at exchange rate stabilisation, which was depreciating, driven by contagion effects. Thus, the government exchanged the inflowing EU-related funds in the foreign exchange market, instead of doing it at the central bank window. Moreover, the government and the central bank arranged an access to the Flexible Credit Line

(FCL) offered by the IMF. Foreign investors treated the credit line as an additional insurance of macroeconomic stability or the country collateral. Thus, the FCL reduced credit constraints, which in the case of emerging markets exist on both firm and country levels (Caballero and Krishnamurthy (2004)), and made the credit channel operation closer to the way characteristic for developed economies. The third group was to sustain domestic demand and involved a faster use of EU funds, loans from the EIB and the World Bank. Also, small and medium-sized enterprises were offered credit guarantees. Finally, the last group was supposed to increase the flexibility of the economy, and labour market in particular. Under auspices of the government, employers and trade unions agreed to enhance flexibility of working time and, by the same token, diminish lay-offs during periods of lower demand.

DATA AND ESTIMATION METHOD

We use monthly data in the estimations showing stylized facts and interest rate channel operation through the lens of VAR and simple EC models, and quarterly data for the structural model. The sample starts in 1998 with the adoption of inflation targeting by the central bank. It ends in May 2010, so it covers 20 monthly or 6 quarterly observations of the financial crisis.

To account for a possible regime shift and the resulting parameter instability, we use a dummy, which is zero in the period before the Lehman Brothers collapse and 1 thereafter[9]. The results are presented both with and without the dummy, since it seems that it captures not only the effects of the financial crisis, but also those of the business cycle. Interestingly, it was insignificant in the case of all credit variables but loans in foreign currency to the corporate sector. The relatively high variability of loans in Poland since 1999 seems to be the underlying reason (see Fig. 3), therefore reactions of loans denominated in the domestic currency are displayed only for the specification excluding the dummy.

While the sample is homogenous in terms of the monetary policy framework, the EU entry in May 2004 was a factor that induced

9 We checked whether the regime shift started before Lehman Brothers collapse, i.e. at the end of 2007, but such dummy was insignificant.

greater mobility of the labour force. The number of persons staying temporarily in other European countries increased from 726 thousand at the end of 2002 to 2 210 thousand at the end of 2008 (the number of employed persons at the end of 2008 totalled 8 270 thousand, GUS Information, 2009 August, and Statistical Bulletin, April 2010). To capture possible structural changes in the labour market due to migrations, we use a dummy equal zero before the Poland's EU entry and 1 thereafter in the VAR, which includes a labour market variable.

First, we analyze developments in the financial markets – i.e. interest rate pass-through from money market to retail rates. To check whether it underwent changes resulting from the financial crisis, we use a following model:

$$\Delta r_t = \alpha_0 + \alpha_1 \Delta mr_t + \beta_1 (r_{t-1} - \beta_2 mr_{t-1}) + \varepsilon_t \tag{1}$$

where r_t is a respective retail deposit or loan rate, mr_t stands for a money market rate (either 1- or 3-month WIBOR), Δ is a first difference of a variable, whereas a_0, a_1, β_1, β_2 are parameters, and $\beta_1 < 0$. Coefficient a_1 shows the instantaneous adjustment of the retail rate to the money market rate, while β_2 measures the long-term adjustment. Using the estimated parameter values, we assess the speed of adjustment, which can be expressed as $(1 - a_1)/\ \beta_1$. We employ data on both outstanding amounts (stocks) and new deposits/loans (flows[10]). In this case, due to a change in the method of retail rates calculation, the sample is much shorter. It covers the period 2005.01-2010.05 only.

Next stages of the monetary transmission are examined with a suite of structural VAR models in the spirit of Peersman and Smets (2003). In the benchmark model, we use four macroeconomic variables – prices (CPI), industrial output as a proxy for the real sector activity, short-term interest rate (1-month money market interest rate, WIBOR1M – serving as a proxy for the policy rate), and the nominal effective exchange rate. Foreign interest rate (EURIBOR) is plugged exogenously. To extract monetary policy shock, we employ a recursive (Choleski) factorization. The variables are ordered in a way

10 In the statistics, they are dubbed "new businesses".

reflecting the assumption of a lag between monetary policy shock and reaction of the real sector and prices. The specification reflects also monetary policy rule: the central bank sets the level of its instrument (interest rate) observing current developments in inflation and the real sector. We allow the exchange rate to react contemporaneously to the interest rate developments, but the interest rate does not respond contemporaneously to the exchange rate[11]. Information on disturbances and lags in the interest rate pass-through, obtained from the error correction models, makes it possible to conclude in a more robust way on the underlying reasons of potential disturbances in the further stages of the transmission.

To gain more insights from the VAR analysis, we add to the benchmark specification various credit aggregates, including those denominated in foreign currency. This brings more evidence whether – as in developed economies – credit played a significant role in the propagation of the financial crisis. We also plug in two variables characterizing the real sector – retail sales and unemployment rate. These variables are added one by one to reduce the problem of a small number of degrees of freedom.

The benchmark model includes four lags; more lags are usually used for the specification containing additional variables. The number of lags is determined taking into account information criteria, but also model stability and serial correlation of residuals. All variables, except the interest rates, are in natural logarithms and are seasonally adjusted using X-12 technique. If necessary, we also use centred seasonal dummies to eliminate the remaining seasonality and autocorrelation of residuals. The VAR models are estimated in levels to allow for the long-run relationships between variables. The key variables of our estimations are reproduced in Fig. 1 and Fig. 4.

Basing on our VAR models with determined optimal lags, we calculate monetary transmission effectiveness (MTE), understood as a standardized elasticity ($e_{y2/y1,yA}$) between instrumental (y_1) and target (y_2) variables with intermediation of the y_A variable from the transmission chain:

11 It is an obvious shortcoming, so to check the robustness of results, we have used Kim and Roubini (1995) decomposition. The results do not exhibit significant differences and are not reported.

$$MTE_{y_1 \to y_2, y_A} = (1 - pv_{A,1})(1 - pv_{A,2}) \frac{\left| e_{y_2 / y_1, y_A} \right|}{1 + \left| e_{y_2 / y_1, y_A} \right|} \tag{2}$$

where:

$$e_{y_2 / y_1, y_A} = e_{y_2 / y_A} * e_{y_A / y_1} \tag{3}$$

if the parameters at respective variables are significant at the *pv* level and fulfil Wald restriction tests (for details see e.g. Bates and Vaugirard (2009)). MTE is a product of the elasticity $e_{y2/y1,yA}$ multiplied by the respective *pv*. To calculate the dynamic MTE, the former VAR models were reestimated for the optimal lag + 1. This overparameterization allows for using the OLS estimator (Harvey (1991)).

To account for the role of cyclical factors in disturbances of the monetary transmission, we conduct simulations on a small (structural) New Keynesian model augmented to include credit market imperfections.

The open economy IS curve is:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 r^l_{t-1} + \alpha_3 (\Delta i^l_{t-1} - \Delta i_{t-1}) + \alpha_4 e_t + \alpha_5 y^{EUR}_{t+1} + \varepsilon^y_t \tag{4}$$

where y is the output gap, r^l is the real and i^l is the nominal rate of interest on loans, i is the money market rate, e is the real effective exchange rate, and y^{EUR} is the GDP growth in the euro area, the main trading partner of Poland. Thus, in the model, a change of spread affects aggregate demand. Moreover, the spread is endogenised to account for its cyclical fluctuations and forward-lookingness. It depends on the future output gap, so the banks expecting deterioration in the economic activity perceive it as a risk and increase the spread.

The exchange rate equation is expressed in terms of the nominal effective exchange rate. It is a behavioural equation, although in the spirit of the UIP condition. The nominal effective exchange rate (s) depends on its lag and lead, the differential between domestic and foreign (i^f) short-term interest rates and the future output gap:

$$s_t = \beta_0 + \beta_1 s_{t-1} + \beta_2 s_{t+1} + \beta_3 (i_t - i_t^f) + \beta_4 y_{t+1} + \varepsilon_t^s \quad (5)$$

The Phillips curve (in terms of net inflation, π^n) is explained by inflation expectations (π^e), proxied by consumer survey-based measures, the output gap and the real effective exchange rate:

$$\pi_t^n = \lambda_0 + \lambda_1 \pi_t^e + \lambda_2 y_{t-3} + \lambda_3 e_{t-1} + \varepsilon_t^{\pi^n} \quad (6)$$

In the principal version of the model, the relationship between the output gap and inflation is linear. For periods of prosperity, we impose non-linearities in a way suggested by Alichi et al. (2009), i.e.:

$$\hat{y}_t = \frac{y^{\max}}{y^{\max} - y_t} y_t \qquad \text{for } y_t \succ 0 \quad (7)$$

$$\hat{y}_t = y_t \qquad \text{for } y_t \leq 0 \quad (8)$$

$$\pi_t^n = \gamma_0 + \gamma_1 \pi_t^e + \gamma_2 \hat{y}_{t-3} + \gamma_3 e_{t-1} + \upsilon_r^{\pi^n} \quad (9)$$

Such specification implies that the impact of the output gap on inflation is relatively stronger if the output gap is positive. The model is estimated and then partially calibrated to account for a supposedly increased role of processes triggered by the financial crisis – e.g. the interest rate spread, stronger influence of economic fundamentals on the exchange rate, etc.

4. EMPIRICAL EVIDENCE

4.1. INTEREST RATE PASS-THROUGH

Owing to the dominant role of the banking sector in provision of external funds to the economic agents, pass-through from the money market to the retail rates is crucial for the effectiveness of the whole monetary transmission process, the interest rate and credit channels in particular.

In line with the literature, we assume that banks are price takers in the money market and price setters in the case of retail rates – banks set retail rates with respect to the money market rates of corresponding maturities. Jobst and Kwapil (2008) point, however, that money market rates serve well as a proxy for the marginal cost in periods of calm, whereas in time of crisis this is not ensured. During the crisis, banks had problems with fund raising in capital and money markets. And if they aim for a certain proportionality between the components when managing their liabilities, then diverging cost developments may result in marginal cost no longer being represented by money market rates alone. Moreover, retail rates can be affected by structural factors, like competition and development of the capital market. In this study, we do not discuss the latter problem, since we suppose that structural factors do not differ much in the two samples we consider. Bearing in mind the scale of disturbances in the money market, we concentrate on the pure pass-through process.

Before the financial crisis, loan and deposit rates moved broadly in line with the market rates. There was some sluggishness in their adjustment to the market rates – notably in the case of loans for consumption, i.e. for loans which have poorer collateral than others. In many cases, the long-run adjustment to the money market rate was lower than one. The speed of adjustment varied from less than one month to about four months in the case of loans for households' consumption.

In the aftermath of the crisis, some long-run relationships between money market and retail rates broke down. In particular this is true for households' deposits (new businesses) of maturities longer than one month and up to six months. An increase in uncertainty and the aforementioned problems with fund raising led banks to offer deposit rates exceeding WIBOR3M, i.e. the rate treated as a benchmark for the retail rates (Table 3). This was most pronounced in the first quarter of 2009, when the negative spread between WIBOR3M and deposit rates amounted to 1.4-1.5 pp; since then, it gradually fell to 0.4-0.5 pp.

Rates on firms' deposits displayed fewer disturbances. A long-run relationship between rates on deposits of maturities up to 2 years (stock) persisted, however, the adjustment time got longer (from about a month and a half to above two months). As far as new deposits are concerned, the long-run relationship of maturities exceeding three months up to six months seems to disappear. From the point of view of the effectiveness of the monetary transmission process, this fact is of less importance, since firms tend to have deposits of maturities up to one month (Table 4).

Interest rate pass-through from money market to retail loan rates for households and firms has also displayed disturbances. Although many long-term relationships persisted, the time of adjustment lengthened, in particular for already existing contracts (stocks). Moreover, the long-run relationship between the rate on loans for house purchases (new businesses) broke down. Another example of the broken long-run relationship is that between money market rate and the rate on loans for sole proprietors (i.e. the owners of small firms) and consumption. In the case of loans for housing, it seems that risk management in the banking sector tended to reflect conditions in the country of bank's parent company rather than its Polish subsidiary.

Interest rate pass-through to rates on loans to firms (both stocks and flows) displays fewer changes. As a rule, the long-term relationships still operate. The speed of adjustment of the average rate on all new loans got lower. Interestingly, the long-term magnitude of adjustment (i.e. the coefficient β_2) does not exhibit more pronounced changes as compared with the period before the financial crisis (Tables 5 and 6). This leads us to a conclusion that apart from the housing sector, which to some extent suffered from constraints transferred from the foreign parent company to their Polish subsidiaries, the interest rate on loans for other sectors, albeit in a more sluggish way, followed money market rates.

4.2. FURTHER STAGES OF THE MONETARY TRANSMISSION

Assuming that there was a regime change, central bank's reaction function (monetary policy rule) obtained from our VAR model is – at first sight – similar in both samples. The reaction to the domestic demand shock is bigger in the long sample than in the short one, whereas the reaction to the price shock does not display any change (Fig. 5, Fig. 7 upper panel shows the response of the interest rate to the domestic demand shock). Dropping this assumption, we obtain a considerably bigger response to both shocks. It should be noted, however, that while before the crisis the reaction of the interest rate to the domestic demand shock was statistically insignificant, in the sample including data after Lehman Brothers collapse, it becomes significant. Our tentative explanation is that facing a risk of a severe output decline and disturbances in the interest rate pass-through and credit channel operation, the central bank reacted to inflation and output shocks more than in the past. Other empirical results (Fig. 6 and Fig. 7) show that the monetary transmission is somewhat slower – assuming the regime shift – the maximum reaction of prices to the interest rate shock appears 3 months later than in the past, but the magnitude of the reaction is very similar. As expected, reactions obtained without the dummy exhibit longer lags. The reaction of prices to the exchange rate shock under the assumption of a regime shift tends to be more prolonged than before the crisis. If, once again, we drop this assumption, the pass-through is smaller and faster. The difference between the two responses can be due to cyclical factors. Przystupa and Wróbel (2010) show that exchange rate pass-through is asymmetric over the business cycle and tends to be the smallest during early recessions. Thus, the dummy effect may encompass not only the increased uncertainty and changes in the monetary policy, but also cyclical fluctuations.

Prices seem to be more flexible with respect to the domestic demand than before the crisis. With the dummy the effect is small, whereas much bigger without it. Bearing in mind the global character of the crisis and the scale of output drop in the EU and the US, we argue that facing adverse conditions, producers were slightly more than usually willing to adjust their prices to a fall in demand. Also, the reaction of the nominal effective exchange rate to the shock in output, which can be interpreted as a positive shock to the economic fundamentals, brings about appreciation, which is less persistent than in the past. Thus, it seems that the financial crisis induced more volatility into the foreign exchange market. The reaction of output to both the interest rate shock and exchange rate shock is slightly smaller than before the financial crisis. In this case, the dummy does not change the responses.

A response of the unemployment rate to the interest rate shock tends to be larger and more volatile in the longer sample, what seems to be inconsistent with the respective reaction of industrial output. The maximum reaction in the longer sample occurs six months later than in the short one. The slower response can be due to reluctance of employers to quick lay-offs after a prolonged period of a tight labour market. The increased openness of the labour market after the EU enlargement in 2004 adds volatility to its reactions. Thus, it seems that the financial crisis triggered changes in the labour market initiated well before the EU entry.

The response of the unemployment rate to the exchange rate shock is somewhat puzzling. Both in the short and long sample, it tends to fall after the unexpected appreciation, while one could expect rather some increase, owing to losses in competitiveness which in turn lead to a drop in output. But in the case of a country displaying high import intensity of exports (it is about 0.7 for manufacturing), such results seem plausible. Thus, they can be interpreted as the effect of improved competitiveness of the real sector due to cheaper imports. The response in the sample covering the financial crisis, which does not display any increase, is probably caused by a higher price competitiveness of exports after 30% depreciation offsetting increased cost of imports (Fig 7).

Interestingly, responses of main macroeconomic variables to the foreign demand shock have not changed much owing to the crisis. Therefore, we only briefly note that a positive demand shock induces exchange rate appreciation. This in turn leads to a downward movement in prices and a positive reaction of the real sector – industrial output increases and the unemployment rate goes down. Prices start to increase slightly only afterwards.

Retail sales, being in this study a proxy for private consumption, react negatively to the monetary tightening. The response obtained from the short sample is slightly smaller than the one obtained from the longer one. The dummy makes this difference even smaller. Thus, it seems that in spite of the increased uncertainty, consumption tends to be smoothed (Fig. 7).

In the wake of the financial crisis, domestic currency loans for households display practically the same reaction to the interest rate shock as before (Fig. 8). In this group of loans, only those to sole proprietors seem to exhibit more downward movement in the longer sample. This could suggest that banks perceived loans for these small entities as relatively risky. The reaction of the corporate sector loans (Fig. 9) in the longer sample is unchanged over the period of the first 15 months after the shock, and only afterwards some differences begin to develop. Both overdraft and loans of maturity exceeding one year (serving here as a proxy for investment loans) exhibit initially slower and smaller (overdraft) reaction to the interest rate shock than before the crisis. This can reflect the fact that during the financial crisis banks lengthened the interest rate adjustment period. The more rigid reaction of the overdraft to the interest rate shock can be also due to an increase in demand for such loans. On the other hand, tightening of loan conditions for small and medium-sized enterprises could have a negative impact. It is noteworthy that in the longer sample, the total amount of household and corporate sector loans (up to 17-18 months after the shock) exhibits the reaction pattern similar to that before the collapse of Lehman. Thus, we conclude that banks simultaneously used in a more active way instruments other than interest rates to affect loan supply, setting tighter standards and conditions[12].

12 Our setting of the VAR does not allow us to draw hard conclusions on credit channel operation, since we do not disentangle between loan supply and demand. Senior Loan Officer Opinion Surveys (SLOOS), conducted by the NBP on quarterly basis, involve questions on both demand and supply. SLOOS show that banks aimed at reducing loans for housing and consumption. As we have discussed, the former are mostly extended in foreign currency. Also, loan officers report that demand for consumer loans was slightly falling in the first half of 2009, but then started to increase. In the case of loans extended to the corporate sector, banks report to tighten standards and conditions with respect to the supply of short-term (of maturity up to 1 year) and long-term loans (of maturity exceeding 1 year) in the same way. The standards and conditions were tightened more for small and medium-sized enterprises than for the big ones. On the other hand, loan officers reported a more pronounced fall in demand for long-term than for short-term loans, suggesting that firms abandoned investment plans, whereas they tried to find financing for the working capital, inventories and debt restructuring.

Our results are broadly consistent with the SLOOS, with the exception of loans to the corporate sector of maturity exceeding one year.

In the case of loans denominated in foreign currency to households[13] and corporate sector, we discuss impulse responses to the (domestic) interest rate shock and domestic demand shock (exchange rate shock seems to induce mostly the accounting effect). After the monetary tightening, both before and after the crisis, corporate sector tends to increase its debt in foreign currency (Fig. 10, upper panel), since that in domestic currency becomes relatively more expensive. The effect is somewhat bigger in the longer sample and is statistically significant. Loans in foreign currency to private persons do not change in response to the monetary policy shock (thus, we even do not reproduce them in the graph), whereas those to the sole proprietors display a similar pattern as loans to the corporate sector. Thus, in the sample including financial crisis data, loans in foreign currency to the corporate sector and sole proprietors seem to be more responsive to the monetary policy shocks. It should be stressed however, that in both samples, they clearly weaken monetary transmission.

After a positive domestic demand shock, both before and after the crisis, households and corporate sector first reduce the debt in foreign currency (Fig. 10, lower panel; the dummy variable, supposed to detect the regime change, is statistically significant for loans to the corporate sector only). The effect is bigger in the longer sample. It seems to be predominantly the accounting effect of appreciation induced by a positive shock to economic fundamentals. Taking into account that loans in domestic currency do not display such behaviour and rather increase after domestic demand shock, we conclude that the reduction of debt independent from the exchange rate changes is minor. Households and firms begin to increase loans in foreign currency about 10-12 months after the shock. The responses become statistically significant even later. Like in the previous case of the interest rate shock, the response of the corporate sector is bigger than in the period before the crisis, whereas that of households does not display major changes. That may suggest that the corporate sector has somewhat changed its behaviour.

13 Over the period 2004-2010, loans denominated in foreign currency for sole proprietors accounted only for about 2.5-10% of the total amount of such loans extended to households.

4.3. EFFECTIVENESS OF THE MONETARY TRANSMISSION MECHANISM. IMPACT OF CYCLICAL FACTORS

The efficiency of the monetary policy depends on the credibility and effectiveness of the monetary transmission mechanism. The effectiveness may change over time and tends to be impacted by both structural shocks and cyclical behaviour of the economy. The former may permanently affect the strength of a specific channel as well as the relative weight of channels, while the latter induces temporary fluctuations of the transmission.

We present indicators obtained for the period 2001.01-2010.05. Monetary policy effectiveness, defined as in Section 3, indicates that the exchange rate has been the most efficient channel among those included in our VAR model, i.e. interest rate, exchange rate, and credit channel (Fig. 11). However, its efficiency is decreasing in line with the development of structural changes. A downward trend observable in 2001 results from a transition from managed to pure float. The EU accession induced fluctuations of the indicator but it did not alter its average level. In the wake of the crisis, effectiveness dropped by one third. It is plausible that the effect is transitory – since July 2009, the effectiveness has been increasing.

The effectiveness of the interest rate channel (Fig. 11) rose rapidly at the early stage of the inflation targeting, apparently resulting from a higher credibility of the central bank and increasing monetization. The level of the indicator, apart from its slight increase during the recovery triggered by Poland's accession to the EU, was stable until the financial crisis. Between the third quarter of 2008 and the first quarter of 2010, the effectiveness decreased by almost 20% and remains at a low level. It may reflect both a temporary change in NBP's monetary policy: a shift from the interest rate control to the liquidity management and an effect of the economic slowdown with a fall of investment and credit use. Both suggest a transitory fall of the effectiveness.

Credit channel, or more precisely the bank lending channel, effectiveness (Fig. 11) changes in line with that of the interest rate. Both seem to reflect the cyclical behaviour of the economy. The level of the indicator is twice lower than that of the interest rate, but its reaction to the financial crisis is bigger, suggesting a significant squeeze of credit supply. Though in our setting it is impossible to disentangle credit supply and demand, we suspect that while the first drop of the effectiveness was probably due to tightening of credit conditions, the second one, in mid-2009, is probably rather a result of a lower demand (see e.g. Del Giovane et al. (2010)).

To trace cyclical features of the indicator, we compare it with the output gap[14] (a proxy for the business cycle). We find that the former tends to fall during recessions while remaining stable during expansions. It may result from a low exchange rate pass-through to consumption prices in the early and middle stage of recession, when enterprises expecting lower profits cut costs (see Przystupa and Wróbel (2010) for details). Then, the slope of the Phillips curve becomes less steep (enterprises are more reluctant to raise prices than to lower them, see e.g. Filardo (1998)). In the early expansion, the convex Phillips curve is combined with a high pass-through effect. The same phenomenon, although due to the opposite reaction, can be observed in the late expansion, when the concave Phillips curve is combined with a lower pass-through. That is, during a recovery, the effectiveness of the exchange rate channel may slightly increase or remain constant. Analytically, this can be described by a two-leaf clover curve drawn by a segment moving in the rectangular coordinates along the horizontal coordinate (output gap) and the vertical one (inflation gap, i.e. the difference between current and target inflation) – Fig. 11. The segment may be interpreted as a long-run path of the GDP growth rate expressed in nominal terms.

To develop the role of the business cycle phase for the effectiveness of the monetary transmission mechanism we used linear and non-linear versions of the structural model described in Section 3. In the non-linear model, the estimated direct impact of the output gap on net inflation varies from 0.13 in the case of a non-negative output gap to 0.42 in the case of a significantly positive output gap (the highest value observed in the sample). In the linear version of the model, the direct impact of the output gap on net inflation is 0.28 (Fig. 12). To analyse the main features of the monetary transmission mechanism, we analyse results of the simulations, in which the short-term interest

14 De-trended industrial production.

rate is increased or decreased by 1 pp for 4 quarters and then it returns to the baseline. Due to non-linear effects of the output gap on inflation, simulations are conducted for different initial values of the output gap. Figure 13 presents the response of CPI y/y inflation to a positive, while Figure 14 – to a negative interest rate impulse. Table 7 summarizes the results.

Simulations based on the non-linear model support previous evidence of the impact of the business cycle on the monetary transmission mechanism. The maximum inflation response to the interest rate increase varies between -0.37 pp in the case of non-positive output gaps to 0.59 pp in the case of the actual output being 4.5% higher than the potential output. A reduction of interest rates leads to even more diversified outcomes: inflation increases by 0.37 pp for a non-positive output gap and by 0.68 pp for a highly positive output gap.

The operation of the monetary transmission mechanism is different in both versions of the model. Capturing non-linear effects in the monetary transmission mechanism makes inflation response to the interest rate impulse less persistent. For the initial levels of the output gap, not sizeably higher than 0.03, the maximum inflation response in the linear model is stronger, although more delayed than in the non-linear one. In the periods of economic boom and the output gap approaching its highest observed value, the maximum response is significantly higher than in the linear version of the model and occurs with the same delay.

5. CONCLUSIONS

The paper shows implications of the current financial crisis for the monetary transmission mechanism in an emerging market economy. The transmission mechanism crucially depends on the monetary policy, but also on structural features of the economy. The financial crisis could potentially affect both. In its sharp phase, many central banks changed their monetary policy from short-term interest rate control to liquidity management. In the case of Poland, we find support for the hypothesis of a change in the monetary policy rule. Facing a risk of a severe output decline, the central bank apparently took into account possible disturbances in the interest rate pass-through as well as in the credit channel operation, and increased its responsiveness to both inflation and output shocks. Reactions of inflation and industrial output to the interest rate and exchange rate shocks display minor changes. The contraction accompanying the financial crisis triggered more volatile reactions of the labour market.

The increase of uncertainty brought about problems with the transmission from the monetary policy instrument to the money market and retail rates, but a breakdown of the long-term relationships concerned mostly deposits of households, consumption and loans for housing and sole proprietors. Other retail rates exhibited more delayed adjustment. What is specific for emerging market economies is the significant role of the exchange rate in the transmission mechanism and the fact that the increased global uncertainty caused massive capital outflows. In the case of Poland, we do not find evidence that it hampered output via the credit channel. Though our setting does not allow us to draw hard conclusions on credit channel operation, we observe that after the crisis, reactions of loans to small entities became deeper, what is consistent with credit channel and asymmetric information literature.

Our results based on the Polish data suggest a significant drop in the overall monetary policy effectiveness since the fourth quarter of 2008, and a slight improvement at the end of 2009. The increased role of credit market imperfections and the weakening of the exchange rate channel can be viewed as typical phenomena in the current phase of the business cycle. There is some evidence that the latter tends to fall during recession and remains stable during expansion. All in all, it seems that disturbances in the monetary policy transmission rather reflect increased perception of risk and cyclical features of the transmission process activated by the financial crisis and, to a much smaller extent, structural changes in the economy. The magnitude of the crisis and its duration, as well as the likely evolution of the regulatory framework and adjustments in macroeconomic policies can lead to changes in the behaviour of economic agents and result in the evolution of the monetary transmission mechanism. The learning process of economic agents – consumers, producers and the banking sector will exert a significant impact on the whole process.

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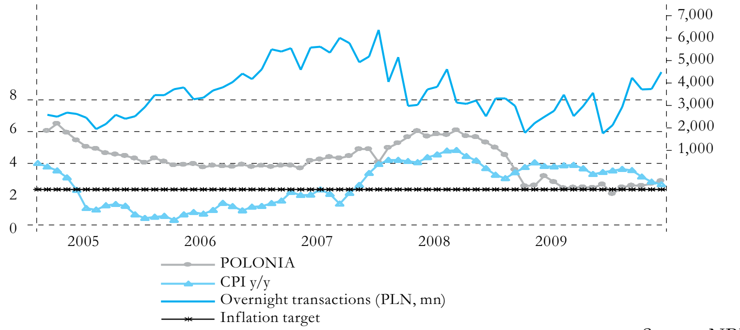
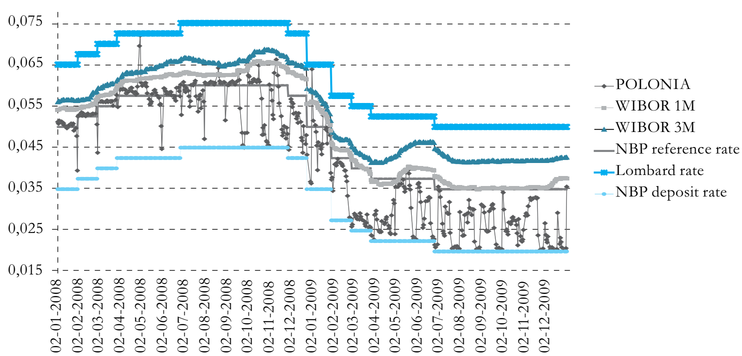
Figure 1: Overnight transactions in the unsecured market, POLONIA, inflation CPI y/y and inflation target



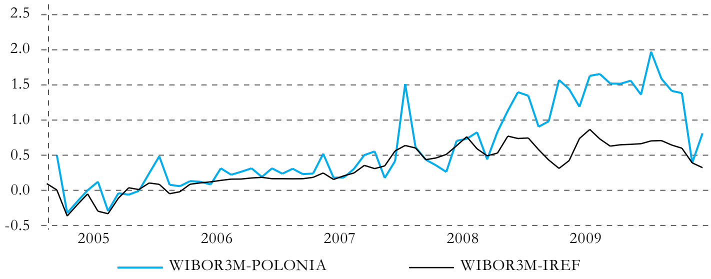
Source: NBP

Figure 2: NBP rates and unsecured market interest rates



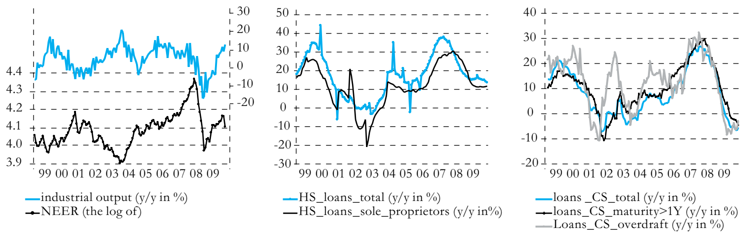
Source: NBP

Figure 3: Spreads between 3-month money market rate (WIBOR 3M), the overnight rate (POLONIA) and the NBP reference rate



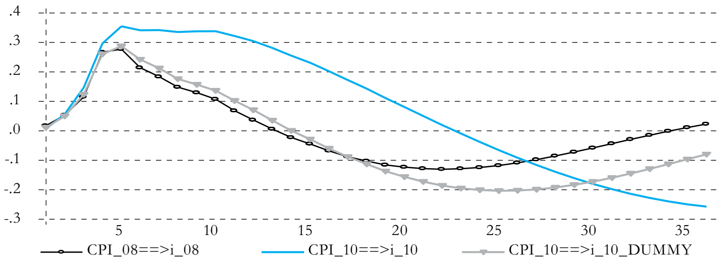
Source: Authors' calculations. Data: NBP and Reuters.

Figure 4: Main variables used in the estimation: industrial output (y/y), NEER, loans in the domestic currency to households – total amount(y/y), to the sole proprietors (y/y), to the corporate sector – total amount (y/y), of maturity over 1Y (y/y) and overdraft (y/y)



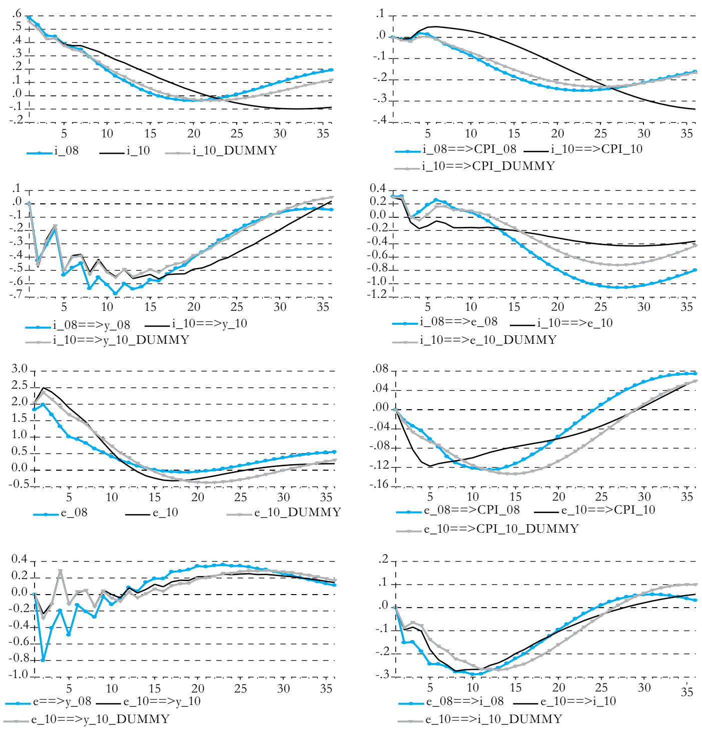
Source: Central Statistical Office and NBP

Figure 5: Response of WIBOR1M to a shock to the consumer price index



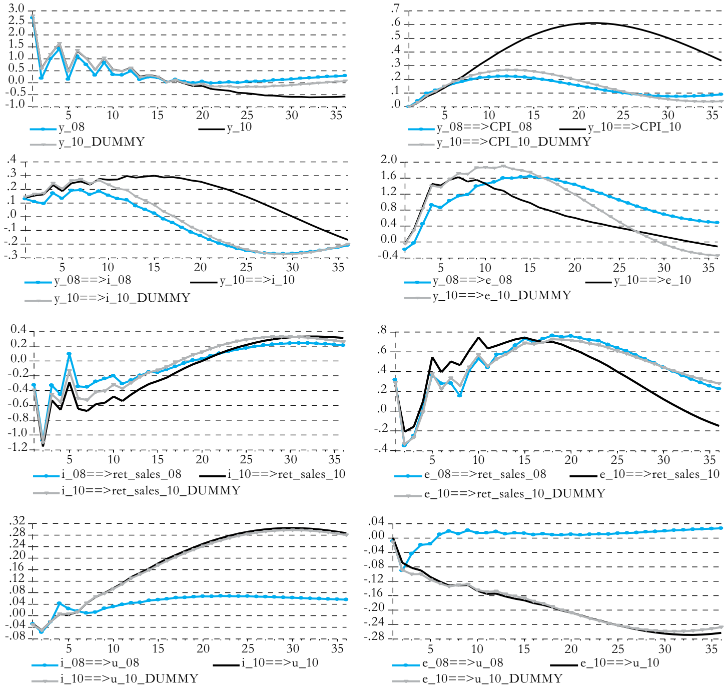
Source: Authors' calculations

Figure 6: Reaction functions of main economic categories before and during the financial crisis: interest rate shock (upper panel) and exchange rate shock (lower panel)



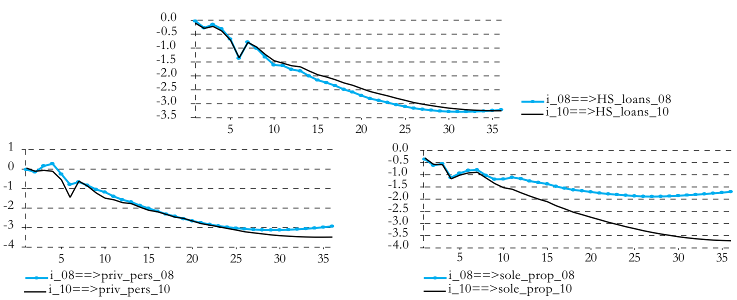
Source: Authors' calculations

Figure 7: Reaction functions of main economic categories before and during the financial crisis: domestic demand shock (upper panel), interest rate and exchange rate shocks on retail sales and unemployment rate (u) (lower panels)



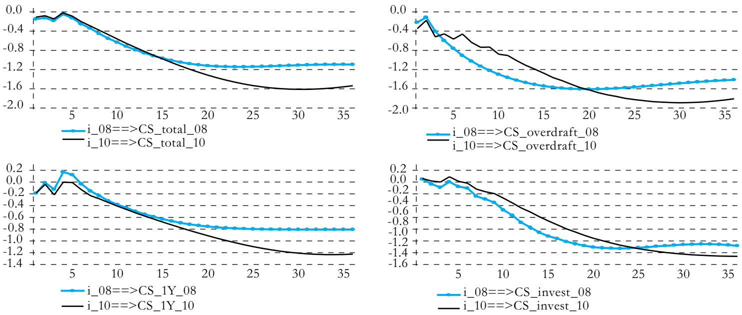
Source: Authors' calculations

Figure 8: Response functions of loans in the domestic currency to households (interest rate shock)



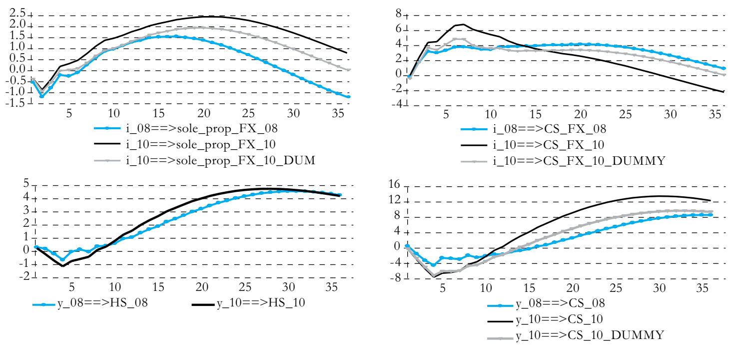
Source: Authors' calculations

Figure 9: Response functions of loans in the domestic currency to the corporate sector (interest rate shock): total domestic currency loans, overdraft, loans of maturity up to 1 year and exceeding one year ("investment")



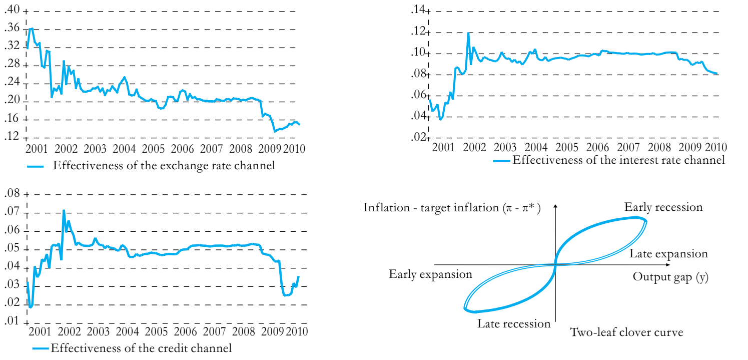
Source: Authors' calculations

Figure 10: Loans in foreign currency to the sole proprietors and corporate sector interest rate shock – upper panel and domestic demand shock – lower panel



Source: Authors' calculations

Figure 11: Monetary transmission effectiveness (transmission to CPI)



Source: Authors' calculations

Figure 12: Direct impact of the output gap on inflation – nonlinear (NL) and linear (L) model

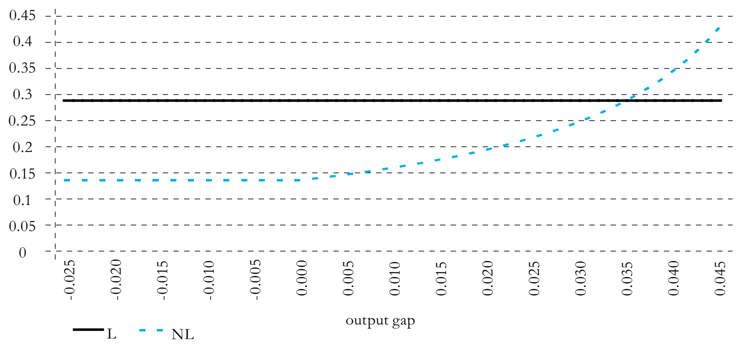
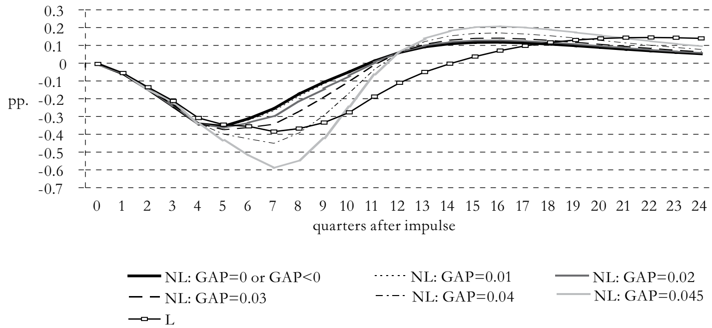
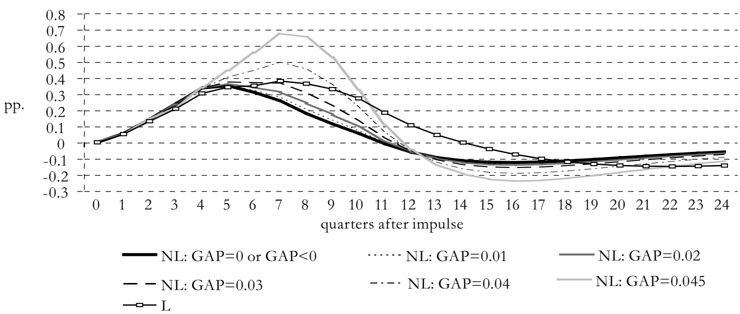


Figure 13: Inflation response to a positive interest rate impulse for different initial values of the output gap, nonlinear (NL) and linear (L) model



Source: Authors' calculations

Figure 14: Inflation response to a negative interest rate impulse for different initial values of the output gap, nonlinear (NL) and linear (L) model



Source: Authors' calculations

Table 1 Poland against the euro area and selected Central European countries, selected indicators, 2008 (in %)

	Euro area	Poland	Czech Republic	Hungary
Trade openness[1]	74.1	74.1	141.2	137.2
Financial openness[1]	261.5	116.6	147.4	173.5
Financial sector assets to GDP	456.9	110.5	137.3	152.4
Bank assets to GDP	345.9	81.6	109.1	109.6
Bank loans to non-financial sector to GDP	105.6	46.6	55.2	54.5
Bank deposits from non-financial sector to GDP	74.7	38.8	62.1	36.4
Stock market capitalization to GDP	40.2	21.1	20.0	12.6
Corporate bonds to GDP[2]	17.5	1.0	2.4	0.4
Share of assets of 5 largest banks in total bank sector assets	57.1	44.6	62.0	71.5
Funding gap[3]	111.3	108.4	77.0	81.4

[1] Data for 2005. Trade openness is defined as a sum of imports and exports as a percentage of GDP. Financial openness is measured as the sum of gross stocks of foreign assets and liabilities as a percentage of GDP. [2]Data for 2006. [3]Loans of non-financial and general government sectors to deposits from these sectors.

Source: Trade and financial openness data: Mohanty and Turner, 2008, Table 3A. Other data: Report on financial system development in 2008, NBP.

Table 2 Main characteristics of the Polish banking sector, 2002-2009

	2002	2003	2004	2005	2006	2007	2008	2009
Average balance of open market operations (PLN millions)[1]	10 222	5 435	4 878	15 559	20 192	18 485	8 334	20 781
Firms:								
share of short-term deposits	97.7	98.1	98.7	98.6	98.8	98.5	98.7	98.4
share of short-term loans	43.4	40.7	38.5	38.4	35.8	36.0	35.2	32.0
share of foreign currency deposits	21.3	17.5	18.3	19.7	21.2	20.0	17.4	15.9
share of foreign currency loans	30.2	31.8	29.0	24.0	22.4	20.2	19.4	25.4
Households:								
share of short-term deposits	90.6	90.3	91.3	93.6	94.7	96.2	95.8	94.3
share of short-term loans	32.2	28.6	26.0	22.6	18.3	15.6	13.8	11.8
share of foreign currency deposits	17.5	17.2	17.0	14.9	14.2	12.5	9.2	8.5
share of foreign currency loans	21.7	27.7	26.3	26.7	31.3	30.1	32.5	39.8

[1] Balance of open market operations is equal to the sum of NBP bills and SWAP operations minus repo operations.

Source: Authors' calculations and NBP data

Table 3 Parameters of long-run relationship between WIBOR 3M and retail rates on deposits of households - stocks (s) and flows (f), 2005.01-2008.09 and 2005.01-2010.05

Maturity	α_1		β_1		β_2		time of adjustment (in months)	
	up to 2008.09	up to 2010.05	up to 2008.09	up to 2010.08	up to 2008.09	up to 2010.05	up to 2008.09	up to 2010.05
$s \leq 2Y$	0.19	0.16*	0.32	0.03*	0.74	na	2.53	na
$f \leq 1m$	0.37	0.40	0.51	0.29	0.82	0.96	1.24	2.1
$1m \prec f \leq 3m$**	0.89	0.69	0.43	0.03*	0.86	na	0.35	na
$3m \prec f \leq 6m$	0.83	0.75	0.48	0.02*	1.01	na	0.35	na
$6m \prec f \leq 1Y$	0.75	0.49	0.96	0.21	0.68	0.92	0.26	2.43
f average	0.57	0.54	0.37	0.09	0.91	1.46	1.16	5.11

Source: Authors' calculations

Notes: * Statistically insignificant; if α_1 is insignificant, we show the adjustment time within a range of $(1-\alpha_1)/\beta_1$ and $1/\beta_1$. ** Stable relationship up to July 2008 only.

Table 4 Parameters of long-run relationship between WIBOR 3M and retail rates on deposits of firms - stocks (s) and flows (f), monthly data 2005.01-2008.09 and 2005.01-2010.05

Maturity	α_1		β_1**		β_2		adjustment time	
	up to 2008.09	up to 2010.05	up to 2008.09	up to 2010.05	up to 2008.09	up to 2010.05	up to 2008.09	up to 2010.05
$s \leq 2Y$	0.08*	0.22	0.67	0.36	0.77	0.84	1.37-1.5	2.17
$f \leq 1m$	0.33	0.69	0.79	0.18	0.86	1.00.	0.85	1.72
$1m \prec f \leq 3m$	0.66	0.68	0.94	0.18	0.91	1.09	0.36	1.78
$3m \prec f \leq 6m$	0.92	0.80	0.49	0.08*	0.93	na	0.16	na
$6m \prec f \leq 1Y$	0.74	0.64	0.76	0.11	0.68	1.07	0.34	3.27
f average	0.37	0.68	0.78	0.25	0.87	0.99	0.81	1.28

Source: Authors' calculations

Notes: * Statistically insignificant; if α_1 is insignificant, we show the adjustment time within a range of $(1-\alpha_1)/\beta_1$ and $1/\beta_1$.

** Up to February 2009 r. parameter β_1 statistically significant.

Table 5 Parameters of long-run relationship between WIBOR 3M and retail rates on loans to households - stocks (s) and flows (f), 2005.01-2008.09 and 2005.01-2010.05

	α_1		β_1		β_2		adjustment time	
	up to 2008.09	up to 2010.05	up to 2008.09	up to 2010.05	up to 2008.09	up to 2010.05	up to 2008.09	up to 2010.05
Total overdraft excluded, *s.*	0.37	0.18*	0.34	0.21	0.68	0.78	1.85	3.9-4.8.
f. for consumption, the annual percentage rate of change	0.05	-0.10*	0.22	0.15	1.13	0.75*	4.32	na
f. for house purchases	0.59	0.74	0.65	0.05*	1.09	na	0.63	na
f. for sole proprietors	0.24*	0.68	0.44	0.06*	1.59	na	1.7-2.3	na
f. total	0.05*	0.27*	0.70	0.44	1.28	0.97	1.3-1.4	0.8-2.3

Source: Authors' calculations

Notes: * Statistically insignificant; if α_1 is insignificant, we show the adjustment time within a range of $(1-\alpha_1)/\beta_1$ and $1/\beta_1$.

Table 6 Parameters of long-run relationship between WIBOR 3M and retail rates on loans to firms - stocks (s) and flows (f), 2005.01-2008.09 and 2005.01-2010.05

	α_1		β_1		β_2		adjustment time	
	up to 2008.09	up to 2010.05	up to 2008.09	up to 2010.05	up to 2008.09	up to 2010.05	up to 2008.09	up to 2010.05
Bank overdraft, *s.*	0.35	0.59	0.28	0.13	0.85	0.85	2.32	3.15
$1Y \prec s \leq 5Y$	0.15*	0.50	0.43	0.19	0.86	0.87	2-2.3	2.63
Total, excluding overdraft, *s.*	0.29	0.37	0.24	0.26	0.82	0.79	2.96	2.4
Up to 3 months, variable and fixed rate up to 4 mln PLN, *f.*	0.54	0.65	0.33	0.26	1.0	0.94	1.39	1.35
Fixed rate, $1Y \prec f \leq 5Y$	-0.15*	0.54*	0.81	0.75	0.56	0.42	1.2-1.42	0.61-1.33
Total f.	0.76	0.72	0.74	0.16	0.96	0.94	0.32	1.75

Source: Authors' calculations

Notes: *Statistically insignificant; if α_1 is insignificant, we show the adjustment time within a range of $(1-\alpha_1)/\beta_1$ and $1/\beta_1$.

Table 7 Maximum inflation response [delay (in quarters)] after the interest rate impulse for different initial values of the output gap, non-linear (NL) and linear (L) model

	NL: GAP=0 or GAP<0	NL: GAP=0.01	NL: GAP=0.02	NL: GAP=0.03	NL: GAP=0.04	NL: GAP=0.045	L
Interest rate increase	-0.35 5	-0.36 5	-0.36 5	-0.37 5	-0.45 7	-0.59 7	-0.38 7
Interest rate decrease	0.36 5	0.36 5	0.37 5	0.38 5	0.50 7	0.68 7	0.38 7

Source: Authors' calculations

MACROECONOMIC DETERMINANTS OF REMITTANCES: THE CASE OF ALBANIA

*Esida Abazaj**

ABSTRACT

This paper aims to empirically estimate the macroeconomic determinants of emigrants' remittances to Albania over the period 1996-2010. This is a first type of its kind in the case of Albania. We employ the Vector Error Correction Model to study the long- and short-run dynamics of remittances. We find that remittances in the long-run depend solely on the macroeconomic conditions of the host country, which is proxied by the unemployment rate in host countries, weighted on the basis of shares of remittances received from each host country. An increase of the unemployment rate by 1 percentage point, decreases remittance transfers by 0.13% in the long-run. The other two explanatory variables, proved insignificant, both in the long- and short-run, rejecting the conventional hypothesis that remittances are primarily sent to meet consumption needs of the emigrants' households in home country. The only finding supporting the altruism hypothesis is the fast adjustment of remittances to their long-run equilibrium, indicated by the high and statistically significant error correction term. Also, the study found no evidence on the investment motive driving Albanian emigrant's remitting decision.

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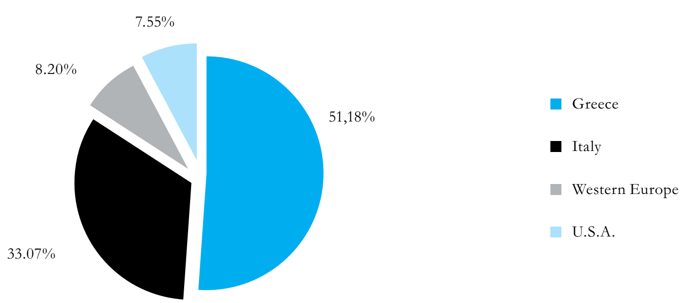
The views in this paper are solely the responsibility of the authors and should not be presented as reflecting those of the Bank of Albania.

I. INTRODUCTION

In the last three years, workers' remittances have attracted much attention in policy circles in Albania, which is considered to be one of the major labour-export countries in the region. Despite its small economic size and population, Albanian migration, as Russel King puts it, is "a type of laboratory on studying new migration processes", because of its massive, dynamic, chaotic, and illegal streams of migration. This phenomenon has prevailed during all stages of Albanian transition, though with different degrees of intensity. According to the latest available official figures and literature, it is estimated that around 1.2 million Albanians were practicing emigration in 2008, constituting more than 25% of the Albanian population. Around 85% of Albanian emigrants are located in Greece and Italy, and the rest in the Western Europe and U.S (Figure 1).

Chart 1: Albanian emigrants by host country



Such recent attention on remittances mostly stems from their rapid and considerable slowdown, which is widely debated to have been caused by the recent economic crisis affecting the host countries with the highest Albanian migrants' concentration.

Remittances to Albania constitute a very important source of foreign exchange, amounting to 12.5% of Gross Domestic Product and 14.43% of consumption, over the last 15 years. Also, these transfers are an essential component to the BoA's Balance of Payments, making up around 80% of current transfers.

Also, when compared to other sources of foreign financing (exports and foreign direct investments), remittances are private in nature, which means they are unlikely to end up in the hands of corrupted government officials (Kapur, 2004, and Lueth and Ruiz Arranz, 2007).

Given the high importance of remittances to Albanian economy and their enormous benefits at households level (though not yet empirically studied), it is reasonable that the recent considerable decrease remittance has been captivating so much attention from policy makers, media and international organizations (IMF, World Bank). So, there is a need to scientifically study and analyze the key driving forces of remittance behaviour, and to use these forces, if possible, to attract more remittances.

There is a substantial body of literature on the macroeconomic impact of remittances on the economic condition of the labour-export countries. However, there is also an increasing theoretical and empirical interest in studying the determinants of remittances, especially the latter, to see if it is plausible for home countries to use or design tools to increase these inflows. The literature on remittances distinguished two types of factors affecting the inflow of remittances: micro and macro.

Micro approaches employ a wide range of variables, mostly obtained from surveys, such as gender, age, marital status, wage level, number of households, age of household head, number of migrants per household, number of years abroad, skills level, occupation, etc (Lucas and Stark, 1985; and Funkhouser, 1995).

The theoretical debate about the determinants of remittances was triggered by the seminal paper of Lucas and Stark (1985), which continues to be the basis of recent discussion and studies on remittances. Using data from a detailed survey of migration conducted in Botswana, the authors attempt to test several hypotheses regarding the motives to remit, like altruism, self-interest, and repayment motive. *Altruism* is the notion underlying most of the literature on remittances determinants, according to which emigrants care about the family left behind and therefore they remit. Such motive indicates that there should be a negative relationship between volume of remittances and the improving economic conditions of emigrants' households. A second probable motive to remit is *self-interest,* which emerges in several forms. It can emerge as "an aspiration to inherit" motive by which emigrants send remittances to gain a higher chance of inheriting assets in the country of origin. It can emerge as "an intent to invest" in the home country or to secure assets and investments that they have already undertaken. Under this motive, remittances are expected to increase as indicators related to investment or business environment of home country improves. Another form of self-interest motive applies to those emigrants who intent to return to their home country after reaching their savings target and therefore are interested in buying social assets (relationships with their family and friends) with the prospect of returning home with dignity. This sub-motive is known as "maintaining links with the family". The third motive, *repayment motive,* considers remittances as repayments of emigrants to their families for paying or financing their migration or education. Under this motive, the higher the emigrant's level of education, the higher the remittances are.

However, in a comparative study on remittances between El-Salvador and Nicaragua, Funkhouser (1995) confirmed that remittances cannot be determined solely by migrants' characteristics. Though the number of emigrants, their characteristics (age, gender, education, and timing of migration) and the general economic conditions in both countries (El-Salvador and Nicaragua) were quite similar, twice as many households received remittances from relatives abroad in Salvador than in Nicaragua. So, Funkhouser (1995) pointed out the need for further research on determinants of remittances, other than microeconomic ones.

Macro approaches aim to identify the impact of main macroeconomic variables on the inflow of remittances. These studies assume that emigrants monitor the key macroeconomic variables, both in their home and host country, especially those affecting their daily lives, and respond to them by adjusting the amount of remittances they send. The main macroeconomic variables employed by most studies as possible determinants of remittances can be grouped into three main categories. The first category includes variables related to host country's economy such as: wages, gross domestic product, unemployment rate, and interest rate. The second category of determinants covers the economic conditions of the home country: consumer price index, economic activity, interest rate, etc. The third one attempts to capture those variables which reflect the relationships between home and host country, such as: exchange rate, financial linkage and openness to trade.

Using variance decompositions, impulse response functions, and Granger Causality, derived from a VECM, Vargas-Silvas and Huang (2005) identify whether remittance flows between the U.S and the rest of the world are affected by macroeconomic conditions of the host or home country. Their results show that when deciding how much to remit, migrants focus more on the economic situation of the host country relative to the economic situation of the home country.

Another empirical estimation of the motives driving remittance flows is that of Schiopu and Siegfried (2006). They investigate the importance of altruistic motives versus investment motives using a new panel data set of bilateral flows from 21 Western European to 7 EU neighbouring countries. Schiopu and Siegfried (2006) find that altruism is important for remitting, as the GDP differential between sending and receiving countries is positively correlated with the average remittance per migrant. By contrast, the interest rate differential which is proxied by the real short-term deposit rate differential between sending and receiving countries, turns out to be insignificant, thus indicating a weak investment motive.

Employing panel-data estimation techniques, Schrooten (2006) estimates the main determinants of remittances to 24 socialist countries from 1990 to 2003. Estimation results show that higher unemployment rate in the destination country negatively influences the size of remittances. Also, Schrooten (2006) finds that remittances increase with problems of the domestic economy. An increase in GDP per capita of domestic economy will trigger more remittances supporting thus the altruism hypothesis. Interestingly enough, compared to previous studies on determinants of remittances, Schrooten (2006) employs two new explanatory variables, which are: quality of institutional framework (captured by the average of the EBRD transition index on enterprise reform, competition policy, banking sector, reform of non-bank financial institution) and times of wars and conflicts (captured by dummy variables). Results showed an insignificant effect of quality of institutional framework on remittances and a significant effect of times of wars and conflicts on remittances per capita.

With regard to determinants of emigrants' remittances in the case of Albania, there is very limited empirical evidence, mainly based on microeconomic data. In their study, Hagen-Zanker and Siegel (2008) test for altruism and insurance amongst Albanian and Moldovan emigrants, by estimating a Tobit regression in the amount of remittances sent per migrant in 2006. In case of Albania, they find conflicting evidence for altruism and conclusive support on the insurance motive of the emigrant. The latter is confirmed by the highly significant and positive coefficient on the unemployment rate and distance which indicates that the more emigrants are exposed to risk, the more they insure by sending more remittances.

Other studies on determinants of Albanian inward remittances to Albania are those of Konica (2006), Gërmenji, Beka and Sarris (2001), and Lianos and Cavounidis (2004), who all utilize data obtained from household surveys. All these three studies concluded that emigrants remit more towards older household heads, spouses, and kids left home, which indicates the dominance of the altruistic motive. An interesting finding is that of Konica (2006) who finds a negative effect of squared migration experience on the probability to remit. Lianos and Covandos (2006), in line with the study of Hagen–Zanker and Siegel (2007), find evidence of insurance motive according to which emigrants remit more when employment in the host country is less stable.

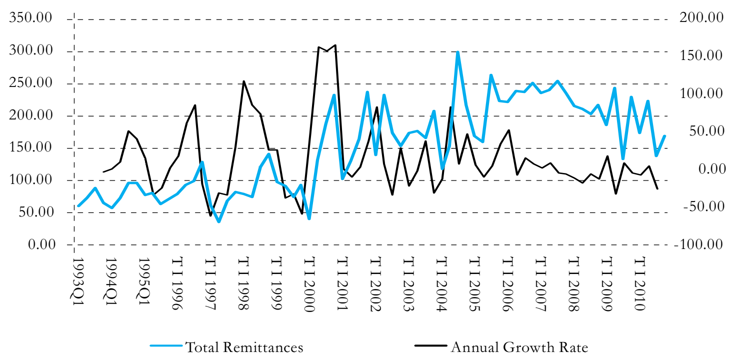
Major contribution to the analysis and understanding of remittance behaviour is also attributed to annual surveys conducted by Gëdeshi, through which he aims to examine the role of remittances in the Albanian economy and their motivations for sending remittances back home.

This paper contributes to the existing literature on remittances, as to our knowledge, it is the first attempt to study the determinants of remittances, at a macro level, for the case of Albania. The rest of the paper attempts to investigate the macroeconomic determinants of emigrants' remittances to Albania. It is organized as follows. Section 2 presents some main stylized facts on remittances. Section 3 discusses the data and methodology employed in our study, and highlights the main results. And lastly, in section 4 some conclusions and policy recommendations are drawn.

II. STYLIZED FACTS

Official reported remittances increased at an annual average rate of 5.6% over the last 15 years. Such rate used to be much higher up to 2007 (estimated at 10.37%), but dropped significantly over the last three years, registering an annual decrease of 15.21%, 6.56% and 13.06% in years 2008, 2009 and 2010, respectively (Figure 1). Gëdeshi (2010) mentions two main factors responsible for the progressive reduction of remittances. First, the recent economic global crisis negatively affected the Albanian emigrants' employment opportunities and income levels, which in turn lead to their lower ability to save and remit. Second, remittances have a long-term downward trend, as widely accepted by various studies (Docquier, Rapoport 2005; IOM, 2005). Over time, emigrants have their status regularized, establish new families or unite with the rest of family in migration, further integrate in the host country, which all lead to weakening of relationships with the country of origin. Such tendency in the remittancebehaviour is expected to occur also in the case of Albania (Civici A., Gëdeshi I., Shehi D., 1999; Gëdeshi I., 2002; Gëdeshi I. Mara, H., 2003; and de Zwager, N., I. Gëdeshi, E. Gërmenji, and C. Nikas, 2005). However, there is much controversy and debate whether the progressive reduction in remittances over the last three years is due to the global economic crisis affecting the countries they live and work in, or due to weaker relationships between emigrants and their households in the country of origin. The 2008 survey of remittance-recipient households' support shows that 94% percent of remittance senders are the households' children (son or daughter), who account for 80 and 15 percent of the total immigrants and share 81 and 5 percent of total remittance inflows, supporting thus the persistence and continuation of the remittance flow in the medium term. By contrast, a 2005 study of IOM, finds out that the Albanian emigration cycle is 17.6 years from the "first experience of migration" and 14.6 years from the point of obtaining legal status. In view of this finding, Albania has already exited the emigration cycle and therefore the decline in remittances is justified.

Chart 2: Remittances to Albania in nominal terms, 1993-2010 (mio EUR)



Source: Bank of Albania

According to official statistics, remittances are large relative to Albanian economy (Figure 2). Among 8 countries of the region, Albania exhibits the third-largest remittances-to-GDP ratio, being surpassed only by Bosnia& Herzegovina (14.90% of GDP) and Kosovo (13.41% of GDP). However, the magnitude of remittances is yet questionable, due to the methodology employed in measuring them. When compared to data obtained from the BoA's surveys on remittance-recipient households, official remittances appear quite high, estimated at three times higher than the surveys data. [1]

Since 1996, remittances to Albania constitute an important source of foreign financing, amounting to 12.51 of Albanian GDP, compared to 21.08% of GDP in exports and 4.35% percent of GDP in Foreign Direct Investment. However, in the last two years, the latter seems to converge to the remittances-to-GDP level, compensating the reduction in remittances, on macroeconomic terms (Figure 2).

An important stylized fact worth mentioning in the discussion of

1 Economic Bulletin, Bank of Albania, No.3, 2009

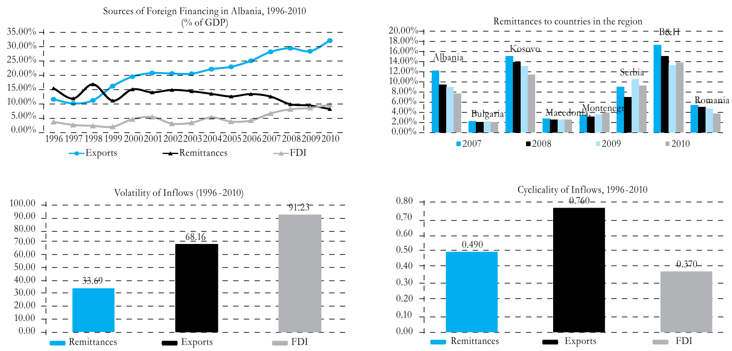
external flows is the volatility of these flows, measured as the ratio of standard deviation to mean. Judging by this measure, remittances are less volatile than exports of goods and services and FDI, making them a very attractive source of foreign financing. The standard deviation of remittances amounted to 33.69% of the mean, compared to 68.16% of exports and 91.23% of FDI (Figure 2).

The cyclicality of remittances with the economic activity of the origin country has been a topic covered in a substantial body of literature, which has produced mixed and contrary findings. Chami et al. (2003), using panel estimation methods for 113 countries over a 30-year period, found that remittances are countercyclical, supporting the hypothesis that remittances are altruistically motivated. Using a cross-country growth regression framework, the 2005 IMF World Economic Outlook found a not statistically significant relationship between remittances and real per capita output growth, regardless of the financial development in the recipient economy.

To study the cyclical properties of remittance flows, we follow the Hodrick-Prescott filter technique, which decomposes the time series of output and remittances into their cyclical components and stochastic trend (Giuliano and Ruiz-Arranz, 2005). If remittances are sent for altruistic reasons, the correlation between the cyclical component of remittances and output is significantly negative. In case remittances are profit-driven (sent for investment purposes), the correlation should be significantly positive. And third, remittances are said to be a-cyclical, when the correlation coefficient is not statistically significant, either positive or negative (Giuliano and Ruiz-Arranz, 2005). Figure 5 shows the correlations of the cyclical components of remittances, exports of goods and services, foreign direct investment with the cyclical components of Albanian output. Remittances show a positive correlation of 0.49 with the Albanian GDP, which is considerably smaller than that of exports. The positive sign of the correlation seems to contrast the findings of BoA's surveys on remittance-recipient households, studies of the World Bank, IMF, other institutions, which converge to the same results: "remittances are sent to finance the daily consumption needs and thy represent a restricted capital source for investment and for the financing of the stable economic development of the countries of origin" (Economic Bulletin, Bank of

Albania, No.3). According to these studies, remittances were expected to show a negative correlation with output (Figure 2). However, it is noteworthy to mention that the correlation coefficients in the graph are not checked for their statistical significance. So, they should be taken with a pinch of salt and simply as providing some hints on the remittances profile.

Figure 2: Stylized facts about remittances to Albania



Source: Bank of Albania, IMF and Albanian Institute of Statistics

III. DATA AND METHODOLOGY

A. DATA

Following the literature on macroeconomic determinants of remittances, we classify the main variables which may affect remittance behavior into three main groups: variables which represent the macroeconomic situation of the host country; variables which represent the macroeconomic situation of the home country; and variables which capture the relationships between host and home country. The primary research question of this study is to determine which macroeconomic conditions (host/home/both/none) the Albanian emigrant takes into account when deciding how much to remit. In trying to answer this question, we also find some explanation on two issues. One regards the question: 'Why Albanian emigrants send remittances?". The second issue regards: "Can Albania attract more remittances? How?"

Our study analyzes remittances using two broad approaches: "the altruism" approach and the "investment" approach. It is based on the optimizing framework, extensively used in the remittance literature, by which a migrant tries to maximize his utility by choosing the optimal level of its own consumption, remittance sent to his/her household in home country to meet the consumption needs, and various investment instruments in home and host country.

To represent the macroeconomic conditions of the home country, we use the Albanian Gross Domestic Product, obtained from the Albanian Institute of Statistics. The economic activity of the home country is used as a proxy to reflect the employment and income-generating opportunities of households (Sayan and Tekin-Koru, 2007; El-Sakka, 2005; and Eric-Lueth and Marta-Ruiz Arranz, 2007). However its effect on remittances depends on the motive driving the remitting behavior. If altruism is the main motive to remit, negative shocks to home output will encourage emigrants to send more remittances. However, if remittances are sent for investment purposes, then negative shocks to home output reflect deteriorate investment opportunities and therefore reduce remittances.

To represent the host country we use the weighted average of Italian and Greek unemployment rate, given that more than 85% of Albanian emigrants are located in these two countries. To construct the index, we gave weight to the unemployment rate of these countries, based on their share of remittances sent. Previous studies show that host-country income is a significant determinant of workers' remittances because it translates to higher labour demand, higher wages, higher incomes and therefore higher remittance transfers. We choose to represent the host country economic conditions with the unemployment rate rather than the gross domestic product, since the former is considered a better proxy of income generating opportunities of emigrants due to their possible social marginalization (Higgins et al., 2004). Data on the unemployment rates for Italy and GDP are obtained from the European Central Bank Statistics.

To represent the relationship between the host and home country, we use the nominal exchange rate LEK/EUR, obtained from Bank of Albania. The effect of exchange rate on remittances is ambiguous.

Vargas-Silva and Pozo (2006) attempt to answer this question by modelling the remitting behavior as utility function, including three main components: i) the consumption of emigrant in host country; ii) the consumption of the household in the country of origin; and iii) the consumption of the emigrant in host community in the future. A depreciation of home currency will boost the household consumption in the country of origin due to the greater purchasing power of the Albanian LEK. The emigrant's future consumption will also increase due to the expected exchange rate gain. In such circumstances, the marginal utility of home-country consumption and of future consumption will fall relative to host-country current consumption. To re-establish an optimum, the remitter may decide to reduce remittances in order to increase the home country current consumption. However, at the same time, depreciation of the home currency has increased the "lifetime expected wealth" for the remitter and therefore he/she may decide to increase remittances to home country. The ultimate effect of a depreciation of exchange rate on remittance inflows will depend on which of the effects will dominate.

The data used in out econometric approach covers the period from 1996 to 2010, in quarterly terms. So, the number of observations is 60. While the remittance data is available back to 1993, we do not include the 1993-1996 period in our estimation because of the non-availability of the data on other variables (Albanian GDP and exchange rate). Also, the data on quarterly GDP is obtained by interpolating the annual figures, following Dushku (2008).

Remittance data is obtained from the Bank of Albania's Balance of Payments, which includes transfers of monetary resources or in kind by migrants who are employed in host economies and are considered residents there. [2] This data includes the remittances sent through formal channels (banks, Money Transfer Operators) and informal ones (cross-bordering in cash). While the former can be measured automatically, the latter is estimated as the difference between foreign currency coming in (exports of goods and services, credits, foreign investments) and foreign currency going out (imports of goods and services, foreign currency going out through the banking system).

2 According to the definition provided by the BOP manual, persons who work and stay in a new economy for less than a year are considered nonresidents, their transactions/transfers belong to compensation of employees.

We understand that the measurement methodology coupled with the dynamic and chaotic pattern of the Albanian emigration and remittance behavior, might impose some limitations, which should be borne in mind as they might influence our empirical findings. All data enter the model in natural logarithmic forms, except for the weighted unemployment rate.

B. METHODOLOGY AND ESTIMATION RESULTS

This paper employs the Vector Error Correction Model, to study the long- and short-run dynamics of remittances. The use of VECM is warranted on several grounds. First, it solves the endogeneity problem which might exist between remittances and other macroeconomic variables. Several studies have found that remittances affect macroeconomic variables in home country. Using an ARDL (Auto Regressive Distributed Lag) model for the case of Romania, Litan (2008) found evidence that remittances have a positive influence on investment and a negative impact on private consumption in the home country. Also, Acosta et al. (2007) using Bayesian Methods and Salvadorian data, find evidence that remittances, if not properly absorbed by the economy, lead to appreciation of the exchange rate, known as the Dutch disease phenomenon. In the case of Albania, there is no empirical evidence on how remittances affect the home country macroeconomic situation, except for stylized facts and various surveys. The 2008 BoA survey results on remittance-recipient households' show that about 30% of monthly income for households obtaining this income derives from workers' remittances. The survey also shows that once these remittances join the household basket, they may be used for productive or unproductive households' needs; may increase the households' dependency on these flows and consequently increase unemployment; or they may be used for increasing investment in businesses or real estate. The second reason in using Vector Error Correction Model is that our variables are non-stationary, which requires an estimation of variables integrated at first- or higher-order. Third, variables might be co-integrated which requires the inclusion of a co-integrating relationship, as an additional regressor.

Our empirical approach starts with identifying the stationary properties of the variables. After conducting the Augmented Dickey Fuller test, we found that our variables are non-stationary at 1%

significance value, except of remittances which are found to be trend-stationary.

We choose to treat remittances as a difference-stationary time series rather than a trend-stationary one. According to Gujarati (1995), these types of misspecification errors can be serious, if not properly handling serial correlation of the resulting error terms. In our estimation, we make sure that we correct for the residual serial correlation (Table 1 in Appendix).

In choosing the appropriate lag length, we take into consideration the information criteria (Akaike and Schwart), the length of our sample and economic sense. A-priori we choose a lag length of 8, given the quarterly frequency of the data (Enders, 1996) and then we follow the general-to-specific approach. We reduce the number of lags, while checking at the same time for autocorrelation, stability and normality of residuals. This approach resulted in an appropriate lag length of 5.

Given Granger and Newbold (1974) and Engle and Granger (1987)'s insights that the estimation of time series equations is only possible when there is cointegration, we need to test for the presence of long-run relationships between remittances, nominal exchange rate, Albanian GDP, and weighted average of host countries' unemployment rate. For this reason, we apply the Johansen cointegration test. As trace and maximum eigenvalue statistics show (Table 2 in Appendix), there is one cointegrating relationship between variables.

Given that we have found one cointegration in our series, the next step is to estimate a Vector Error Correction Model. The preferred specification of the VECM includes one lag and one exogenous term, which is the time trend component. This specification satisfies the stability tests and residuals' autocorrelation and heteroscedasticity tests (Table 3 in Appendix). It generates the following relationship (the brackets include the standard errors and t-statistics). The full estimated VECM output is represented in Table 4 of Appendix.

$$\log(rems) = -37.95 + \underset{\begin{bmatrix}0.88\\-1.91\end{bmatrix}}{1.69} * \log(lek\_eur) + \underset{\begin{bmatrix}1.70\\-1.74\end{bmatrix}}{2.98} * \log(albanian\_gdp) - \underset{\begin{bmatrix}0.058\\2.31\end{bmatrix}}{0.13} * unweight \quad (1)$$

The estimated long-run relationship obtained from the VECM estimation, indicates that over the long-run, remittances depend solely on the economic conditions of the host countries (proxied by the weighted unemployment rate in Italy and Greece). The other two explanatory variables appear insignificant and with the unexpected sign.

As equation (1) shows, a deprecation of exchange rate by 1% raises the remittance inflows by 1.69%. The positive sign of the exchange rate coefficient seems to contrast the widely-held belief that Albanian emigrants are altruistically motivated, according to which they are expected to send more (less) remittances to make up for the loss (gain) in the purchasing power of households in the home country due to appreciation (depreciation) of the home currency. However, as Gupta (2005) suggests, a depreciation of currency would render remittances more profitable, or may even raise expectations of an appreciation in the future, and most probably would increase remittances. Nevertheless, the exchange rate effect appears insignificant in the long-run. This indicates that emigrants weaken their ties with the home country in the long-run, send less remittances, and as a consequence are no longer interested in monitoring the exchange rate developments. The validity of the maturation phase in the behavior of remittances is also confirmed by the statistical significance of the time trend component, appearing in the VECM specification (Table 4 in Appendix).

An increase in Albanian Gross Domestic Product by 1% leads to an increase of 2.98% increase in emigrants' transfers. The procyclicality of remittances with the GDP (also confirmed by the stylized facts) rejects the hypothesis on the altruistic nature of remittances. There may be two explanations for such procyclicality, also mentioned in Sayan and Tekin-Koru (2007). One possible explanation can be the co-movement between output cycles in Albania and output in host countries (Italy and Greece), coupled with the co-movement between remittances and host country GDP. A second explanation may relate to the long duration of stay of Albanian emigrants in host countries, which lead to family reunification and legalization of emigrants' status. All these may have caused the underlying motive of workers' remittances to shift from helping the families left behind towards investment motives. The latter is strongly rejected by various surveys and studies which show that Albanian emigrants' savings in host countries amount to be 4.2 times higher than the remittance rate. However, the t-statistics shows that in the long-run, Albanian GDP appears to be a non-significant determinant of remittances.

The weighted unemployment rate in host countries, as expected, influences remittances negatively and appears to be statistically significant. An increase in the unemployment rate of host countries by 1pp would decrease remittances by 0.13%. The economic activity in the migrant workers' host country is expected to be quite important, because improved economic conditions in the host country allow migrants to increase their employment and earning prospects, which in turn allows migrants to send more money home (IMF, 2005) The result is in line with the recent rapid decline in remittances to Albania over the last three years (on average -11.61%), at a time where the economic conditions in the host countries worsened significantly, due to the economic global crisis. According to ECB statistics, the unemployment rate in Greece, in the last three years, increased from 7.6% to 12.30%, while in Italy, the unemployment rate increased from 6.7% to 8.5%. Also, Gëdeshi (2010) points out that the unemployment rate amongst migrants is more prevalent than that of the local population, suggesting a stronger impact of host economic conditions on migrants' remittances.

A negative coefficient on the error correction term, estimated at 86%, ensures the convergence of remittances to their long-run level, with the absolute size of the coefficient indicating the speed of convergence. Such high magnitude of coefficient is quite high, however justifiable. The rational is simple. Albanian emigrants try to remit a target level of remittances on regular basis, in order to meet their households' consumption needs. However, their target of remittances may be affected by unforeseeable changes in policies, either in host or home country. Taking into consideration that most of households survive on these remittances, in the next period, Albanian migrants will try hard to adjust the difference between desired and actual remittances sent in the previous period. A high and statistically significant speed of convergence, confirms the stability and consistency of remittances.

IV. CONCLUSIONS AND POLICY IMPLICATIONS

In this study, we aimed to estimate the main determinants of emigrants' transfers to Albania, by employing the Vector Error Correction Model, to measure the log-run and short-run responsiveness of remittances to unemployment rate in Greece and Italy, the Albanian Gross Domestic Product, and the Lek_EUR exchange rate. The study showed that remittances, both in the long- and short-run, depend solely on the macroeconomic conditions of the host country, which is proxied by the weighted unemployment rate in Greece and Italy. An increase of the unemployment rate by 1 percentage point, decreases remittance transfers by 0.13% in the long-run. The other two explanatory variables, proved insignificant, both in the long- and short-run, rejecting the conventional hypothesis that remittances are primarily sent to meet consumption needs of the emigrants' households in home country. The only finding supporting the altruism hypothesis is the fast adjustment of remittances to their long-run equilibrium, indicated by the high and statistically significant error correction term. Also, the study found no evidence on the investment motive driving Albanian emigrant's remitting decision.

These findings have important policy implications for Albania to which remittances constitute a major source of foreign exchange funding. First, Albanian policy makers should be aware that remittances are another channel by which economic development and shocks in the euro area may be transmitted to Albania. Second, if Albania wants to increase remittance transfers over the long-run, it should focus more on individual and demographics as remittances are not that responsive to home country macroeconomic variables in the long-run.

However, we believe that our study does have some limitations, which might be addressed in future research studies.

First, our empirical estimation is based on 60 observations, which restricts the number of endogenous variables to be used and the lag length choice. It would be quite useful to include additional exogenous variables to capture the macroeconomic conditions in host country (gross domestic product, consumer price index); the relationship between host and home country (interest rate differential, financial linkage, openness to trade); and the macroeconomic conditions of home country (consumer price index, unemployment rate). We choose not to account for these additional explanatory variables, as they would increase the number of parameters to be estimated and, therefore increase the estimation inaccuracy.

Second, we use the weighted unemployment rate of Italy and Greece based on the share of remittances received from each country. There are two drawbacks in using such index. One is that we assume that emigrants behave and respond similarly to macroeconomic shocks though being in different countries. The other drawback is that constructing a weighted average index requires historical data on bilateral transfers between Italy and Albania, and Greece and Albania, over the period 1996-2010. Since such data is not available, we use an approximate estimate obtained from the Economic Bulletin of Bank of Albania, according to which 60% of remittances originate from Italy and the rest from Greece. These are the shares we apply in constructing the weighted index of unemployment rate.

Third, due to possible errors arising from measurement methodology, it would be more useful to utilize data on remittances channelled through banking system and money transfer operators (Money Gram and Western Union), as representing more accurate and reliable figures. Also, we could make use of data obtained from surveys of remittance-recipient households. However, in doing this, we would have to wait till the database of these surveys becomes long enough to allow empirical estimation.

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APPENDIX

Table 1: Unit Root Tests

Variables	Augmented Dickey Fuller (1996-2010)					
	Levels			First Difference		
	intercept	trend&intercept	none	intercept	trend&intercept	none
remittances	0.6195	0.0010	0.7882	0.0000	0.0000	0.0000
un_weight	0.3925	0.7504	0.6312	0.2218	0.3835	0.0287
lek_eur	0.3227	0.4906	0.6554	0.0000	0.0000	0.0000
gdp_albanian	0.7298	0.7693	1.0000	0.0000	0.0000	0.1480

H0: Variable has a Unit Root
The null hypothesis is rejected for p-values greater than 0.05.

Table 2: Johansen Cointegration Test

Hypothesized No. of CE(s)	Unrestricted Cointegration Rank Test (Trace)			
	Eigenvalue	Trace Statistics	0.05 Critical Value	Prob.**
None *	0.408198	58.45338	47.85613	0.0037
At most 1	0.245778	29.60131	29.79707	0.0527
At most 2	0.152788	14.08755	15.49471	0.0806
At most 3 *	0.086373	4.968315	3.841466	0.0258

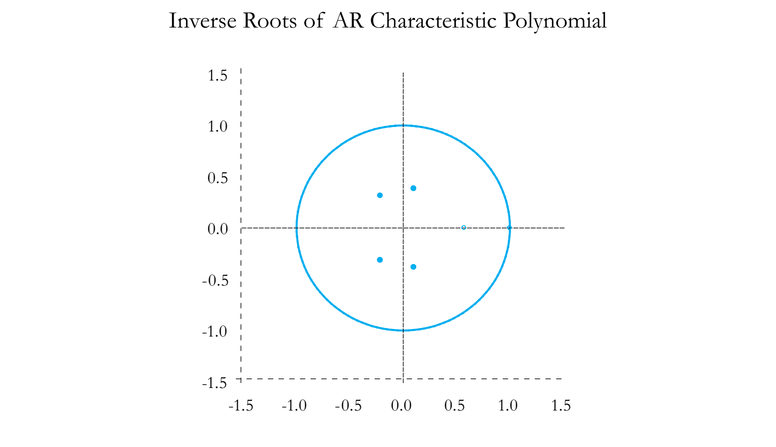
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level.
*denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p- values

Hypothesized No. of CE(s)	Unrestricted Cointegration Rank Test (Maximum Eigenvalue)			
	Eigenvalue	Max-Eigen Statistics	0.05 Critical Value	Prob.**
None *	0.408198	28.85208	27.58434	0.0342
At most 1	0.245778	15.51376	21.13162	0.2545
At most 2	0.152788	9.119233	14.2646	0.2764

Max-eigenvalue test indicates 1 cointegrating eqn (s) at the 0.05 level.
*denotes rejection of the hypothesis at the 0.05 level.
**MacKinnon-Haug-Michelis (1999) p-values

Table 3: Diagnostic Tests of VECM specification

a) Stability



b) Autocorrelation, Heteroscedasticity, and Jarque-Bera diagnostic tests

	Autocorrelation LM Test H0: No serial correalation at lag order 1	White HSK test H0: no heteroscedasticity	Jarque_Bera H0: residuals are multivariate normal
P-value	0.0847	0.0922	0.1788

The null hypotheses of normality, no autocorrelation and no HSK in residuals are accepted at 95% confidence level.

Table 4: Vector Error Correction Estimate (t-statitics in parentheses)

	Dependent Variable			
Regressor	d(log(rems))	d(log(LEK_EUR))	d(log(ALBANIA_GDP))	d(UNWEIGHT)
CointEq1	-0.866934	0.058846	-0.020124	-0.214821
	[-4.90215]	[2.75549]	[-1.08853]	[-2.07351]
D(log(REMS(-1)))	0.088201	-0.032322	0.029262	0.082427
	[0.58840]	[-1.78557]	[1.86740]	[0.93864]
D(log(LEK_EUR(-1)))	-0.941028	-0.000503	0.164595	0.632585
	[-0.87611]	[-0.00388]	[1.46591]	[1.00532]
D(log(ALBANIA_GDP(-1)))	-0.573708	-0.554244	-0.219118	-0.679768
	[-0.39406]	[-3.15251]	[-1.43975]	[-0.79701]
D(UNWEIGHT(-1))	-0.504335	0.036686	-0.012495	0.411344
	[-2.45481]	[1.47869]	[-0.58180]	[3.41768]
C	1.360905	-0.075608	0.062767	0.263594
	[4.68364]	[-2.15478]	[2.06644]	[1.54853]
@TREND	-0.043892	0.002924	-0.001174	-0.008272
	[-4.79691]	[2.64661]	[-1.22755]	[-1.54310]
R-squared	0.411776	0.320734	0.139706	0.44238
Adj. R-squared	0.342573	0.24082	0.038494	0.376778
S.E. equation	0.316683	0.038242	0.033105	0.185522
F-statistic	5.950276	4.013506	1.380338	6.743354

EU – ALBANIA STABILIZATION AND ASSOCIATION AGREEMENT. TRADE INTEGRATION AND ECONOMIC IMPLICATIONS

Alban Pllaha

1. INTRODUCTION

Albania's aspirations of becoming a member of the European Union (EU) dates back in the early 1990s, right after the country overthrew the communist regime and opened up its borders to the world market. In January 2003, Albania and EU officially launched the negotiations for the Stabilization and Association Agreement (SAA). The SAA is considered to be the first step that will permit Albania to officially start its negotiations for joining the European Union. The SAA aims to bring political and economic collaboration between Albania and EU. This bilateral agreement (the SAA) has all the characteristics of a regional integration agreement. The aim of the SAA is to anchor the Albanian economy and institutions to the EU standards. The opening-up of the economy to the EU free trade area implies: a more competitive market environment, a wider variety of products and services, free movement of products, services and people etc., supported by well-tested free market rules and regulations. However, the approach of regional integration could result risky for the Albanian economy if social, economic and institutional conditions in Albania are not right. A number of questions might emerge naturally at this point: To what extent is the Albanian economy ready to compete, in a free trade area, with developed economies such as the EU countries? Is regional integration the answer to economic growth? Do empirical evidences offer optimistic results on trade integration? What is the actual status of regional trade integration between Albania – EU and regional countries? Is there room for trade intensification with EU and regional countries?

This paper will attempt to answer the above questions by focusing on trade integration aspects of the SAA. The paper is structured as follows: Section 2 offers an overview of the theory of regional integration and analyzes empirical evidences on this topic. Section 3 analyzes the Albanian economy throughout the transition period. Section 4 analyzes the EU – Albania SAA, the geography of Albania's trade flows, regional free trade agreements and their consequences on Albania's trade flows. Section 5 introduces the gravity model theory, discusses data sources, their application to the gravity model and evaluates the model outcomes. Section 6 offers some concluding comments.

2. REGIONAL INTEGRATION

2.1 THEORY OF REGIONAL INTEGRATION

The theory of regional integration is a concept that emerged in the early 1950s. Viner (1950), Meade (1955) and Lipsey (1957) are considered to be the pioneering authors of the regional integration theory. The traditional theory of regional integration mainly gives emphasis to the theoretical prospective in international trade and regionalism. According to Viner (1950), *trade creation* and *trade diversion* are two conceptual outcomes from regional trade agreements. He finds that trade creation is welfare-improving as domestic inefficient products/services are replaced by cheaper imports from partners. Trade diversion, however, is seen as welfare-reducing as cheap products/services imported from the rest of the world are substituted with expensive imports from regionally integrated partners. Meade (1955) highlights another conclusion: the effect of *trade expansion*, which is seen as welfare-improving. According to him, trade expansion stimulates extra consumption of imported goods/services, which encourages low prices in the partner country.

Nowadays, the theory of regional integration goes beyond simple border controls (tariffs and quotas). *Deep integration* is a contemporary concept related to regional integration. The overall idea of deep integration is the elimination of non-tariff barriers that can affect trade between countries. Deep integration aims further co-ordination, co-operation and policy adaptation, between trading partners in terms of health and safety regulations, technical specifications, competition laws, licensing and certification regimes etc. (Hoekman and Konan, 1998).

According to Lawrence (1996), deep integration creates a flattering environment for *extra-regional trade*, thus reducing the risk of trade diversion. Adding up, common policies and regulations among integrated parties create a stable economic environment, consequently stimulating further integration and augmenting the effects of liberalization. Velde et al. (2004) suggest that the effects of global and regional trade integration should be considered separately. The classical theory of regional integration suggests that global trade will have a positive impact on the country's income due to specialization of production and trade according to comparative advantage. However, some inefficient sectors of economy (previously protected by the old trade regime) will lose out as they face more competition and lowering of the prices. Regional integration on the other hand is expected to produce the following effects related to poverty: The most important effect is price reduction within the integrated region. The elimination of non-tariff barriers reduces costs of intraregional traded products. As a consequence, consumers are better off as they can consume more goods/services with cheaper prices. Increased competition and productivity spillovers are expected outcomes from regional integration, which can be welfare improving. As national regulations are regionally harmonized, producers adopt new production processes, which allow them to be more efficient. Another effect of regional integration is the reduction of tax revenues. This will be reflected in less national spending in social sectors and revenue compensation, consequently poverty reduction will be affected negatively (Zahariadis, 2007). Lastly, experience has shown that economies (countries) with competitive advantages comparable to those of the rest of the world will usually gain more from regional integration than countries at the extreme[1]. Economies at the extreme will usually face trade diversion effects (Zahariadis, 2007). The theory of regional integration suggests that when two countries integrate, the country with capital to labor

1 Economies with comparative advantages significantly different (positive or negative) from the average of the rest of the world.

endowment below world average will experience faster industrialization as it integrates with a country above world average (World Bank 2000).

2.2 EMPIRICAL EVIDENCES ON REGIONAL INTEGRATION

Regional integration has been subject of numerous empirical studies. However, empirical evidences on the beneficial effects of regional integration are of a mixed nature. For instance, Bayoumi and Eichengreen (1974) studied the effects of Free Trade Areas and the European Union. Their findings suggest that integration led to intra-regional trade, resulting thus in trade-creating. Aitken (1973) also finds that intra-regional trade in the European Union led to trade-creation. Soloaga and Winters (2001) studied a large number of Regionally Integrated Areas, and concluded that most regional integration agreements lead to trade-creation rather than trade-diversion. Conversely, Schieff and Winters (2003) studies on regional integration (including the European Community, EFTA, NAFTA and MERCOSUR) found evidences of trade-diversion as intra-regional trade increases. Velde et al. (2004) also find some evidences of trade-diversion in the cases of EU and EFTA.

Empirical evidence suggests that EU integration has led to *permanent unification* of income per capita among member countries (World Bank 2000). Poorer EU members have gone through a faster catch-up process compared with more developed ones as a result of encouraged integration policies. Maskus and Eby Konnan (1997) studied the possible effects of EU-Egypt Free Trade Area and found out that Egypt's GDP would increase by 1-2%. According to Bussolo and Niimi's (2005), Nicaragua's GDP would increase with less than 1% due to the Central American Free Trade Agreement. Alessandri (2000) studied the effects of EU-Mediterranean Free Trade Agreement, and stressed that most member countries would experience small welfare improvement. Other empirical evidence suggests that Free Trade Agreements among small economies mostly result in welfare losses as integration among small economies mostly leads to trade-diversion rather than trade-creation (Kaminski and de la Rocha, 2003). Smith and Venables (1998) focused their study on deeper integration in the EU single market. Their study forecast suggested that harmonization of standards and customs could lead to 2.9% increase of GDP. Similarly, Augier and Gasiorek (2001) suggest that deeper integration leads to productivity boost (their study analyzed EU-Mediterranean Agreements).

Empirical evidences on the Stabilization and Association Process and regional integration of SEE countries (South-Eastern European countries) are rather limited. However, a couple of studies on regional integration of SEE countries offer some useful empirical evidences. For instance, Bussiere et al. (2005) found out that trade between EU and SEE countries started to pick up after 2000, suggesting that SEE countries dynamic of trade with EU might follow a similar path as trade between EU and CEE countries[2]. Their findings also underline the fact that the share of extra-euro area trade between the region (SEE countries and CEE countries taken together) accounted for about 13% in year 2003. Kaminski and de la Rocha (2003) found out that intra-trade among SEE countries is well below its potentials. They also found that Albania, Bulgaria and Romania not only under-trade with each other but they also under-trade with the other former Yugoslav SEE countries. World Bank (2004) suggests that the Albanian economy would benefit from the free trade area with EU by 0.3-05% of its GDP.

3. THE ALBANIAN ECONOMY THROUGHOUT THE TRANSITION PERIOD

The "*wind of change*" that brought the fall of Berlin wall and collapse of communism in many Central and Eastern European countries swept through Albania as well. The student protests of 1990-1992 started a chain of events that brought about the fall of communism and finally allowed Albania to open itself up to the free market system. The transition period for Albania has been rough and a prolonged one. The early 90s for Albania were characterized by economic collapse, social confusion and large scale of emigration. Real GDP shrank by a cumulative 38% (World Bank, 2004) within two years 1990-1992. Between 1993 and 1996 the Albanian economy started to stabilize, reporting positive GDP growth rates and relatively lower inflation

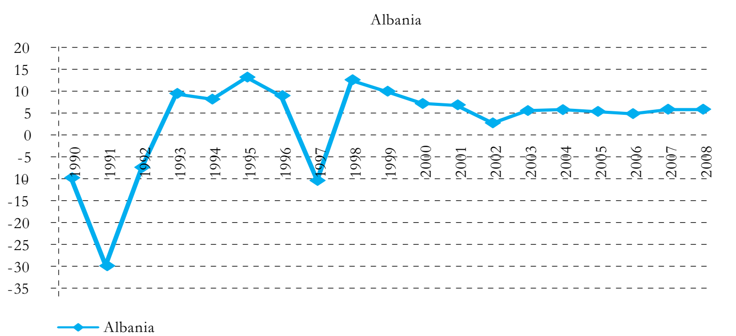
2 Empirical evidence has shown that during 1995-2005, most of CEE countries have experienced a dynamic trade growth with EU area as a consequence of deeper integration.

rates. Agriculture and services were the main sectors contributing to the stabilization of the economy. This economic stabilization, however, did not last long as the Albanian economy collapsed again in 1997 due to the "pyramid schemes"[3].

At their peak these pyramid schemes accounted for about half of the country's GDP and about two third of the Albanian population invested in them (IMF, 2000). The collapse of pyramid schemes resulted in economic and social crisis. Real GDP in 1997 shrank again by about 7% (see Chart 1). The Albanian economy started to recover again in 1998, supported economically and institutionally by the EU. Since 1998 until now, the Albanian economic indicators have improved significantly characterized by a real GDP growth of around 6-8% (see Chart 1), stabilized fiscal conditions, improvement in the external balances and inflation back to single digits (World Bank Database, 2010).

The outstanding performance of the Albanian economy since the late 90s until now can be attributed to several key factors. First, a reallocation of resources and sector prioritization lead the Albanian economy toward deindustrialization. Nowadays, services (a sector with higher productivity than the agriculture sector) account for about 60% of the country's GDP (World Bank, World Development Indicators, 2010)[4].

Chart 1: Albania's GDP growth rates (annual, in %)



Source: World Bank, World Development Indicators, 2010

3 During 1996-1997, Albania was convulsed by the dramatic rise and collapse of several huge financial pyramid schemes (IMF, 2000).

4 In 1991, services accounted for less than 20% of the Albanian GDP (World Bank, World Development Indicators, 2010).

Albania remains however a largely agricultural economy with more than 50% of its working force employed by this sector (Albanian Institute of Statistics Database 2010).

Table 1 Albania - GDP and employment by share and activity, 1996-2006

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006*
GDP share by activity 1996-2006 (%)											
Agriculture, hunting and forestry	35,1	30,2	27,1	24,4	23,5	21,9	21,6	21,5	20,2	18,6	17,6
Industry	9,5	8,4	6,9	6,9	7,2	6,8	6,4	7,9	9,1	9,6	9,9
Construction	4,9	5,8	4,7	5,7	7,6	9,7	11,1	12,5	12,6	12,5	12,8
Total Services	46,6	51,2	55,2	57,5	53,9	54,4	53,2	49,3	48,7	49,8	49,9
Employment share by activity 1996-2006 (%)											
Agriculture, hunting and forestry	70,3	69,6	70,8	72,1	71,8	57,7	57,8	58,2	58,6	58,5	58,0
Industry	7,6	7,9	7,7	7,7	5,4	7,7	7,6	7,2	8,1	8,0	7,9
Construction	2,0	1,4	1,0	1,0	1,2	6,1	6,1	6,0	5,6	5,6	5,7
Total Services	15,6	14,4	13,3	14,0	15,4	20,8	20,8	20,7	19,0	18,2	18,8

Source: Albanian Institute of Statistics

The second reason for the reported rapid economic growth in Albania is due to remittances. Extremely large numbers of Albanian citizens migrated to different western European countries after 1991. A large chunk of the nation's laborers (about 25% of the Albanian population lives abroad)[5], found without jobs in a collapsed economy, were forced to migrate to other labor markets. Significant parts of their wages would be sent to their families in Albania, which had no other source of income. It is sad, but these remittances constituted one of the main sources of the Albanian economy. Remittances had become a new sector of the economy accounting on average for 12% (2007-2009) of GDP (Bank of Albania Database, 2010). The final main factor contributing to the Albanian economic growth is foreign trade. Albanian foreign trade during the past decade has been growing significantly. If we see Table 2, trade volume in 2009 is almost three times as much as trade volume in 1999. Albanian exports through the past decade have also been growing rapidly. Table 3 reveals that

5 According to the Migration Development Institute (NEXUS), about 25% of Albanian population was practicing migration in 2008.

exports in 2009 have more than doubled compared with those of 1999. Albanian exports in 2008 account for about 31% of GDP, whereas in 1998, exports only accounted for about 10% of GDP (World Bank; World Development Indicators, 2010). Despite the above optimistic figures when taking into account imports, a different picture appears. The "percentage of coverage"[6] in 2009 is 23.9% (see Table 2), indicating that Albania is clearly an importing country. Adding up, imports' share in 2008 accounted for about 59% of GDP. Imports in 2009 have more than doubled compared with imports in 1999 (see Table 3). Furthermore, imports have continued to overtake exports through the transition period leading such to a widening of the trade deficit. A large trade deficit can put pressure on current account.

Table 2 Flow of goods in foreign trade (1993-2009)

Year	Export (FOB)	Import (CIF)	Trade balance	Trade volume	The percentage of coverage
1993	*12.499*	*58.336*	*-45.838*	*70.835*	*21,4*
1994	*13.387*	*57.019*	*-43.632*	*70.406*	*23,5*
1995	*18.710*	*66.147*	*-47.437*	*84.857*	*28,3*
1996	*22.001*	*98.060*	*-76.059*	*120.061*	*22,4*
1997	*21.044*	*95.022*	*-73.977*	*116.066*	*22,1*
1998	*31.104*	*126.271*	*-95.167*	*157.375*	*24,6*
1999	*48.430*	*159.465*	*-111.035*	*207.894*	*30,4*
2000	*37.037*	*157.109*	*-120.072*	*194.146*	*23,6*
2001	*44.096*	*190.155*	*-146.059*	*234.251*	*23,2*
2002	*47.490*	*210.368*	*-162.877*	*257.858*	*22,6*
2003	*54.487*	*225.983*	*-171.496*	*280.469*	*24,1*
2004	*62.121*	*236.072*	*-173.951*	*298.193*	*26,3*
2005	*65.818*	*262.191*	*-196.373*	*328.009*	*25,1*
2006	*77.405*	*299.147*	*-221.742*	*376.553*	*25,9*
2007	*97.171*	*376.194*	*-279.023*	*473.365*	*25,8*
2008	*112.572*	*439.894*	*-327.322*	*552.466*	*25,6*
2009	*102.989*	*430.945*	*-327.956*	*533.934*	*23,9*

Source: Albanian Institute of Statistics

The above analysis on growth and trade performance offered an optimistic picture on the Albanian economy. However, other social and economic indicators reveal a different picture on the overall economic situation. For instance, GDP per capita in Albania has been growing progressively during the past decade; however, Albania in

6 The percentage of exports covering imports (exports * 100 / imports).

2008 had one of the lowest GDP per capita in the region with only \$3911. During the same year, FYR of Macedonia had the next lowest GDP per capita in the region with \$4664, whereas Croatia's GDP per capita with \$15637 is almost four times higher than the Albanian one (World Bank, World Development Indicators, 2010). Other social and economic indicators, such as poverty headcount ratio at \$2 a day (PPP) (% of population), reveal that in 2005 almost 8% of the Albanian population lived below \$2 per day (World Bank, World Development Indicators, 2010). In addition, unemployment rates in Albania continue to be high, so in 2009 official unemployment was as high as 14% (Bank of Albania Statistics, 2010). In conclusion of this section, it can be stated that during the past decade, economic conditions in Albania have improved steadily, however, Albania still faces considerable social and economic challenges in the future.

4. STABILIZATION AND ASSOCIATION AGREEMENT AND REGIONAL FREE TRADE AGREEMENTS

4.1 EU – ALBANIA SAA

Albania's aspirations of becoming a member of the European Union dates back in the early 1990s, right after the country overthrew the communist government and opened its borders to the world market. It took, however, almost ten years until the two parties (EU-Albania) started the negotiations for the Stabilization and Association Process (SAP) in May 1999. The SAP included five South-Eastern European countries (Albania, FR Yugoslavia, Macedonia, Croatia and Bosnia and Herzegovina)[7]. These bilateral negotiations aim the official collaboration between the EU and the signing countries. The endorsement of the SAP is to build new relationships with trade preferences and financial assistance in supporting the SEE-5 countries toward their path to EU membership.

In January 2003, Albania and EU officially launched the negotiations for the SAA. The SAA is considered to be the first step that will permit Albania to officially start its negotiations for joining

7 In this paper, the five South-Eastern European countries (Albania, FR Yugoslavia, Macedonia, Croatia and Bosnia and Herzegovina) will be referred as SEE-5.

the European Union. The SAA aims to bring political and economic collaboration between Albania and EU. One of the most important economic emphases of this agreement is to have no barriers for import – exports between Albania and EU (free trade area). The EU – Albania SAA was only signed on June 12th 2006, and finally ratified by all EU member countries in spring 2009. However, the ratification of the SAA does not guarantee that Albania will be soon a member of the European Union. Fundamentally, the SAA represents a real challenge for the Albanian government in fulfilling the mandatory adaptations prerequisite for the EU membership.

Within the time frame of ten years (from the ratification moment Spring 2009), Albania is anticipated to implement a bouquet of mandatory adaptations to deeper integrate with the EU. This paper, however, only focuses on the trade and economic-related ones. Some of these adaptations are stated below.

A. Import and export adaptations:

I. Albania is expected to gradually remove customs duties for all EU industrial products within five years, while the EU is expected to immediately remove all customs duties for the Albanian industrial products from the moment the SAA starts being applied.

II. Albania is expected to gradually remove 70% of its customs duties for certain agricultural products imported from EU (within the time frame of five years from the moment the SAA starts being applied). The EU should eliminate all customs duties for all the Albanian agricultural exports from the moment the SAA starts being applied.

III. All bilateral export taxes and related changes will be liberalized after the SAA starts being applied.

IV. "Bilateral Free Trade Agreements between all countries (SEE-5) participating in the SAP" (Zahariadis, 2007).

V. Albania will be assisted by the EU in order to adapt its customs system to that of the European Union.

B. Laws and Legislative adaptations:

Albania has to gradually adapt its laws and regulations to those of the European Union in terms of:

I. Non-tariff barriers (technical barriers);

II. Competition laws and regulations;

III. Intellectual, industrial and commercial rights;

IV. Free movement of products, services and people.

4.2 GEOGRAPHY OF ALBANIA'S TRADE FLOWS

Albania's most important trading partners since the early 90s include Italy, Greece, Kosovo, Germany, Bulgaria, Serbia & Montenegro, Macedonia, Turkey, China and Croatia. Trade with these countries has led to further collaborations in trading goods and services. Table 3 gives a summary of the Albanian trade flows by region during 2009. The overall trade flows during 2009 have shown a downward trend. In absolute values, total Albanian exports in 2009 decreased by 8.1% compared to the previous year, whereas total imports grew only by 1.9%.

During 2009, exports to EU-27 accounted for about 78.9% of total Albanian exports, in absolute values, 8.9% lower than exports of 2008. On the other hand, imports from EU-27 were characterized by an upward trend, increasing by 4.3% compared to 2008, and accounted for about 67.5% of total Albanian imports. It is obvious that Albania is EU-oriented (in terms of trade). During 2009, trade flows with EU-27 accounted for 69.7% of total Albania's trade volume. Italy and Greece continue to be Albania's main trading partners. During 2009, trade with Italy alone corresponded to 62.6% of total Albanian exports and 27.9% of total Albanian imports. Whereas 7.3 and 16.5% of total exports and imports, respectively, are traded with Greece.

Regional countries continue to represent an important group of trading partners for Albania. However, during 2009, trade flows with regional countries have experienced a significant shrinkage. For instance, exports toward regional countries account for 12.3%

of total exports, however, in absolute values, exports declined by 17.4% compared to the previous year. On the other hand, imports from regional countries share to total imports are 7.7%, in absolute values, imports shrank by 19.2% compared to 2008.

China and Turkey represent two other important trading partners for Albania. In absolute values, exports to Turkey experienced a decline of 72.5% compared with the previous year, whereas imports were characterized by an upward trend and grew by 7.3% in absolute values. Exports and imports from Turkey account for 0.5% and 6.9% of total Albanian exports and imports, respectively. Trade flows with China are characterized by an upward trend. Exports to China represent 4.7% of total Albanian exports. In absolute values, during 2009, Albanian exports to China increased by 57.3% compared with the previous year. Imports from China were also characterized by an upward trade, accounting for 5.1% of total Albanian imports and increasing by 9.2% in absolute values compared with the previous year.

Table 3 Geography of Albania's trade flows, 2009

	Exports			Imports		
			Growth rate			Growth rate
	Export Value	Share to total	2009/2008	Import Value	Share to total	2009/ 2008
	(million lek)	(%)	(%)	(million lek)	(%)	(%)
EU-27	81609,6	78,90%	-8,90%	291130,5	67,50%	4,30%
Italy	64753,8	62,60%	-6,90%	120,285,7	27,90%	-3,50%
Greece	7507,5	7,30%	-23,70%	71242,8	16,50%	5,80%
Germany	3526,1	3,40%	16,90%	22840,8	5,30%	1,70%
Spain	1279,3	1,20%	635,80%	6091,1	1.4%	11,70%
France	925	0,90%	-3,40%	8542,5	2%	109,50%
Austria	890,7	0,90%	16,80%	9190,8	2,10%	18,90%
Other EU countries	2727,3	2,60%	-48,20%	52936,80%	12,30%	11,20%
Countries of the region	12769,4	12,30%	-17,40%	33250,8	7,70%	-19,20%
Macedonia	3162,8	3,10%	-4,30%	9864,1	2,30%	-14,10%
Kosovo	7196,4	7%	-3%	3750,5	0,90%	17,30%
Montenegro	1368,9	1,30%	-41,30%	2041,7	0,50%	30,80%
Serbia	814,4	0,80%	-58,60%	11796.30	2,70%	-35%

Croatia	117,4	0,10%	-37,90%	4665,1	1,10%	-10,80%
Bosnia and Herzegovina	104.8	0,10%	-44,20%	1097,1	0,30%	-16,10%
Moldova	1,1	0,00%		32,3	0,00%	-55,10%
Other countries						
Turkey	566,1	0,50%	-72,50%	29873.2	6,90%	7,30%
China	4913,1	4,70%	57,30%	21928,46	5,10%	9,20%
US	844,8	0,80%	98,90%	5967,97	1,40%	39,20%
RoW	2735,9	2,60%	47,00%	48956,50%	11,36%	-21,60%
Total Flows	103438,8		-8,1	431107,4		1,90%

Source: Albanian Center for International Trade (2009 Trade Report)

The next section analyzes some Regional Free Trade Agreements and implications for the Albanian trade flows.

4.3 WHERE IT STANDS: REGIONAL FREE TRADE AGREEMENTS, CONSEQUENCES ON ALBANIA'S TRADE FLOWS

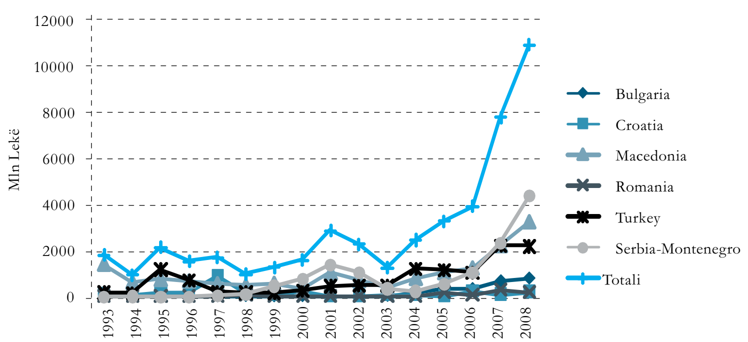
Table 3 summarizes Albanian trade flows during 2009 by region. As stated earlier, the SAA aims to create a free trade area between all countries participating in the Stabilization and Association Process (by signing bilateral free trade agreements among participating countries). Albania has already signed FTAs with the following countries of the region: Macedonia (July 1st 2002), Bulgaria (June 1st 2003), Croatia (June 1st 2003), Kosovo (October 1st 2003), Romania (January 1st 2004), Serbia and Montenegro (August 1st 2004), Moldova (November 1st 2004), Bosnia & Herzegovina (December 1st 2004), and Turkey (April 1st 2003 marks the opening date of negotiations)" (Stability Pact for South Eastern Europe, 2006).

The outcomes on Albanian trade flows from some of the above regional free trade agreements are treated next. Chart 2 illustrates Albanian export flows with some regional countries (Bulgaria, Croatia, Macedonia, Romania, Turkey, Serbia and Montenegro)[8] during the time period 1993-2008. Between 1993 and 2004, total export flows

8 Bosnia & Herzegovina and Moldova are not included in import-export chart flows because trade flows with these two regional countries are insignificant, whereas Kosovo is not included because the database source lacks some data.

toward regional countries seem to be quite stable, around 2000 (in million lek), characterized by slight upward and downward trends. During the time frame of 2002-2004, Albania completed the signing of bilateral free trade agreements with all countries of the region (countries participating in the Stabilization and Association Pact). From 2004 until 2008, Albanian exports toward regional countries are characterized by a clear upward trend. Total Albanian exports toward regional countries in 2008 reached the value of 10904 (in million lek), more than four times higher compared with exports values of 2004[9]. The boom of Albanian exports to regional countries can be easily attributed to the bilateral FTAs among Albania and regional countries. Nevertheless, during 2009, exports to the region were characterized by a downward trend, contracting by 17.4% in absolute values compared with the previous year (see Table 3). The "global financial crisis" affecting the region (2008-2009) is believed to be the main contributor to such shrinkage of Albanian exports to the region.

Chart 2: Albanian export flows to regional countries 1993-2008 (in million lek)



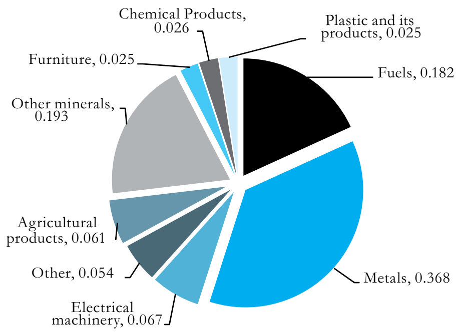
Source: Author's own calculations using data from Bank of Albania

In terms of export structure, Chart 3 shows the overall structure of Albanian exports to the region during 2009. The main categories of Albanian exports to the region are: metals, other minerals, fuels, electricity and agricultural products with 36.8%, 19.3%, 18.2%, 6.7% and 6.1% share to total regional exports, respectively. As shown in Chart 3, metals and other minerals are the main exports to the region

9 Total Albanian exports to regional countries during 2004 reached the value of 2439 in million lek (see Appendix 1).

accounting for more than 50% of total regional exports. Even though the Albanian economy is largely dependent on the agricultural sector, agricultural products exported to the region accounted for only 6.1% of total regional exports. Fuels and electrical machinery seem to be two other important categories of Albanian exports to the region.

Chart 3: Structure of exports to the region, 2009

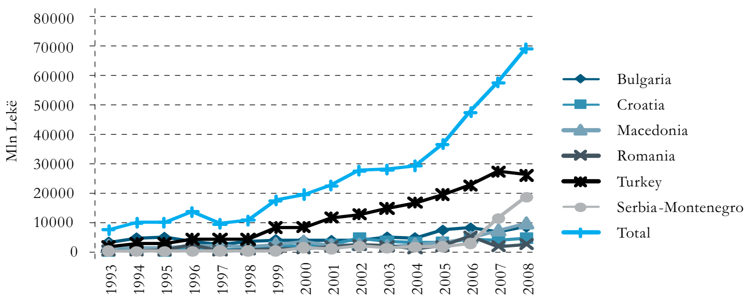


Source: Albanian Center for International Trade (2009 Trade Report)

Chart 4 shows import flows from regional countries through 1993 to 2008. Total import flows from regional countries (1993-2008) can be divided into three main "phases" in terms of dynamics. During the first "phase" (1993-1998), imports from regional countries seem to be quite stable at around 10000, in million lek (see Chart 4). Imports during the second "phase" (1998-2004) are characterized by a continuous upward trend. Imports during this phase almost tripled, from about 10725 (in million lek) in 1998 to 29397 (in million lek) in 2004. During the last "phase" 2004-2008[10], imports from regional countries are characterized by even a sharper upward trend compared with imports of "phase 2" (see the blue line, Chart 4). Imports from regional countries quick-jumped from about 29397 (in million lek) in 2004 to 69741 (in million lek) in 2008 (see Appendix 1). *The rapid growth of total import flows from regional countries, after year 2004, shows the effects of regional bilateral FTAs (see Chart 4).*

10 During this phase (2004-2008), Albania had bilateral FTA regimes with all regional countries. The last regional bilateral FTA was that with Bosnia & Herzegovina signed in December 2004.

Chart 4: Albanian import flows from regional countries 1993-2008
(in million lek)

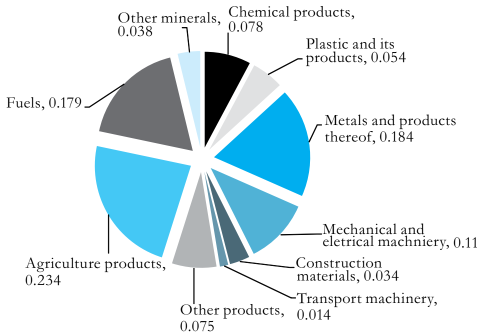


Source: Author's own calculations using data from Bank of Albania

Chart 5 gives an overview of the structure of import flows from regional countries. Agricultural products, metals and products thereof, fuels, mechanical and electrical machinery, chemical products and other products are the main categories of imports from regional countries. The category of agricultural products accounts for 23.4% of total imports from regional countries. Even though the Albanian economy is agriculturally dependent, with more than 50% of its working force employed in this sector, Albania still imports heavily agricultural products from the region. On the other hand, Albanian agricultural products exported to the region account for only 6.1% of total Albanian exports to the region.

The above facts suggest that the Albanian agricultural sector needs to reallocate its resources and become more competitive in the regional free trade area or move to more productive sectors such as services. The three main imported categories from regional countries are: agricultural products 23.4%, metals and products thereof 18.4% and fuels 17.9%, revealing that imports from the region are dominated by commodity products.

Chart 5: Structure of imports from the region, 2009



Source: Albanian Center for International Trade (2009 Trade Report)

Previous research on regional trade flows in the Balkan region reveal some interesting results. For instance, Kaminski and de la Rocha (2003) suggest that trade flows among Balkan countries are underreported. According to them, the main reasons for such unreported trade flows are: high taxation of trade and corrupted customs. In their study, Kaminski and de la Rocha (2003) find out that for the same bilateral trade flow (bilateral trade flows among SEE-5 countries) considerably different data are reported by the importing country and different data are reported by the exporting country. Their finding suggests that when analyzing bilateral trade flows among SEE-5 countries, one should take into consideration that the reported data might be considerably below actual trade flows.

5. ACTUAL TRADE TO POTENTIAL TRADE BETWEEN ALBANIA AND ITS MAIN TRADING PARTNERS: GRAVITY MODEL ESTIMATES

5.1 LITERATURE REVIEW ON GRAVITY MODELS

Gravity models are one of the most used models in evaluating bilateral trade among countries. Gravity models were initially recommended by Linder (1961) and Linnemann (1966). Similarly to the original theory of gravitation[11], gravity models express bilateral trade flows between two countries as a function of two key variables: as positively related to the economic size of the two countries trading among them, and negatively related to the distance between the capital cities of these two countries. More recent studies add four other variables to the gravity model equation (see Cheng and Wall, 2004). The first consideration is that countries speaking the same language are more likely to trade among them than otherwise. Second, countries sharing a common border trade more among them, mainly because transaction costs might be reduced due to closeness among the countries. Third, if countries have been part of the same territory (such as Czechoslovakia, or former Yugoslavia) they are likely to have built trading ties throughout their common history, stimulating as such intensified trade flows among them. Finally, gravity models also consider the possibility of trade stimulation between a country entering a free trade area and constituent countries. For instance, Spain intensified trade with euro area countries in the second half of 1980s (Bussiere et al., 2005).

This paper uses a simplified gravity model equation, taken by Kaminski and de la Rocha (2003) and Frankel, Stein and Wei (1997)[12], to measure potential trade flows between Albania and its main trading partners. The equation uses standard parameter values as follows:

$$\log T_{ij} = 0.7 \log (GDP_i * GDP_j) + 0.3 \log (GDPPC_i * GDPPC_j) - 0.7 \log (Distance_{ij})$$

where: T_{ij} represents a trade flow from country i to country j; GDP stands for the total Gross Domestic Product and GDPPC for the Gross Domestic Product per capita; $Distance_{ij}$ denotes the distance between capital cities of trading partners.

To resolve the equation, the date for each specific country is entered to the equation. The results (predicted potential trade) then are compared to the actual trade flows for each specific bilateral trade flow.

11 The theory of gravity by Isaac Newton. This theory in physics explains the gravity force among two bodies, as directly proportional to their mass and inversely proportional to the distance between them.

12 This simplified gravity model takes into consideration the above mentioned problem of poor quality data and unreported trade flows among Balkan countries (see Kaminski and de la Rocha, 2003).

The predicted results from the gravity model should be analyzed circumspectly for two main reasons. Initially, as mentioned earlier, data statistics from SEE-5 countries tend to be underreported (Kaminski and de la Rocha, 2003). For instance, when comparing the gap between actual to potential trade flows one should take into consideration that the real gap might be smaller due to underreported actual trade.

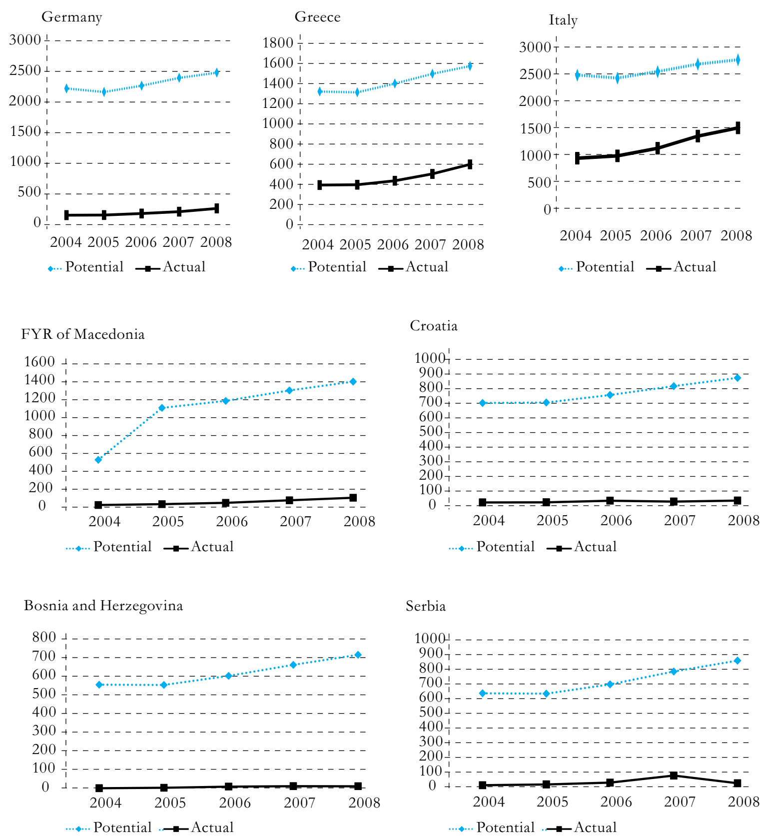
Second, this specific gravity model equation has the tendency to exaggerate potential trade flows. As explained earlier, this equation uses the distance between the capital cities as a variable negatively related to trade flows. However, SEE-5 countries are characterized by poor infrastructure, leading such to increased trading costs. Kaminski and de la Rocha (2003) emphasize the fact that Albania has not very good transportation networks to most Balkan countries apart from Greece. In addition, the distance variable does not take into consideration other costs related to transportation, such as time lags spent at the border controls, cost of adapting the documentation to the importing/exporting country etc.

5.2 DATA SOURCES, APPLICATION TO THE GRAVITY MODEL

This paper uses two main data sources applied to the above described gravity model: Bank of Albania and the World Bank. The ratios of actual trade volumes are received by adding up the annual (2004-2008) export and import flows (statistics from Bank of Albania) between Albania and each specific trading partner. The equation variables of total Gross Domestic Product and Gross Domestic Product per capita are received by adopting data from the World Bank (World Development Indicators) for each specific country. The annual (2004-2008) GDP and GDPPC original indicators are expressed in US dollars. For consistency purposes, the annual GDP and GDPPC are than expressed in Euros, using the official exchange rate of the Bank of Albania (see Appendix 3). The distance variables are received by using the official website of Michelin (www.viamichelin.com).

Using the above mentioned data sources, the gravity model is used to generate data for potential trade flows among Albania and seven of its main trading partners. EU-27 is Albania's most important trading partner. Consequently, this paper uses the gravity model to generate data statistics about potential trade flows between Albania and its three most important trading partners: Germany, Greece and Italy. As mentioned earlier, regional countries represent an important group of trading partners for Albania, as such potential trade data are also generated for Bosnia and Herzegovina, Croatia, FYR of Macedonia and Serbia. Despite being an important regional trading partner for Albania, Kosovo is not included in the forecasts of potential trade due to insufficient data.

Chart 6 Ratios of actual trade to potential trade between Albania and its main EU trading partners (in million euro)



Source: Author's own calculations. Data from Bank of Albania and the World Bank (World Development Indicators, 2010).

Note: Scale may differ across charts to enhance readability in accordance to trade flow differences among countries.

5.3 DISCUSSION OF FINDINGS

This section discusses the findings from the gravity model. As mentioned earlier, the gravity model has both strengths and weaknesses. The results from the gravity model should be interpreted with caution and should not be taken for absolute truth. This, however, does not weaken the competency of the gravity model projections; it rather suggests that these projections are to be considered as recommended indicators of potential direction of change.

To analyze the potential trade flows between Albania and its main trading partners, the results from the gravity model are compared to the actual trade flows. For instance, the graphical representation of actual to potential trade flows with Germany (see Chart 6.a) reveals some interesting facts. As it can be clearly noticed, actual trade flows with Germany are far below their potential. Actual trade flows with Germany in 2008 are about $1/10^{th}$ of their potential. Even though Germany is Europe's main exporting country, trade flows with Germany remain below their potential. Projections from the gravity model suggest that Albania and Germany could intensify their trading volumes by about 90% more than the actual ones. Gravity model projections on potential trade flows with Greece offer a different picture. For instance, actual trade flows with Greece in 2008 are about 40% of their potential. Taking into consideration the above mentioned problem of unreported trade flows, it can be assumed that actual trade might be considerably higher. The proximity between Albania and Greece might be one of the explanatory reasons why actual trade flows with Greece are more intense compared to trade flows with Germany. As explained earlier, gravity models theory suggests that neighboring countries are likely to trade more among them. Trading costs among neighboring countries tend to be reduced due to closeness, culture similarities, and historical trading networks. The gravity model projects some interesting data about potential trade flows with Italy. Differently from the other two EU trading partners (Germany and Greece), trade flows with Italy are significantly more intense. Italy represents Albania's most important trading partner, accounting for 62.60% of total Albanian exports and 27.90% of total imports to Albania during 2009 (see Table 3). However, gravity model projections suggest that actual trade with Italy is still below its potential. In 2008, actual trade flows with Italy accounted for about 54% of their potential. Taking into consideration the possible unreported data statistics on actual trade flows, it can be said that trade flows with Italy are very close to their potential. Apart from the proximity factor, it appears that the large presence of Albanian expatriates in Italy and Greece is the key explanatory factor why trade flows with Greece and Italy are much closer to the equilibrium level, when compared to trade flows with Germany. Even though actual trade flows with Germany, Greece and Italy are below their potential, an escalation of trade flows between Albania and these three trading partners is to be expected after the full implementation of the SAA (the SAA was finally ratified in spring 2009).

Chart 6.b) reveals projections from the gravity model on potential trade flows between Albania and four regional trading partners (Bosnia and Herzegovina, Croatia, FYR of Macedonia and Serbia)[13]. Gravity model predictions suggest that actual trade flows with Bosnia and Herzegovina are almost inconsiderable weighed against the potential trade flows. Similarly, actual trade flows with Croatia are far below potential trade flows generated by the gravity model. Actual trade flows with Croatia in 2008 accounted for only about 4% of potential trade. Gravity model predictions suggest the existence of an opportunity for accelerating trade flows between Albania and Croatia. Even though trade flows with Serbia have increased significantly during the past five years (see Charts 2 and 4), actual trade flows remain far below their potential. During 2007, actual trade flows with Serbia accounted for only about 10% of their potential. Yet again, it can be said that there exists room for trade intensifications among these two regional trading partners. FYR of Macedonia and Albania share a common border. According to the gravity model theory, these neighboring countries are expected to have considerable trade flows among them. However, forecasts of the gravity model expose contradicting results to the theoretical expectations. For instance, during 2008, actual trade flows with FYR of Macedonia accounted for only about 7.5% of their potential. Gravity model projections suggest that actual trade flows during the previous years were even more disproportional to the potential trade.

13 Despite being two important regional trading partners, Kosovo and Montenegro could not be included in the gravity model projections due insufficient data statistics.

In general, it can be stated that trade with regional countries is far below its potential. The hypotheses are that trade flows with regional countries are considerably below their potential for the following reasons: First, during the communist regime, Albania (the communist regime in Albania lasted for more than 45 years) was one of the most isolated countries; as such, Albania had no trading networks with regional countries. Second, several studies suggest that statistical data on trade flows with regional countries are underreported. Kaminski and de la Rocha (2003) suggest that corrupted customs and high border taxes on certain products support smuggling activities among Balkan countries. They suggest that real trade flows among regional countries are considerably higher compared to the official reported data statistics. Finally, Albania inherited a poor transportation infrastructure to regional countries. Such poor road networks represent an enormous barrier for trade intensifications between Albania and regional countries.

6. CONCLUSIONS

This paper analyzed the EU – Albania SAA. The main focus was trade integration with EU and regional countries. The SAA between Albania and EU was finally ratified in spring 2009. The global financial crisis of 2007-2009 (affecting both economies of Albania and that of the EU) and the short period of time since the SAA ratification make it difficult for an empirical study to offer consistent evaluations. As a consequence, this paper combines findings and suggestions from this paper with conclusions drawn by other previous empirical research (on the EU – Albania SAA).

The SAA represents a great opportunity for SEE–5 governments to renovate their institutions to the European standards. Albania's performance under the SA Process and SAA has been impressive covering numerous areas, such as regional co-operation, non tariff barriers (technical barriers), competition laws and regulations, intellectual, industrial and commercial rights, free movement of products, services and people, etc.

One of the aims of the SAA is to create a regional free trade area among SEE-5 countries (parallel to the EU free trade area with each of the SEE-5 countries). Empirical studies suggest that such bilateral free trade agreements are expected to increase regional trade flows, resulting as such in economic development (Kovac, 1998). As analyzed in Section 4.3, trade flows between Albania and regional countries experienced a boom after 2004 (year in which Albania concluded the signing of FTAs with all regional countries). It can be concluded that bilateral Free Trade Agreements with regional countries have definitely contributed to the intensification of Albania's trade flows with these countries. However, empirical projections from the gravity model suggest that trade with regional countries is still far below its potential, emphasizing as such the opportunity for trade intensification. The proposition is that Albania under-trades with regional countries for three main reasons: a) no history of trading ties and networks before 1990s, b) corrupted customs and high taxation contribute to increased smuggling activities resulting in unreported trade statistics, and c) poor road networks with regional countries. The gravity model exercise suggests a potential for trade intensification with regional countries; however, these potentials cannot be realized unless Albania and regional countries improve their infrastructure networks and deeper integrate with each other.

This paper also analyzed Albania's trade integration with its most important EU trading partners (Germany, Greece and Italy). During 2009, trade volume with EU-27 accounted for 69.7% of total Albania's trade volume. It can be concluded that Albania is clearly EU-oriented (in terms of trade). Italy and Greece continue to represent Albania's main trading partners. Gravity model projections suggest that trade flows with Italy and Greece are near their optimal levels. On the other hand, trade flows with Germany are about 90% below their potential, suggesting as such an opportunity for trade intensification. The full application of the SAA is expected to intensify Albania's trade flows with its main trading partners (Italy, Greece and Germany). Empirical evidences also support the above findings. Gravity models also consider the possibility of trade stimulation between a country entering a free trade area and constituent countries (Bussiere et al., 2005). In other words, the successful implementation of the SAA is expected to also boost trade flows with the remaining EU-27 trading partners. Zahariadis (2007) finds that EU-Albania SAA combined with FTAs between Albania and regional countries could lead to about 1.5%

increase of Albania's GDP. An additional 0.46% of GDP could be achieved if Albania was to modernize its customs administration and harmonize its legislations to the EU ones.

Abstracting from the above findings, it can be concluded that Albania's trade integration with regional countries and the EU has been remarkable. However, outcomes from the gravity model exercise recommend that Albania could further integrate with EU-27 as well as with regional countries.

Finally, it is important to underline some of the most important limitations arising from the analytical structure implemented by this paper. For instance, the gravity model equation applied here tends to exaggerate potential trade flows due to: a) the phenomenon of unreported trade among SEE-5 countries, and b) the distance variable (which does not take into consideration other costs related to transportation, such as time lags spent at the border controls, cost of adopting the documentation to the importing/exporting country). In addition, the gravity model exercise did not include trade flows with Kosovo (an important regional trading partner for Albania) due to missing data statistics. As a consequence, the outcomes produced by the gravity model exercise are not to be treated as absolute truth; they are rather considered as significant indicators on trends of trade flows.

Trade integration, however, represents just one of the many aspects essential for the success of the SAA. Trade liberalization alone could not generate its potential economic growth without structural support and regional cooperation. Further studies could contribute to this topic by focusing their research on other important dimensions of deeper integration, such as: trade liberalization analyzed by specific sectors, political cooperation, trade facilitations and contribution of infrastructure to trade integration.

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7. APPENDIX

Appendix 1

Albanian exports flows to regional countries 1993-2008 (in million lek)							
	Bulgaria	Croatia	Macedonia	Romania	Turkey	Serbia and Montenegro	Total
1993	88	126	1.397	20	170	4	1.804
1994	73	63	624	7	143	22	931
1995	18	198	742	7	1.161	-	2.126
1996	4	150	677	15	684	-	1.530
1997	3	884	555	8	195	54	1.698
1998	15	187	467	39	170	92	969
1999	4	54	573	13	152	469	1.265
2000	12	213	322	1	245	781	1.573
2001	14	7	1.021	5	444	1.370	2.861
2002	14	22	695	8	477	1.049	2.265
2003	23	39	372	10	451	353	1.247
2004	164	41	787	23	1.178	246	2.439
2005	361	18	1.033	159	1.133	552	3.256
2006	325	219	1.235	64	1.014	1.053	3.910
2007	670	89	2.199	291	2.192	2.323	7.764
2008	792	188	3.225	183	2.164	4.353	10.904
Albanian import flows from regional countries 1993-2008 (in million lek)							
	Bulgaria	Croatia	Macedonia	Romania	Turkey	Serbia and Montenegro	Total
1993	3.188	123	1.919	309	1.760	87	7.386
1994	4.657	677	1.392	366	2.690	3	9.784
1995	4.859	247	1.549	458	2.786	-	9.898
1996	3.722	1.386	1.971	2.380	4.119	26	13.604
1997	2.519	419	1.942	280	4.157	117	9.434
1998	3.404	801	1.703	509	4.152	156	10.725
1999	4.062	1.578	2.633	902	8.179	97	17.450
2000	3.735	1.857	3.417	865	8.401	1.238	19.513
2001	3.771	2.428	2.192	1.722	11.590	860	22.563
2002	3.997	4.527	2.318	2.211	12.796	1.816	27.665
2003	4.963	3.458	1.901	1.849	14.830	1.033	28.034
2004	4.731	3.068	2.460	1.020	16.764	1.354	29.397
2005	7.345	3.107	3.205	1.900	19.624	1.634	36.815
2006	8.150	4.267	4.777	5.157	22.793	2.662	47.806
2007	6.712	3.666	7.293	1.622	27.454	11.264	58.012
2008	8.406	4.378	9.686	2.382	26.245	18.644	69.741

Source: Bank of Albania

Appendix 2

Exports by country (in euro)						
Description	2004	2005	2006	2007	2008	2009
Germany	15030	17610	19910	19200	24590	24960
Greece	58390	55420	60650	65020	80370	56360
Italy	354630	383920	457910	534990	566640	459580
Bosnia and Herzegovina	310	890	3440	3150	1530	790
Croatia	320	150	1770	730	1530	880
Serbia	1840	4470	8540	14100	19510	10420
Macedonia	6040	8330	10070	18510	27030	23910
Imports by country (in euro)						
	2004	2005	2006	2007	2008	2009
Germany	113810	112790	136180	166870	215920	209370
Greece	340910	346160	380660	444400	523660	504880
Italy	596610	610760	677250	826240	945810	850070
Bosnia and Herzegovina	910	2700	6550	9190	10330	7790
Croatia	23800	24990	34590	29670	35620	32260
Serbia	10670	13160	21580	63700	6380	5880
Macedonia	19140	25830	38850	59080	78870	59810
Trade volume (in euro)	2004	2005	2006	2007	2008	2009
Germany	128840	130400	156090	186070	240510	234330
Greece	399300	401580	441310	509420	604030	561240
Italy	951240	994680	1135160	1361230	1512450	1309650
Bosnia and Herzegovina	1220	3590	9990	12340	11860	8580
Croatia	24120	25140	36360	30400	37150	33140
Serbia	12510	17630	30120	77800	25890	16300
Macedonia	25180	34160	48920	77590	105900	83720

Source: Bank of Albania

Appendix 3

Years	2004	2005	2006	2007	2008
	GDP (current US$)				
Albania	7464446950	8376483740	9097856196	10831224735	12294892535
Germany	2,7451E+12	2,7897E+12	2,91243E+12	3,31613E+12	3,64949E+12
Greece	2,30757E+11	2,45797E+11	2,67479E+11	3,12302E+11	3,55876E+11
Italy	1,72775E+12	1,77774E+12	1,86348E+12	2,11447E+12	2,30308E+12
Bosnia and Herzegovina	10022838730	10764936725	12255198845	15226731980	18511525614
Croatia	40713209719	44431812057	49037889118	58558231254	69332496258
Serbia	24517897938	26193415791	30527312060	40121875321	50061135405
Macedonia, FYR	5368441930	5814726241	6373113830	7926664430	9521429713
	GDP per capita (current US$)				
Albania	2409	2693	2914	3458	3911
Germany	33267	33827	35355	40310	44446
Greece	20861	22136	23992	27902	31670
Italy	29699	30333	31616	35612	38492
Bosnia and Herzegovina	2650	2847	3241	4030	4906
Croatia	9172	10003	11045	13201	15637
Serbia	3285	3520	4119	5435	6811
Macedonia, FYR	2642	2857	3127	3886	4664
Exchange rate USD/EUR	1,1316	1,244775	1,255658333	1,370633333	1,470583333
	Calculated GDP (current EUR)				
Albania	6596365279	6729315531	7245487052	7902350302	8360554792
Germany	2,42586E+12	2,24113E+12	2,31944E+12	2,41941E+12	2,48166E+12
Greece	2,03921E+11	1,97463E+11	2,13019E+11	2,27852E+11	2,41996E+11
Italy	1,52682E+12	1,42816E+12	1,48407E+12	1,5427E+12	1,5661E+12
Bosnia and Herzegovina	8857227580	8648098431	9759978905	11109267234	12587879377
Croatia	35978446199	35694653296	39053528987	42723483976	47146254610
Serbia	21666576474	21042691082	24311798241	29272508077	34041685548
Macedonia, FYR	4744116234	4671307056	5075515895	5783212940	6474593787
	Calculated GDP Per Capita (current EUR)				
Albania	2129	2163	2321	2523	2659
Germany	29398	27175	28157	29410	30223
Greece	18435	17783	19107	20357	21536
Italy	26245	24368	25179	25982	26175
Bosnia and Herzegovina	2342	2287	2581	2940	3336
Croatia	8105	8036	8796	9631	10633
Serbia	2903	2828	3280	3965	4631
Macedonia, FYR	2334	2295	2490	2835	3172

Source: Author's own calculations, using data statistics from Bank of Albania and the World Bank.

Appendix 4

	2004	2005	2006	2007	2008
	Albania-Germany				
Potential	2217,42	2160,179	2263,392	2393,208	2479,151
Actual	128,84	130,4	156,09	186,07	240,51
	Albania-Greece				
Potential	1326,781	1318,448	1405,613	1501,495	1577,92
Actual	399,3	401,58	441,31	509,42	604,03
	Albania-Italy				
Potential	2486,33	2432,706	2551,165	2690,397	2771,064
Actual	951,24	994,68	1135,16	1361,23	1512,45
	Albania-Bosnia and Herzegovina				
Potential	554,5661	553,3559	601,9256	660,9909	714,9316
Actual	1,22	3,59	9,99	12,34	11,86
	Albania-Croatia				
Potential	703,4898	706,7677	758,5646	818,7817	875,3825
Actual	24,12	25,14	36,36	30,4	37,15
	Albania-Serbia				
Potential	637,8544	635,2219	698,4234	786,231	860,3789
Actual	12,51	17,63	30,12	77,8	25,89
	Albania-Macedonia				
Potential	527,40	1106,79	1184,04	1300,54	1398,95
Actual	25,18	34,16	48,92	77,59	105,90

Source: Author’s own calculations: Outcome from the Gravity Model; using data statistics from Bank of Albania and the World Bank.

GROWTH EFFECTS OF INTERNATIONAL INTEGRATION IN SOUTHEASTERN EUROPE - IMPLICATIONS ON FDI AND TRADE

*Jonel Kristo**

ABSTRACT

International integration is explored through a sample of 9 countries in Southeastern Europe for a period of 13 years, from 1996 to 2009. A panel data approach is taken, using fixed effects and a within estimator model. The central questions of this study are to assess the directional effect of international integration on growth, to study the channels of transmission of such growth, and to measure the intensity of these relationships.

The findings suggest that an integrated region benefits more from trade in the form of exports, and less so from imports. Foreign direct investments are attracted to an integrated region more intensively, although inter-regional R&D expenditures in cost-oriented industries are not influencing growth to a considerable extent. The difference between high-tech and low-tech investments might give more conclusive results regarding this matter. For an integrated region where FDI and trade are intense, a competent and readily available labor force is found to affect growth incrementally more.

Disclaimer: The statements made in this paper are the author's own responsibility, and do not necessarily reflect the opinion of the Bank of Albania on the issue.

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INTRODUCTION

With the positive experience of cluster-based industrialization in places such as Silicon Valley in the San Francisco Bay Area in Northern California, or the many other integrated economies around the world, researchers have sought to measure the marginal effect of such economic structures on growth. Do economies grow substantially better – both in volume and speed – if they seek policy and spatial coordination of the relevant factors of production[1]?

Crozet and Koenig (2007) have attempted to answer the second part of this question by looking at data for EU regions over the 1980-2000 time span. They conclude – through the exploration of the effect of spatial concentration of economic activity on growth performance – that regions with a more uneven internal spatial distribution of production appear to grow faster. Our research differs from Crozet and Koenig's (2007) study in that we explore this relationship for non-EU countries, where institutional legacies and levels of economic development are substantially different. Also, Henderson (2003) and Ades & Glaeser (1995) seem to focus their research on the effect of integration in terms of urbanization on growth, and Brulhart and Sbergami (2008) consider intra-country spatial integration while trying to explore the causal link of the latter to growth. Regional integration is gaining significance in an era where globalization and union-type integration (as the EU) is rendering national borders less and less significant. In this sense, regional factors are becoming determinants of investment decisions (Pelegrin and Bolance, 2008), thus contributing further to the proved conviction of foreign direct

1 The traditional factors of production such as land and labor are characterized by greater immobility, so they can not be significantly associated with the need of cluster-based development to move resources in the most productive regions. For this reason, and for the scope of this paper, we have adjusted the definition of "factors of production" to include those competencies and resource endowments of firms and regions, which act as relevant factors in entrepreneurial decision making. Pelegrin and Bolance (2008) considered factors such as market demand, industrial density, labor cost, human capital availability, and the presence of innovation systems as relevant factors of production under international integration. Also, the term production refers to the general process of turning inputs into outputs, and does not refer necessarily to this process in an exclusive manufacturing sense.

investments as one factor of growth.[2] Supporting the new economic growth model of greater utility through spatial proximity, economic integration reflects Baldwin and Martin's (2004) belief that regional economic coordination is conducive to such growth. If significant interaction can be proved between growth and economic integration, than chances are that public policy will be oriented towards departing from the classical regional approach to growth, and instead embrace growth promotion at the national and international level (Martin, 1999). Pelegrin and Bolance (2008) estimate this interaction to be valid from an inner-country point of view. They assert that in the Spanish manufacturing sector, economic integration proves to be a determinant location factor for FDI, especially in the context of same industry activity. Fujita and Krugman (2004) pose a kind of vicious circle between consumers, producers, and market thickness when they describe the circular causation of forward linkages as the incentives of workers to be close to the producers, and backward linkages as the incentive of producers to concentrate where the market is larger.

In an earlier contribution, the centripetal forces[3] identified by Fujita et al. (1999) promote shortening of the supply chain due to geographical proximity. In light of increased competitive spoils, firms and workers saturate the region lured by higher wages and more efficient resource allocation. When this saturation happens – which, according to Krugman's (1991) core-periphery model causes centrifugal forces to emerge – factor immobility and congestion diseconomies bring in a thinning-out effect of firms' dispersal in space. On similar lines, it could be hypothesized that the temporary utility derived from an internationally integrated economy in equilibrium, at a time when centrifugal forces are still dormant and markets are in the early stages of their business cycles, causes greater developmental effect on economic growth. Williamson (1965) asserts that 'a poorly developed infrastructure should force higher concentration' as a means of dealing with the lack of facilitative supply chain instruments, rather

2 Dees (1998); De Mello (1996); Blomstrom, Lipsey, and Zejan (1994); Borenzstein, De Gregorio, and Lee (1995); Balasubramayam, Salisu, and Sapsford (1996 and 1999); Kawai (1994). There should be some consideration given to an alternative point of view in this regard given by Bosworth and Collins (1999), who find that positive effect of FDI on domestic fixed investment tends to fall off significantly when more country characteristics are controlled for. Rodrik (1999) argues along those same lines.

3 Comprised by (1) Forward and backward linkages; (2) thick markets; (3) knowledge spillovers

than use economic concentration as a technique to gain marginal growth from exploiting and/or augmenting industry competencies in thicker markets. Moreover, following that same logic of natural cyclical development, there is a change in behavior towards growth when the opportunity cost of non-integration is so high that it makes sense to pursue the opposite in quest of higher societal returns at affordable temporary negative costs.

THEORETICAL FRAMEWORK OF THE RESEARCH

This cyclical approach to development indirectly reflects one of the goals of this paper: to establish empirical evidence that international integration can act as an independent factor of marginal growth and, therefore, as a driver of future investment decisions. The novelty of this paper rests in considering the effect of inter-country decentralization of production functions around those regions[4] that can complement each other with integration (or coordination) of their respective factors of production. This goal redefines the concept of country-specific comparative advantages, and postulates the idea that countries, if able to complement each other and form a complete entrepreneurial supply chain, can better attract investments to bring the entire region in an elevated state of growth. This "countryhoodedness" promotes a cross border configuration of economic activities and the authors hypothesize that there are several positive effects to be expected. First, it could be possible that by slowing down perfect competition, the process of diminishing returns could be reversed to an earlier stage so that, at least temporarily, industries can compete with positive profits (vs. normal profits). This poses a controversial point, however, and one could ask about the balance that should be required between promoting intentional tardiness of perfect competition and the deadweight loss to society from an imperfect free market economy.

4 The word regions used for the scope of this paper refers to countries that comprise one global region, not to cities within a specific country. An example would be the Southeastern European region, which is relevant to this paper. Countries belonging to the SEE region, according to the definition given in the 1999 Stability Pact of the European Bank for Reconstruction and Development, slightly modified for this paper, are: Albania, Bosnia & Herzegovina, Bulgaria, Croatia, FYROM, Italy, Greece, Romania, and Serbia.

The literature in this regard is very limited, to say the least, but congestion externalities formalized by Krugman (1991) may call for authorities and policy makers to not promote international integration on the shoulders of higher net negative costs to society. Second, the pragmatic concept of cross border pooling of resources facilitates the implementation of systems that promote Narula and Zanfei's (2004) idea that the foundations of the competitive advantage no longer reside in only one country, and rightfully so.

The economic theory of comparative advantage has traditionally promoted a country-exclusive exploitation of specialization of production to compete with other countries adhering to the same school of thought. When countries realize that they don't possess a natural or farmed ability to comparatively advance, then they turn to international trade for fulfilling their consumption needs, which should have turned into an almost natural reaction by now. But this disarmament does not have to happen this fast, or at least not until the international integration option is exhausted as a potential alternative.

Narula and Zanfei (2004) also recognize the lack of joint velocity movement between technological specialization of countries and innovation needs of firms, leading one to think that the gap could be closed by physically expanding the innovation system further to include additional cross border areas of technological advancement[5]. Maurseth and Verspagen (2002) explore this topic in the required direction. They found that innovation systems in European regions, if dispersed geographically, have a negative impact on knowledge flows and R&D activity, thus making it impossible to benefit from Criuscolo's (2005) asset-exploiting (use of firm own assets in a foreign location) and asset-augmenting (when firms locate elsewhere to improve, acquire, or create new technological assets) activities. But this raises an important question from an international perspective: if a country does not hold the necessary infrastructure to act as an innovation system by itself, can it integrate internationally with neighboring countries and offer a joint scientific base (among other complementary factors of production) to foreign investors? From a purely infrastructural perspective, the answer is yes. It is possible

5 In this section we mention technological advancement exclusively due to the robust results of Pelegrin and Bolance's (2008) estimation that the presence of a local innovation system in a country (in their case the country is Spain) is always a significant variable in determining FDI location, regardless of industry sector.

to invest in erecting a cross border scientific exchange network that covers entire countries with proximity to each other. Even from a purely intellectual perspective, the answer is still yes, and we are hopefully able to realize the marginal benefits of additional knowledge. However, the main question should be if such an investment makes economic sense from a competitive growth perspective, and do firms find it viable to welcome such initiative in the cluster.

Shavier and Flyer (2000) argue that when firms are heterogeneous, international integration is expected to be characterized by adverse selection. They follow up on this idea by suggesting that when firms already have the best technologies, human capital, training programs, supplier and distribution network, they will competitively suffer when these factors spill over to their competitors. Conversely, they continue, firms with the weakest technologies, human capital, training programs, suppliers, or distributors have little to loose and a lot to gain; therefore, these firms are motivated to integrate. Subsequently, the issue that this logic presents is to establish whether companies in the SEE region belong to the first or the second group, so that we can be sure of the presence of incentives to integrate economically.

The net national income effect of higher FDI inflows caused by larger economic integration efforts does not seem to have been the subject of much research, although a considerable number of studies have explored various forms of location determinants of FDI.[6] In addition, Pelegrin and Bolance (2008) assert that, for certain industries (chemicals, transport equipment, electric and electronic equipment), economic integration matters mainly due to competitive responsiveness towards low labor costs, human capital availability, and same industry convergence. On the other hand, they state that cost-oriented industries, such as food and beverages and paper, printing and publishing, value endowment more than regional integration.[7] In this context, does international integration affect growth, and if so, to what extent?

6 Scaperlanda and Balough (1983); Culem (1988); Thiran and Yamawaki (1995); Hill and Munday (1991, 1992); Mariotti and Piscitello (1995); Guimaraes et al (2000); Egea and Lopez Pueyo (1991); Pelegrin (2002);

7 This logic is important because it takes into consideration the possibility of SEE economies being cost-oriented, and if so, it can be that they won't value integration as much in face of factor endowments. In addition, Brulhart and Sbergami (2008) also pose an income constraint that is valuable for the level of economic growth in SEE: that integration looses its power when real gross income per capita goes above $10,000.

EMPIRICAL FRAMEWORK AND METHODOLOGY

For all common purposes, the variables and methodology in the paper follow the general structure of Economidou, et al (2006), although departures and adaptations from that structure are made to adjust to the theoretical framework of interest in this particular paper. With the questions laid out in the preceding section, the main hypothesis of this paper becomes the following:

Hypothesis: The net economic effect of international integration is positive when the panel sample is constrained into a cross-border region with geographical proximity and other similarities

$$\sum_{i=1}^{9} w_i * E_{i\,int_i} - \sum_{i=1}^{9} w_i * E_{ni\,int_i} > 0 : \Delta E > 0$$

Where E_{iint} is economic growth under international integration, E_{niint} is economic growth with no international integration, and ΔE is the net effect of this difference. A weighted average approach is used to account for country size and resource abundance.

The implications of international integration on economic growth are estimated through the following model:

$$y_{it} = \alpha + \beta C_{it} + \varsigma T_{it} + \nu_{it} + \varepsilon_{it}$$

The model has two explanatory parts for the dependent variable growth rate of GDP per capita expressed by y_{it}: a group of control variables that measure the state of the economy for country *i* captured by βC_{it}, and a group of international integration variables captured by ςT_{it}. What is left is a country specific error term, ν_{it}, and a stochastic error term, ε_{it}. All variables enter the model in logarithmic form under the safe supposition that the variables affect growth nonlinearly.

Variables

Following several empirical growth studies, the state-of-the-economy group of variables includes: (1) gross enrollment ratio for all secondary schooling programs (GERS), (2) employment to population ratio (ETPR), (3) general government expenditure share of GDP (GEXP), (4) annual population growth rate (POPG), and (5) gross expenditures on R&D as a share of GDP (GERD). The sign on GERS is expected to be positive because a better educated population enhances a country's ability to absorb new technologies and innovate, which makes it an important growth factor (Lucas, 1993, Krueger and Lindahl, 2001). This variable is used to proxy for country *i*'s level of human capital stock.

The ratio of total employment to population is used here as a proxy for labor force availability and it gives a fast indication of how frictional the labor market is for country *i*. The logic here is that the higher the rate of employment and the higher the employment insecurity, the more inelastic the labor market. This will harden recruiting efforts of new FDIs when entering country *i,* The sign on ETPR is expected to be negative, because the higher the levels of labor force utilization, the harder it will be for companies to find labor for hire that isn't already allocated in existing ventures, thus adding to start-up costs for new FDIs.

Government expenditure is a dilemmatic indicator. Net unproductive government spending is expected to affect growth negatively. However, Barro and Sala-i-Martin (1995) and Economidou et.al. (2006) show that the contribution of governments on education, health, public works, or other forms of productive capital can promote growth and helps explain cross-country differences in per capita income. Therefore, based on former findings in the literature, the sign on GEXP is expected to be positive.

Population growth supposedly imposes a negative burden on society, and therefore the sign on POPG is expected to be negative. Economidou, et.al. (2006) explain that higher fertility rates imply that more resources should be devoted to raising the newborn population rather than producing new goods, thus reducing income growth. Neoclassical growth models assume the same thing, that a higher population growth rate impacts negatively the steady-state level of output per worker. Note here however, that demographic indicators like this might need considerably more time to incorporate any significant information in the data.

Lastly in this group is the ratio of gross expenditures on research and development over GDP, which is used here to measure the intensity of new knowledge generation. The sign on this variable is expected to be positive. Firms that operate in an interregional investment mode value knowledge and R&D intensity may be an attraction factor for investors (Driffield and Munday, 2000), thus positively contributing to growth. We do not distinguish here between high-tech or low-tech expenses.

The second group of control variables includes measures of international integration: (1) net inflows of FDI as a share of GDP (FDIR), which measures all inward flow of FDI as a share of recipient's country GDP, (2) volume of trade as a share of GDP (TRAD), (3) trade intensity index (TII), which is used to determine whether the value of trade between two countries is greater or smaller than would be expected on the basis of their importance in world trade, and (4) intra industry trade index (IIT), which measures the level of net gains from specialization in different industries across countries, and that a participating country is increasing or decreasing its integration in the world economy. Ideally, this measure would give a preliminary indication whether there is any same-industry convergence happening in SEE.

The estimated coefficient of FDIR is expected to be positive, because FDI are long seen as the channel through which new technologies and knowledge are transferred and spilled over between countries. However, UNCTAD (1999) argue that FDI can be positively or negatively associated with growth depending on the variables that enter an estimation equation, so such assumption about the sign of FDIR is taken with a note of caution.

Trade is assumed to affect growth positively, and is used here as a measure of a country's openness to the rest of the world. A core question that is raised here is that one can not reasonably assume that imports and exports are equally important to income growth (Haveman, et. al., 2001). Therefore, TRAD is dissected into exports as a share of GDP (EXP) and imports as a share of GDP (IMP). Trade (be it exports only or imports only) is considered a growth-enhancing interaction, and more open economies should exhibit higher growth rates (Frankel and Rommer, 1999).

The trade intensity index is defined as the share of one country's exports going to a partner divided by the share of world exports to the partner. An index that is more (less) than one indicates a bilateral trade flow that is larger (smaller) than expected given the partner country's importance in world trade. The estimated coefficient on TII is expected to be positive, conduit to the logic that larger trade flows affect income growth positively.

Lastly for this group, the intra industry trade index is used to measure the level of integration of a participating country into the world economy. Some analyses of factors influencing the success or failure of efforts to promote industrialization and growth conclude that a growing level of intra industry trade plays an important positive role. Intra industry exchange produces extra gains from international trade over and above those associated with comparative advantage because it allows a country to exploit larger markets (Hoekman, et. al., 2003). With this said, the estimated coefficient is expected to be positive. The TII and IIT are two trade indices developed in the World Bank's Handbook on Development, Trade, and the WTO (Hoekman, et. al., 2003). The indices are mathematically defined as follows, where x_{ij} and x_{wj} are country i's and world exports to country j, X_{it} and X_{wt} are country i's total exports and total world exports, respectively, X_{jk} and M_{jk} represent exports and imports of total products in country j to and from country k.

$$\mathrm{TII}_{ij} = \left(\frac{x_{ij}}{X_{it}}\right) \Big/ \left(\frac{x_{wj}}{X_{wt}}\right) \qquad \& \qquad \mathrm{IIT}_{jk} = 1 - \left[\sum |X_{jk} - M_{jk}| \Big/ (X_{jk} + M_{jk})\right]$$

Tables 1 and 2 below shows the values of these two indices for Albania.

Table 1: Trade Intensity Index of Albania with Respective Countries

Year	BiH	Bulgaria	Croatia	Greece	Italy	FYROM	Romania	Serbia
1996	0.109	0.011	0.247	1.293	0.786	5.340	0.017	0.053
1997	0.119	0.010	1.236	2.037	0.637	3.980	0.009	0.062
1998	0.101	0.026	0.195	1.778	0.757	2.126	0.029	0.007
1999	0.091	0.004	0.038	1.170	0.835	1.766	0.007	0.044
2000	0.094	0.013	0.195	1.175	0.807	1.203	0.000	0.059
2001	0.139	0.012	0.005	1.238	0.834	3.453	0.002	0.092
2002	0.172	0.011	0.010	1.191	0.845	2.191	0.003	0.106
2003	0.007	0.014	0.017	0.994	0.875	1.025	0.003	0.254
2004	0.044	0.076	0.017	0.945	0.852	1.765	0.005	0.367
2005	0.106	0.135	0.007	0.855	0.844	2.174	0.027	0.357
2006	0.367	0.091	0.067	0.767	0.835	2.159	0.008	1.978
2007	0.254	0.140	0.022	0.670	0.814	2.651	0.026	2.222
2008	0.092	0.128	0.037	0.664	0.742	2.816	0.013	2.457
2009	0.059	0.132	0.027	0.559	0.775	2.807	0.039	0.686

Source: Author's own calculations with data from UN COMTRADE, Bank of Albania, and the Albanian Institute of Statistics

Table 2: Intra Industry Trade Index of Albania with Respective Countries

Year	BiH	Bulgaria	Croatia	Greece	Italy	FYROM	Romania	Serbia
1996	0.496	0.002	0.195	0.252	0.488	0.513	0.013	0.604
1997	0.436	0.003	0.648	0.294	0.382	0.441	0.052	0.537
1998	0.714	0.009	0.380	0.302	0.511	0.433	0.143	0.754
1999	0.370	0.002	0.070	0.300	0.775	0.372	0.029	0.341
2000	0.217	0.006	0.206	0.207	0.650	0.185	0.001	0.816
2001	0.191	0.007	0.006	0.203	0.676	0.591	0.006	0.949
2002	0.196	0.007	0.007	0.230	0.626	0.462	0.007	0.538
2003	0.064	0.009	0.022	0.266	0.699	0.714	0.010	0.984
2004	0.481	0.067	0.027	0.291	0.740	0.477	0.044	0.292
2005	0.495	0.094	0.012	0.276	0.767	0.487	0.154	0.506
2006	0.686	0.077	0.098	0.273	0.803	0.467	0.025	0.908
2007	0.511	0.181	0.047	0.256	0.784	0.286	0.304	0.943
2008	0.260	0.173	0.083	0.269	0.752	0.274	0.144	0.989
2009	0.183	0.143	0.054	0.205	0.731	0.399	0.222	0.443

Source: Author's own calculations with data from UN COMTRADE, Bank of Albania, and the Albanian Institute of Statistics

Methodology

The panel data is comprised of countries and variables that vary over a certain time period, and this renders panel data analysis methods necessary. It is reasonable to expect that macroeconomic variables vary over time and across countries, and the choice of the appropriate panel data model to use for estimation will depend highly on the type of answers that we are looking for, as well as the Hausman test results.

A fixed effects model within estimators is used, noting that the consistency of fixed effects models is preferred to the efficiency of random effects models. In this study, the idea of interest is to analyze the effect of our variables in an integrated mode, meaning that we are not particularly interested in the fluctuations of the coefficient for a particular country, seeing that country as a sample. On the contrary, we would like to know the effect of economic integration on the level of economic growth of an entire region, not the individual effects of specific countries. In addition, although our observations are not very large, they are sufficiently broad so that we can spare some efficiency for consistency. The countries sample in this case is also the population, so that no inferences are required to spill from the sample to the population (which would be the case for random effects models (Verbeek, 2000)). Greene (2007) also asserts that fixed effects models are more suitable to unbalanced panels.

Moreover, the *within estimator* is econometrically robust and explores variations over time and allows us to answer two central questions of this study: *what* and *how much* is the growth effect of a country integrating internationally into a group of countries?

To support the choice of fixed effects within estimator, a Hausman test is conducted. The central idea of the Hausman test (Hausman, 1984) is to compare an efficient model to a less efficient but consistent model to see whether both estimation results stand. First, a fixed effects model is estimated and its coefficients are stored. Next, a random effects model is estimated and its coefficients are also stored. Next, the coefficients of both estimations are compared, and Hausman's null hypothesis – that the coefficients estimated by the random effects model are the same as the coefficients estimated by the fixed effects model – is evaluated. Test results are given in table 3 below. The test results show that the null hypothesis is rejected at the 5% confidence level with a significant p-value smaller than 0.05.

Table 3: Hausman Test Results (with Stata 11)

Variables	Coefficients			
	(b) Random	(B) Fixed	(b)-(B) Difference	sqrt(diag(V_b-V_B)) Standard Errors
FDIR	0.580	1.398	(0.817)	0.552
POPG	7.865	0.107	7.759	2.710
TRAD	(2.861)	(2.184)	(0.677)	2.564
EXP	2.493	2.032	0.461	1.218
IMP	(0.059)	0.673	(0.732)	1.380
ETPR	0.555	(0.793)	1.349	0.160
GEXP	(0.212)	(0.290)	0.079	0.126
TII	0.108	0.088	0.020	
IIT	0.100	0.088	0.012	0.042
GERS	9.401	6.200	3.201	
GERD	(0.129)	(0.434)	0.305	

b = consistent under Ho and Ha;

B = inconsistent under Ha, efficient under Ho

Test: Ho: difference in coefficients not systematic;

chi2(11) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 93.26; Prob>chi2 = 0.0000

Finally, a stationary test is used to check whether the panel data have unit roots, a safeguard test against spurious regression results. In this phase of the paper we follow the same path of Economidou et al. (2006) and Im et al. (2003), and use the Im, Pesaran, and Shin method for panel unit root testing. Levin et al., (2002) show that the IPS test is preferred because of its power and fewer restrictions. Economidou et al. (2006) add that the IPS test allows for heterogeneity between units in a dynamic panel framework (which is what is sought in this paper) and it is based on Augmented Dickey-Fuller regressions. The results of the unit root test are shown in Table 4 below and all variables are reported with a linear trend. At the 5% level of significance, the null hypothesis of the series having unit roots is rejected, and therefore the panel does not need differencing of orders higher than zero.

Table 4: Panel Unit Root Test (with Eviews 5)

Variables: ETPR, EXPO, FDIR, GDPC, GERD, GERS, GEXP, IIT, IMP, POPG, TII, TRAD				
Method	Statistic	Prob.*	Cross-sections	Observations
Im, Pesaran, and Shin W-stat Null: Unit root (assumes individual unit root process)	-4.4623	0.0000	9	1386

*Test assumes asymptotic normality

DATA

The data used has annual frequency and comes from various sources. The bulk of the data that describes the initial state of the economy – government expenditures, trade volume, exports and imports, and growth rate of GDP per capita is taken from World Bank's and OECD's *National Accounts* data files. The employment to population ratio is taken from the *Key Indicators of the Labor Market* database of the International Labor Organization. Data on the level of net FDI inflows is taken from the *International Financial Statistics* and *Balance of Payments* database of the International Monetary Fund. Demographic data like the annual rate of population growth is derived from total population data from United Nations' *Population Division* and *World Population Prospects* databases. The cross tables for the trade intensity index and the intra industry trade index are built with data from *UNCOMTRADE* and methodological support from the World Bank's *Handbook on Development, Trade, and the WTO*. Data on human capital stock and the level of R&D expenditures for firms is taken from UNESCO's *Institute for Statistics*. Missing data for Albania's firm expenditures on R&D were taken from the Albanian Statistical Institute business surveys in 2006, 2007 and 2008.

The cross sectional dimension has 9 developing countries, all belonging to the region that is typically classified as Southeastern Europe. All nine countries have some trade interaction with each other and share similar geographical patterns. The time period under study covers data from 1996 to 2009, the largest period for which data were semi-completely available and with which we could build a strongly balanced panel (albeit not fully balanced).

ESTIMATION RESULTS

Estimation results for all countries and all variables are given in table 5. There are 6 models built. The first model (1) is a baseline model where effects of FDI, trade, and international integration are not controlled for. The second model (2) adds international investment in the baseline model, while models (3)-(4) and (5)-(6) include general aspects of trade and economic integration effects on growth.

The findings in models (1) and (2) indicate that the ratio of total employment to the population is consistently significant and negative, which conforms to our expectations about the effects of labor force availability. This finding suggests that in a developing economy, employment uncertainty encourages high retention rates, despite shifting factors of reward and recognition. Therefore, it might be harder for companies entering a new market to find readily available labor that is on stand-by and not currently utilized. Waiting for the domestic labor turnover cycle to play out certainly adds to start-up costs, and might deter FDI to follow through. On the other hand, findings on gross enrollment ratio for secondary schooling confirm the conviction that a more competent labor force has a significant positive influence on growth. This adds to the point that labor in a new market has to be readily available, as well as posses a required level of professional competency. The interaction between domestic government expenditures and foreign direct investment is an interesting one. Results show that government expenditures undermine growth when FDI is the only international integration variable controlled for, and it seems that developing countries would benefit much more from increased FDI volume rather than government spending. The influence of FDI on growth seems to be consistently significant and positive, in line with our expectations. Lastly, it seems that the level of R&D expenditures does not influence growth. Pelegrin and Bolance (2008) find that for cost-oriented industries it is much more important to find affordable labor and enough factor endowments, and that knowledge flows are attracted to regions with mature local innovation systems. Industries in SEE countries are mainly cost-oriented and work less in tech-intense sectors, as well as local innovation systems in the region are in their early stages of development.

When the impact of trade on growth is considered in models (3) and (4), it seems that higher trade volume leads to higher growth rates for the economies of Southeastern Europe. Adding more to this effect, the dissection of trade shows that it is exports that influence growth positively, and imports, although insignificant in terms of statistical significance, have a negative coefficient. The coefficient on FDI diminishes when trade is controlled for, but it stays positive, suggesting that developing economies in SEE benefit considerably more from trade than from international investments. However, it might be the case that countries of Southeastern Europe may have struck Narula's (2001), Balasubramanyam et al.'s (2002), and Xu's (2000) minimal threshold level of an efficient labor market (including human capital stock), and of an adequate absorptive capacity[8] that is able to exploit the positive externalities of FDI, after which point benefits from FDI occur. Economidou et al. (2006) point out that for *least developing countries* internal integration arrangements can do little to attract FDI in the absence of appropriate economic structures. SEE countries are all classified as *developing* or *highly developing*[9] countries and this might explain a minimum difference between our and the preceding author's findings. Lastly, the influence of exports and FDI on growth seems to be comparably positive in model (4).

In models (5) and (6) we control for international integration variables. There are no major differences in influence on growth from the ratio of total employment to population and from the level of secondary schooling. However, gross R&D expenses gain significance when trade intensity and particularly intra industry trade are both controlled for. Intra industry trade is argued to promote industrialization. Nevertheless, higher R&D expenditures add a financial burden to any start-up process in the context of cost-oriented economies. These results should be taken with a grain of caution however, because the data do not differentiate on the type of R&D expense and it is impossible to make strong statements about the effect of international integration on R&D and, subsequently, on growth. Meanwhile, it seems that this effect of R&D on growth necessitates the mutual presence of intra industry trade and of larger-than-expected

8 Macroeconomic management: inflation, debt, openness, infrastructure, education, etc.

9 United Nations Human Development Report (2009)

bilateral trade flows. So, if we could differentiate on types of R&D expenses we could evaluate a region's growth benefits from local innovation systems and investments in R&D from international integration. In both models (5) and (6) FDI and exports intensify their positive influence on growth when international integration variables are controlled for, which shows that an integrated region benefits more from international investments and trade in the form of exports. In model (5) we see that imports have gained significance and that they affect growth negatively when trade intensity in the region is higher than expected given the region's weight in world trade. The argument behind this finding might be that larger trade openness in general does not filter exports over imports, but rather allows all forms of trade to occur, and it seems that imports reach demand faster than exports do. A deeper analysis of the interaction between these two variables will require a later study at the micro level, where we could see what kind of exports and what kind of imports cause these effects in the region. In models 5 and 6, international integration seems to power up the *concurrent* effect of FDI and Exports. FDI seem to be attracted to an integrated region more intensively compared to a region with just trade in the common sense, as shown in models 3 and 4. However, the IIT coefficient does not seem to be significant, and this might suggest that there are no clear indications of any industrial cluster currently working or being formed in Southeastern Europe.

Lastly, the annual growth rate of the population was not found statistically significant in any case, and it might be the case that demographic variables require wider time spans than 13 years to fluctuate enough that we could study their effect on growth.

CONCLUSIONS

International integration is explored through a sample of 9 countries in Southeastern Europe for a period of 13 years, from 1996 to 2009. The central questions of this study are to assess the directional effect of international integration on growth, to study the channels of transmission of such growth, and to measure the intensity of these relationships.

The findings suggest that: an integrated region benefits more from trade in the form of exports, and less so from imports. Foreign direct investments are attracted to an integrated region more intensively, although inter-regional R&D expenditures in cost-oriented industries are not influencing growth to a considerable extent. The difference between high-tech and low-tech investments might give more conclusive results regarding this matter. For an integrated region where FDI and trade are intense, a competent and readily available labor force is found to affect growth incrementally more.

Table 5: Fixed-Effect Coefficient Estimations

Variables	Models					
Real GDP per Capita Growth (Dependent Variable)	Baseline (1)	FDI (2)	Trade Effect (3)	(4)	International Integration (5)	(6)
POPG	-0.151(0.842)	-0.168(0.361)	-0.202(0.312)	0.749(0.443)	-0.305(2.379)	-0.151(2.361)
ETPR	-0.939**(0.402)	-0.893*(0.333)	-0.796**(0.318)	-0.669**(0.309)	-0.884*(0.297)	-0.826*(0.297)
GEXP	-0.462(0.279)	-0.549**(0.232)	-0.461**(0.221)	-0.239(0.225)	-0.328(0.217)	-0.314(0.216)
GERS	0.866*(0.393)	0.378*(0.157)	0.743*(0.113)	0.701*(0.076)	0.742*(0.060)	0.380*(0.075)
GERD	0.079(0.152)	0.117(0.126)	0.126(0.120)	-0.149(0.145)	-0.316(0.194)	-0.392**(0.198)
FDIR		0.886*(0.401)	0.084*(0.041)	0.137*(0.043)	0.718*(0.249)	0.473*(0.137)
TRAD			0.942*(0.261)			
EXP				0.283*(0.033)	0.052*(0.019)	0.239*(0.117)
IMP				-0.313(0.357)	-0.637***(0.354)	-0.698***(0.354)
TII					0.149*(0.033)	0.093***(0.049)
IIT						0.087(0.054)
Observations	126	126	126	126	112	112
R2 within	0.227	0.473	0.529	0.566	0.613	0.624
F-test	6.57	16.59	17.63	17.80	16.75	15.59

Standard errors are given in parenthesis.

*Significant at 1% level, **Significant at 5% level, ***Significant at 10% level,

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