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# International Capital Flows and Economic Growth in CESEE: A Structural Break in the Great Recession



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# International Capital Flows and Economic Growth in CESEE: A Structural Break in the Great Re- cession

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### **Abstract**

This paper deals with real effects of bank-intermediated international capital flows to 11 CESEE countries 1997-2012. The purpose is to check for structural breaks in the short-run relationship between bank-intermediated capital flows and output growth since 2008. The relationship is investigated in dynamic panel growth regression framework. Results show that there was no systematic relationship between international banks' exposures and countries' growth rates at normal times. The relationship turned negative at times of crisis, implying that international banks did not cause or propagate negative output shocks in the period of great recession. Moreover, banks may have alleviated intensity of negative shocks by resisting reduction of country exposures in line with contracting GDP.

Asset and liability side of local banks' balance sheets are separated by different kinds of capital and liquidity buffers. So, effects of lending in local credit markets on GDP growth should be looked at separately from international component on the liability side of banks' balance sheets. When international banks' exposures are replaced by local credit portfolios in panel growth regressions, the results change: (1) there is a positive relationship between credit to households and output growth: moreover, strength of positive relationship is magnified at times of crisis; (2) positive relationship between corporate credit and output growth does not change at times of crisis. Thus, crisis-related household sector deleveraging may be much more costly in terms of output loss, than corporate sector deleveraging. Key policy implication is that maintaining the flow of credit to households has higher importance in combating the crisis in the short run than stimulating the flow of credit to non-financial corporations. Also, crisis-related household sector deleveraging may be much more costly in terms of output loss, than corporate sector deleveraging.

### **Key words**

capital flows, economic growth, CESEE, Great Recession, panel analysis

### **JEL classification**

C3, F3, F41

## Introduction

Is financial openness good for economic growth at all times, or is there too much of a good thing? The concept of too much of a good thing gained credibility after Duenwald, Gueourguiev and Schaechter (2005) identified overly rapid credit growth in Bulgaria, Romania and Ukraine before the beginning of great recession. Similar findings raised suspicion that capital inflows intermediated via international banks towards their subsidiaries in CESEE may led to unsustainable developments (e.g. Backe, Egert and Zumer, 2007). Outburst of a series of adverse shocks since 2008 seemingly confirmed earlier reservations: fundamental weaknesses in large European banks and sovereigns and subsequent deleveraging of banks were often interpreted as causes of protracted output contractions in New Europe.

At the same time, a number of researchers emphasized a more nuanced approach to the same problem. Brezigar-Masten, Coricelli and Masten (2010) and Hartwell (2012) found that financial openness and liberalization had stabilizing effects at times of crisis.

The dilemma can be interpreted within the wider framework of capital inflows – economic growth nexus. Economic literature on real effects of international capital flows after liberalization is inconclusive. Results vary depending on periods, list of countries and types of capital flows included in the analysis. The purpose of this paper is to investigate real effects of bank-intermediated international capital flows to 11 CESEE countries 1997-2012. This period includes five years of great recession when individual countries' growth rates in CESEE begun to diverge compared to years of great moderation. Therefore main aim of this research is to check for structural breaks in the short-run relationship between bank-intermediated capital flows and output growth since 2008 within dynamic panel growth regression framework. Regression includes controls for external shocks (export growth), FDI flows, domestic policies (fiscal policy and exchange rate) and banking crises (in Latvia and Slovenia). After proper control for these impacts, results show that there was no systematic relationship between international banks' exposures and countries' growth rates at normal times. The relationship turned negative at times of crisis, implying that international banks did not cause or propagate negative output shocks in the period of great recession.

Asset and liability side of local banks' balance sheets are separated by different kinds of capital and liquidity buffers. Additional contribution of this work is reflected in investigation of effects of lending in local credit markets on GDP growth separately from international component on the liability side of banks' balance sheets. When international banks' exposures are replaced by local credit portfolios in panel growth regressions, results show dominant effect of household loans at times of crisis.

The paper is structured as follows. The first section presents a review of the related literature which elaborates the relationship between capital flows and GDP growth in a cross-country and panel data framework. The second section presents the simple descriptive statistics that unravels the rationale behind the idea for the paper. The model is presented in the third section. The fourth section contains a presentation of data, the econometric method and results. The interpretation of the results is presented in the fifth section. The sixth section concludes.

### 1. Literature review

Bailliu (2000) investigated the role of private capital flows in the determination of economic growth using panel data for 40 developing countries from 1975–95. The results show that as long as domestic assets of commercial banks represent more than 58 per cent of the total assets of those banks and the central bank, the estimated effect of net capital flows will be positive. In countries with poorly developed banking sectors, the effect of capital flows on growth is found to be negative. This may be caused by a correlation between a low level of financial sector development and government-imposed distortions in the financial sector.

Using a non-parametric approach and probit analysis on the sample of 62 (developed and developing) countries and 141 currency crisis episodes, Ito (2004) investigated the relationship between financial openness and the impact and duration of economic crisis. A higher pre-crisis level of financial openness helps to reduce output losses for industrialized countries, but not for less developed and emerging market countries. Also, the duration of post-crisis output contraction can be shorter when an industrialized country has a higher level of financial openness, but for the group of emerging market countries, the duration of output contraction can be lengthened for a country with more open capital accounts. On the other hand, the post-crisis level of financial openness appeared to help industrialized countries reduce the magnitude of output losses, but in emerging market and less developed countries, the post-crisis level of financial openness magnified output losses.

The main hypothesis of Bussiere and Fratzscher (2008) is that a key reason for the elusive evidence of the financial openness-growth nexus is the presence of a time-varying relationship between openness and growth over time (broadly similar to the hypothesis investigated in this paper). There may be an intertemporal trade-off because countries tend to gain in the short-term, immediately following capital account liberalization, but may not grow faster or even experience temporary growth reversals in the medium- to long-term after the opening of the capital account. Authors used a standard (Barro, Sala-i-Martin) growth model for 45 developing and developed countries in order to check for the impact of openness. The opening of the capital account led to a 1.5% higher growth during the first five years after liberalization, while growth in the longer run returned to or even below its pre-liberalization rate.

Edwards (2008) investigated the relationship between capital flows, currency volatility (crisis) and economic growth in the sample of 157 countries on 1970-2001 data. The author wanted to understand whether the extent of capital mobility determines the depth of crisis (as measured by the decline in growth) once a crisis occurs. Countries that restricted capital mobility have not experienced milder crisis than countries which allowed for a freer mobility of capital.

Garita (2009) analyzed the channels through which *de facto* financial openness affects economic growth and its components in the sample of 25 developed and 186 developing economies in the 1970-2005 period. The author used a dynamic panel model in order to test the hypothesis that financial openness and different types of capital flows have a positive effect on economic growth. Data on FDI and portfolio inflows is used as a *proxy* for *de facto* financial openness. The findings are that FDI inflows positively affected growth of GDP per worker. These inflows also positively affected the growth rate of the capital stock per worker with (non-robust) evidence of crowding-in effects. Also, the results show that there is a significant and positive correlation between FDI inflows and TFP, in both developing and developed countries.

Brezigar-Masten, Coricelli and Masten (2010) analyzed how financial integration and development affected the macroeconomic dynamics in 31 European countries after the beginning of the 2008 crisis. The authors conducted an empirical analysis in two stages using dynamic panel models. In the first stage, the authors evaluated the effects of finance on GDP. In the second stage, they evaluated whether financial integration stimulates the development of national financial markets. Financially more open countries experienced a smaller decline in the supply of finance and thus a smaller amplification of the business cycle through the finance-growth nexus. This result is in contrast to the view that financial integration and openness represented destabilizing factors in the recent financial crisis.

Aizenman, Jinjark and Park (2011) analyzed the relationship between economic growth and disaggregated capital flows from 1990 to 2010 using cross-section and panel regression models. The main results on the sample of about 100 developed and developing countries show that effects of capital flows on GDP growth depend on the types of flows, economic structure, global patterns of growth and the analyzed period (before or during the crisis). FDI flows have a significant and positive effect on GDP growth during the entire sample period, including the crisis period. The relationship between equity flows alone<sup>1</sup> and growth is smaller and unstable, while the effect of short-term debt is nil before

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<sup>1</sup> Mainly abstracting from reinvested earnings.

the crisis, but negative and large during the crisis. It is important to emphasize that such negative effect is more significant in countries with weaker institutions.

Aslanoglu and Deniz (2012) investigated the transmission mechanism that works from financial openness and (exchange rate) stability to economic growth in developing countries from 2000 to 2010. The finding is that the impact on growth is conditional on (i) the host economy's being able to attract foreign funds, and (ii) central bank of the host economy's exchange rate stability policy. In the empirical section of the paper the authors construct a stability in openness index (SIO), which is composed of portfolio investment inflows and the exchange rate volatility indicator, and conduct a causality analysis (between SIO and industrial production) using the Geweke's measure of linear feedback. Their results suggest that SIO has a positive impact on economic growth in case of eight (of totally nine) analyzed countries. Among them, only Russia reflects a short run relationship, while the rest reflects a long run relationship between stability and growth.

Hartwell (2012) examined interrelationship between financial liberalization, the probability of a banking crisis and the performance of several economic indicators during periods of crisis as a function of financial sector liberalization and other institutional factors. Using a dataset of 28 transition countries from 1989-2012, Hartwell concluded that the probability of a crisis is smaller in transition economies with a liberalized financial sector and that liberalization can help to moderate the effects of a crisis when it does strike. The results also indicate that the quality of institutions (in this case, property rights) is most important for safeguarding against a crisis and mitigating its effects.

The literature is inconclusive. Some research (e.g. Edwards, 2008; Brezigar-Masten, Corricelli and Masten, 2010; Hartwell, 2012) point out benefits of financial openness, even at times of crises. Others point at a different impact of different types of capital flows (Aizenman, Jinjark and Park, 2011, and Garita, 2009), instability of the relationship over time (Bussiere and Fratzscher, 2008) or across countries, depending on their level of development (Bailliu, 2000; Ito, 2004). The possibility of context-dependency regarding the relationship between capital inflows (especially bank-intermediated capital inflows) and economic growth calls for a deeper investigation of this relationship in the context of CESEE countries before and after the crisis of 2008/09.

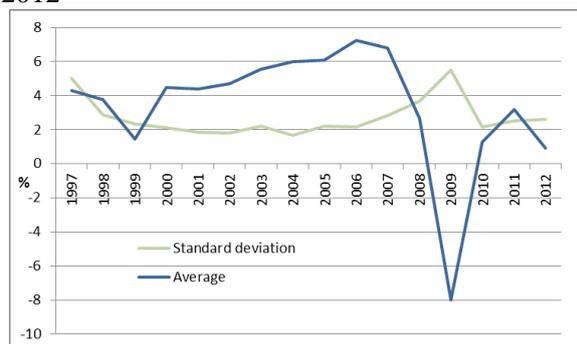
## 2. Stylized facts: where the research idea came from

The average rate of output growth was speeding up until 2007 in 11 CESEE countries (Fig. 1). The recovery after the 2009 slump was mild, with a pause during the second leg of the European recession in 2012. On average, the pattern of growth in CESEE closely resembles the growth pattern in the EU-15 (Fig. 2).<sup>2</sup> Moreover, cross-country growth differences (as reflected in the cross-country standard deviation of growth rates – Fig. 1) increased during the Great Recession. This means that the magnitude of the 2009 shock was very different across CESEE, but the shock was persistent: the cross-country variability remained elevated somewhat in 2010-2012, compared to the calmer pre-crisis period of 2000-2006.

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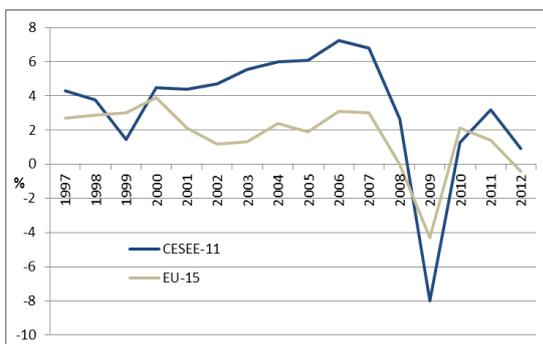
<sup>2</sup> The linear correlation of annual output growth between EU-15 and CESEE-11 is 81% on average. However, country specific correlations are weaker and diverse.

FIG. 1: AVERAGE GDP GROWTH AND ITS STANDARD DEVIATION IN CESEE-11, 1997-2012



Source: Eurostat.

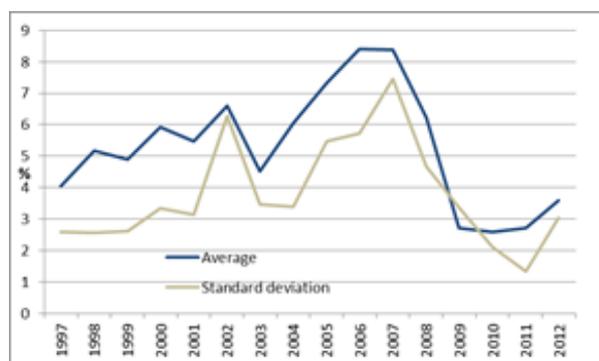
FIG. 2: AVERAGE GDP GROWTH IN CESEE-11 AND EU-15, 1997-2012



Source: Eurostat.

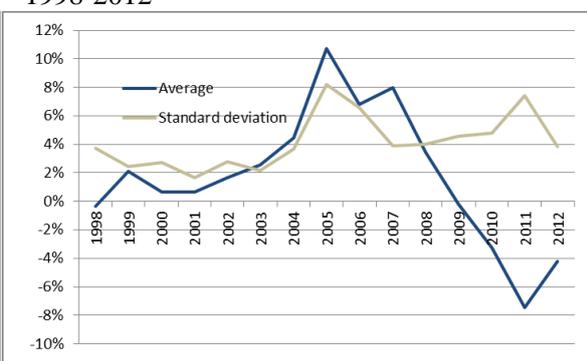
The dynamics of FDI capital inflows shows that the lower average ratio of FDI to GDP during the crisis was accompanied by greater similarity across countries (lower standard deviation) compared to the period before the crisis (Fig. 3). Similarities measured by the standard deviation of FDI flows to GDP ratios decreased when the average ratio began to pick up in 2012 thanks to the strong but isolated revival of FDIs in the Czech Republic, Estonia and Latvia. This is an example of a broader pattern of widening cross-country differences in real developments in CESEE after 2008.

FIG. 3: AVERAGE FDI/GDP INFLOW AND ITS STANDARD DEVIATION IN CESEE-11, 1997-2012



Source: UNCTAD.

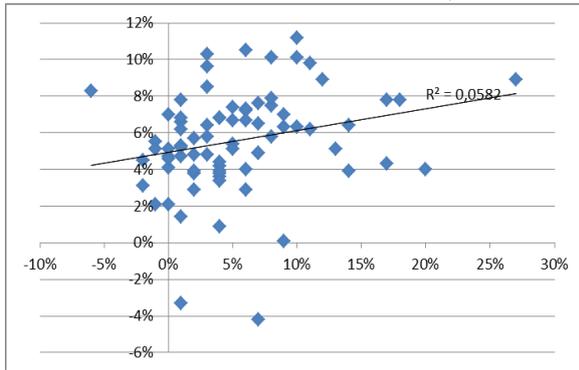
FIG. 4: AVERAGE CHANGE IN INTL' BANKS' EXPOSURE TO CESEE-11 IN % OF GDP AND ITS STANDARD DEVIATION, 1998-2012



Source: BIS.

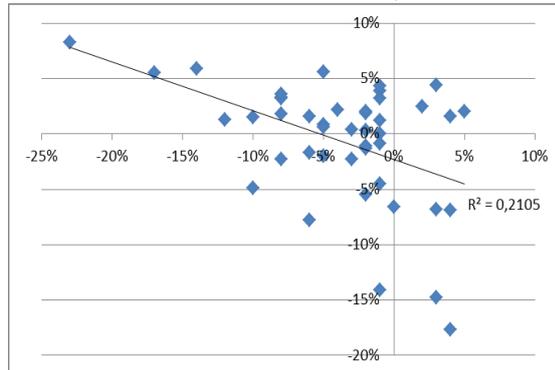
Bank-related capital inflow is measured by changes in BIS reporting banks' exposures to all sectors in CESEE countries in % of local GDP. Banks' exposure behaved markedly differently in comparison to FDI to GDP ratios. There were no increased cross-country correlations as there were with FDI inflows. The standard deviation of cross-country bank-related capital inflows remained elevated during the crisis, but the maximum deviation was observed before the crisis, in 2005 and 2006. Figures 5 and 6 show correlations between changes in international banks' exposures to local GDPs (BIS data) and output changes before (2002-2008) and during the crisis (2009-2012). The relationship was weak before the crisis (Fig. 5). Then there seems to be a structural break: the relationship reversed the sign and got stronger (Fig. 6). Somewhat paradoxically, the stronger decline in bank-related capital inflows was associated with higher output growth. This might happen due to the indicator's construction (GDP is in the denominator of the BIS measure of inflows) or it may reflect a more important phenomenon of the structural break in the relationship between international banks' exposure and local GDP growth.

FIG. 5: COUNTRY-YEAR CHANGES IN INTL' BANKS' EXPOSURE TO CESEE-11 IN % OF GDP VS. OUTPUT CHANGE, 2002-2008



Sources: BIS and Eurostat.

FIG. 6: COUNTRY-YEAR CHANGES IN INTL BANKS' EXPOSURE TO CESEE-11 IN % OF GDP VS. OUTPUT CHANGE, 2009-2012



Sources: BIS and Eurostat.

A plausible explanation is the following: most large banks in CESEE held significant capital and liquidity buffers throughout the Great Recession, especially at its early stages. Capital and liquidity buffers may have enabled large international banks to meet the healthy local credit demand or, at least, allowed banks to avoid a pro-cyclical credit crunch, irrespective of the shocks absorbed on the foreign liabilities' side of banks' balance sheet. On top of it, international shocks may have been weak or absent if international banks lent support to local subsidiary banks in CESEE by maintaining exposures or resisting decrease in exposures in line with contracting GDP. Absent this channel of international shocks, domestic output remained primarily driven by real and structural (external as well as domestic) shocks. This is a narratively expressed hypothesis which needs to be tested in a more formal way.

### 3. Model to be tested

The model specification is simple: real GDP growth ( $y$ ) depends on the real external shock of export growth ( $ex$ ), capital flows intermediated via banks (termed  $BIS$  due to the data source), FDI flows and the vector of domestic policy variables ( $P$ ), which includes fiscal policy and the exchange rate:

$$y = f(ex, FDI, BIS, P, \varepsilon) \tag{1}$$

Real external shocks ( $ex$ ) are obviously exogenous, but there might be multi co-linearity among the right-hand side variables. For example, while a positive external shock has a positive expected effect on growth it may also positively affect capital flows ( $BIS$ ), therefore producing second-order effects on growth via a push factor that affects capital inflows. In addition, more FDIs may lead to a higher demand for foreign bank funding ( $BIS$ ). Finally, reverse causality may work from growth  $y$  to fiscal policy  $P$ , as changes in fiscal policy may be easier to implement in an environment of robust economic growth.

The next problem is associated with the fact that domestic private sector credit ( $C$ ) is privately produced. Policy control over credit is only indirect, hence very imperfect, especially in countries where the interest rate channel does not work or works very imperfectly. So it is more appropriate to look at private credit supply separately from policy variables:

$$y = f(ex, FDI, BIS, C, P, \varepsilon) \tag{2}$$

The possibility of reverse causality is obvious ( $y$  implies demand for  $C$ ), but a number of additional linkages between  $C$  and  $P$ , FDI and  $BIS$  also emerge. Complexities of this kind are hard to control even in a developed structural model. Rather than trying to develop such a model, all kinds of multi co-linearities and reverse causations were controlled by employing an econometric method allowing for endogeneity, which are discussed in the next section.

The relationship between capital flows intermediated via banks ( $BIS$ ) and economic growth ( $y$ ) is of special interest in this paper. The standard assumption is that growth is affected by capital inflows

symmetrically in both good and bad times. But in this paper we based our analysis on the hypothesis that there was a structural break in this relationship at times of crisis in CESEE. So we included slope *dummy* variables to determine the importance of the effects of this structural break. By including a dummy variable we extended our model to the form:

$$y = f(ex, FDI, BIS, BIS2008, C, P, \varepsilon) \quad (3)$$

where  $BIS2008 = D * BIS$ , and  $D$  is dummy equal to 1 from 2008 onwards. Note that significant parameter with  $BIS2008$  implies a structural break in the relationship between capital inflows and economic growth. The key issue is how to interpret different types of structural breaks when parameter with  $BIS$  is positive:

1. If the parameter with  $BIS2008$  is positive, the eventual contraction of capital inflows intermediated via banks has a stronger negative impact on output growth during financial turmoil than during good times. This result would support the widespread narrative about the critical role of sustaining and recovering capital inflows in combating crisis. The potential cyclical variability of the impact would imply that the banks' role in financially open environments may be negative overall, even if the duration of times of turmoil is shorter than the duration of periods of financial moderation.
2. If the parameter with  $BIS2008$  reverses sign and sum of this parameter and parameter with  $BIS$  is still positive, the contraction of capital inflows intermediated via banks during financial turmoil leads to GDP contraction, but this effect is smaller than the positive effect of capital inflows during moderate times. This result would confirm the widespread narrative about the critical role of capital inflows in sustaining growth, but it would leave open the possibility for the overall positive impact of capital inflows intermediated via banks on GDP growth in the long run.
3. If the sum of parameters reverses sign and turns negative at times of turmoil, different interpretations emerge. A normatively bad interpretation would be that stronger capital inflows at times of turmoil cause negative growth if inflows are intermediated towards an inefficient and corruptive government or zombie corporations which waste resources and/or tie them in inefficient uses, paying ever higher interest rates. This would certainly induce an economic slump. However, the problem with this interpretation is that financial intermediaries lend money to debtors that are unable to ever repay, which is irrational. An alternative, normatively good interpretation is that relatively larger international exposures towards local banks in weaker markets reflect support for local banks in order to withstand negative local shocks. In this case, banks' stability may prevent propagation of even stronger negative impulses at times of crisis. For example, if a relatively higher international exposure at times of crisis is related to additional capitalization for absorption of losses, or if it substitutes (and/or prevents) for withdrawal of domestic deposits from local banks, that is certainly helpful for financial stability and the economy in gloom. This thesis is in line with Brezigar-Masten et al.'s (2010) findings. This is the essence of what we call the *bank buffer hypothesis*.

There is another way to approach the same hypothesis – by looking at domestic credit ( $C$ ) directly and constructing  $C2008$  in the same way as  $BIS2008$  and substituting  $C$  for  $BIS$  in (3). Therefore, the model becomes:

$$y = f(ex, C, C2008, FDI, BIS, P, \varepsilon) \quad (4)$$

Significant differences between parameters with  $C2008$  and  $BIS2008$  would indicate separation of the asset side from shocks to the foreign liabilities' side of banks' balance sheets. This is a direct way to test the bank buffer hypothesis.

#### 4. Data and econometric method

The sample consists of eleven CESEE countries from 1997 to 2012 (a sample of total 176 observations). The dependent variable is the real GDP growth rate. Right-hand side (explanatory) variables can be divided in four main categories: (i) bank-related external shocks (BIS reporting international banks' exposures in terms of GDP of CESEE countries); (ii) non-bank related external shocks, which can be

divided in “global” shocks (real growth of exports) and country-specific external shocks (FDI flows in % of GDP); (iii) domestic policy variables (general government deficit, expenditures and revenues in % of GDP and the nominal exchange rate<sup>3</sup>); and (iv) domestic credit (loans to households and loans to non-financial corporations). Table 1 below shows a representation of variables used in the analysis and the data sources.

Table 1: Data description

Category	Variable name	Label	Unit	Source
Dependent variable	GROWTH	Real GDP growth rate	%	Eurostat
Bank-related external shocks	BIS	BIS reporting banks' exposure to CESEE	%GDP	BIS
Nonbank-related external shocks	EXPORT_GROWTH	Real growth of exports	%	Eurostat
	FDIFLOW	FDI flows	%GDP	UNCTAD
Policy variables	FISCAL_BALANCE	General government balance	%GDP	Eurostat; CNB*; IMF
	GEN_GOV_EXPEND	General government expenditures	%GDP	Eurostat; CNB; IMF
	GOV_REVENUES	General government revenues	%GDP	Eurostat; CNB; IMF
	EXCHANGE_RATE	Nominal effective exchange rate	Index 2010=100	BIS
Domestic credit	LOANHOUSE_GROWTH_REAL	Real growth of loans to households	%	ECB; national central banks
	LOANCORP_GROWTH_REAL	Real growth of loans to non-financial corporations	%	ECB; national central banks

\*CNB – Croatian National Bank

The analysis includes several intercept and slope dummy variables which capture the effects of various structural breaks. *Dummy2008* captures the effect of the crisis and recession in 2008-2012 (which can be interpreted as a regime-switch). *Dummyshock2009* captures the effect of 2009 alone, which is the year when all countries in the sample recorded the largest economic declines. *Bank crisis dummy* captures the effects of the banking crisis in Slovenia (2009-2012) and Latvia (2009). Among slope dummy variables we use *BIS2008* and *credit growth2008* dummy variables, which capture the structural break in the relationship between capital inflows or credit growth and economic growth.

In order to test our hypothesis we estimated a dynamic panel regression model of the form:

$$Y_{it} = \delta Y_{it-1} + \beta X_{it} + \gamma CONTROL_{it} + \theta DUMMY_{it} + \alpha_i + \varepsilon_{it} \quad (5)$$

The dependent variable appears in the reporting tables in the Appendix as GROWTH. Matrix X includes explanatory variables which appear individually in separate specifications: the ratio of general government balance to GDP (FISCAL\_BALANCE)<sup>4</sup>, the ratio of FDI flows to GDP (FDIFLOW), the nominal effective exchange rate (EXCHANGE\_RATE), the share of general government revenues in GDP (GOV\_REVENUES), the share of general government expenditure in GDP (GEN\_GOV\_EXPEND), real growth of loans to households (LOANHOUSE\_GROWTH\_REAL), and real growth of loans to non-financial corporations (LOANCORP\_GROWTH\_REAL).

<sup>3</sup> Due to the unavailability of data, revenues and expenditures for Croatia are at the central government level and are obtained from the statistics of the Croatian National Bank (CNB) and IMF reports.

<sup>4</sup> Note that the balance implies that a positive parameter means that a lower deficit/higher surplus is associated with GDP growth and *vice versa*.

There are two control variables which appear in all equations: growth of total exports (EXPORT\_GROWTH) and the ratio of bank-intermediated capital flows to GDP (BIS). In tests of the bank buffer hypothesis BIS is replaced by LOANHOUSE\_GROWTH\_REAL and LOANCORP\_GROWTH\_REAL.

The model includes the following dummy variables: DUMMY2008, which takes the value of 1 in the period 2008-2012, DUMMYSHOCK2009, which takes the value of 1 in 2009 and BANKCRISISLS, which takes the value of 1 in case of Slovenia from 2009-2012 and Latvia in 2009. A special role is assigned to slope dummy BIS2008 (=DUMMY2008\*BIS), which is replaced by LOANHOUSE\_GROWTH\_REAL08 and LOANCORP\_GROWTH\_REAL\_08 (LOANHOUSE\_GROWTH\_REAL08 =dummy2008\* LOANHOUSE\_GROWTH\_REAL and LOANCORP\_GROWTH\_REAL\_08=DUMMY2008 \*LOANCORP\_GROWTH\_REAL) in tests of the bank buffer hypothesis.

The choice of estimators depends on the relationship between time and space dimensions of the sample. The LSDV, the Anderson-Hsiao (1981, 1983), the difference GMM (Arellano and Bond, 1991) and the system GMM (Arellano and Bover, 1995; Blundell and Bond, 1998) estimators are appropriate when the space dimension dominates the time dimension. The Pesaran and Smith (1995) and the Pesaran, Shin and Smith (1999) estimator is appropriate for very large models, which cannot be applied here, given the 11 countries and 16 years of data. Standard LSDV is biased even when  $t=20$ , but it has minimum variance compared to other estimators. Kiviet (1995) calculated the correction for bias and proposed the corrected LSDV estimator (LSDVC). A simulation by Judson and Owen (1999) has shown that LSDVC is the most appropriate estimator for samples like the one used here. The other optimum solution is a one-step GMM estimator (Arellano and Bond, 1991). Similar results are obtained by Buddelmeyer, Jensen, Oguzoglu and Webster (2008). However, LSDVC is based on the assumption of strict exogeneity of regressors. This is highly unlikely here, as explained before. Also note that there are explanatory variables with GDP in the denominator on the right-hand side of the equation which may aggravate the endogeneity problem. In addition, to our knowledge, the Arellano and Bover (1995) and the Blundell and Bond (1998) estimators have not been subject to simulations in smaller samples. For that reason, we used a one-step GMM estimator which allows for endogeneity.

GMM is based on the use of a lagged dependent variable and regressor in levels as an instrument. Therefore, the Sargan test is used to choose the model. If residuals are homoscedastic, Sargan's statistic has a chi-square asymptotic distribution. Parameter consistency requires the absence of autocorrelation up to the second order.

GMM is based on regression of the first difference of the dependent variable ( $Y_{it} - Y_{it-1}$ ) against regressor variables ( $Y_{it-1} - Y_{it-2}$ ) and ( $X_{it} - X_{it-1}$ )-s. Since the variable  $Y_{it-1} - Y_{it-2}$  is surely correlated with residuals ( $\varepsilon_{it} - \varepsilon_{it-1}$ ), the method of instrumental variables is proposed as an estimation solution. The instrumental variables suggested by Arellano and Bond (1991) are lags of the dependent variable as well as lags of regressors in levels. The validity of these instruments is tested using the Sargan test where the null hypothesis tests if the over-identifying restrictions are valid. Also, an optimal number of instruments is needed to accept a null without significantly increasing estimator bias. Hence, the Sargan test is used to choose the model. If residuals are homoscedastic, Sargan's statistic has a chi-square asymptotic distribution. Also, test of autocorrelation among residual differences must be conducted. If the autocorrelation of the first order is confirmed, parameter consistency is not violated (hence it is ignored). The serial correlation of residual differences of the second order makes the estimation parameter inconsistent.

## 5. Results<sup>5</sup>

Results (see the Appendix) show that economic growth in CESEE countries represents an AR process with a key role played by real international shocks. This is reflected in positive and highly significant parameters with export growth in all specifications. The result lends a strong support to the hypothesis about the dominance of real channels in crisis transmission.

Results presented in Table A1.1 in the Appendix show that the dummy variable *BIS2008* is statistically significant in all specifications. The lagged value of this variable is also significant in all specifications, except in the specification with household loan growth. The size and signs of estimated coefficients indicate that the “cumulative” effect of a structural break in BIS flows is negative. This indicates higher bank-intermediated capital inflows to GDP in relation to GDP when GDP contracts and *vice versa*. The result may reflect support by international lenders to local banks and other borrowers at times of real distress. A possible objection to this interpretation is that the result is due to endogeneity because GDP is used in the denominator of the regressor. However, if international banks keep their exposures unchanged when local GDP is contracting (even if exposures decrease but less than GDP which leads to an increase in BIS), this indeed shows the support for local banks and markets. International lenders at least abstain from proportional withdrawals of international financing despite a contraction in local GDP.

Estimated parameters with current and lagged values of the variable *BIS* throughout the whole estimation period are not statistically significant in any specification. This is an interesting finding: while during the boom phase there were no obvious benefits of international banking integration, there are potential benefits at times of crisis because of the negative relationship between capital inflows intermediated via banks and economic growth.

Next, the results in Table A1.2 indicate a statistically significant structural break in the series of household loan growth in all specifications. The parameter with a dummy version of the variable (active at times of crisis) is positive, which indicates an amplified positive influence of household loan growth at times of turmoil compared to normal times. An implication is that if loans to households grow during the crisis, they have a stronger impact on growth than in moderate times. Effect of their eventual decline is amplified, too. No similar effect is found with regards to corporate loans. Their relationship to GDP growth did not change in the great recession.

Furthermore, there is no statistically significant effect of aggregate FDI flows on GDP growth. This does not necessarily imply that FDI flows are not important for growth. A statistical construction of the FDI concept includes flows that may dampen real impacts (e.g. inclusion of earnings in the measured FDI aggregate).<sup>6</sup>

The main conclusion related to domestic policy variables is that the effects of fiscal balance and general government expenditures are statistically significant in all specifications. The sign of coefficients with these variables indicates that an improvement in fiscal balance has positive, while growth of general government expenditures has negative effects on GDP growth. The effects of general government revenues are not statistically significant in any version. These results may indicate that fiscally prudent countries which based their fiscal consolidation on the expenditure side had a better growth performance. One should interpret this with caution due to a possible endogeneity effect (again, GDP is in the denominator of the regressor). However, as the variability of nominal fiscal variables is higher on average than the variability of nominal GDP, the causality may indeed run from fiscal policy to output change.

The effect of the exchange rate level is statistically significant in only one version of the equation, which implies a negative relationship between exchange rate depreciation in the previous period and speed of GDP growth. This can indicate that negative (destabilizing) effects of depreciation (e.g. increase in the value of foreign currency denominated debt) could have offset the positive effects on

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<sup>5</sup> Detailed results of various model specifications are presented in the Appendix.

<sup>6</sup> The true impact of FDI flows should be tested at firm-level which is beyond the scope of this paper.

export growth in some countries. However, this result should be treated with great caution because it is not confirmed in other specifications and may be purely random.

The results indicate that the *dummy2008* (which takes the value of 1 in period 2008-2012) and the *dummyshock09* (which simulates the effect of the 2009 shock when all countries in the sample experienced the strongest economic slowdown) are statistically significant in all specifications in Version 1. The cumulative effect (the sum of the coefficient with current and lagged values) on GDP growth is negative in case of both dummy variables, but the effect of the 2009 shock is (as expected) much stronger. The purpose of inclusions of these dummies was to test whether the main results hold with growth critical dummies switched on and off. No significant changes in the main results occurred in models with vs without great recession dummies, showing their robustness. The results with dummies are reported for convenience.

Finally, the banking crisis dummy is statistically significant in all specifications in Versions 2 and 3 (with credit variables as the main explanatory variables) and in 4 out of 7 specifications in Version 1. In Version 1, the effects are not statistically significant in specifications with fiscal balance and the exchange rate. A lagged positive value implies that the negative impact of the banking crisis on GDP is alleviated in the second year after the inception of the banking crisis, but a net negative effect still remains. Also, the significance of lagged values occurs sporadically. For that reason, no lagged banking crisis is included in Version 2. Parameters are even more negative in versions without other dummies, which are not reported here. The finding of a severe negative effect of the banking crisis on economic growth is in line with other measurements of impacts of banking crises.

## 6. Conclusions

There are no indications that international banks caused or propagated adverse shocks at times of crisis in CESEE when effects of real international and domestic policy shocks on output variability are properly accounted for. Neither there are indications that pre-crisis capital inflows intermediated via international banks had significant positive impact on the short-run GDP growth. However, international banks may have alleviated shocks by retaining exposures, or at least by resisting decrease in exposures in line with GDP towards countries with contracting outputs. The result can be interpreted within a broader set of economic research that found positive impact of international financial liberalization at times of crisis.

Short run output developments are largely explained by real international shocks reflected in growth of exports, banking crises and evolution of loan portfolios. Key policy conclusions in this respect are the following. First, support for exporters at times of crisis (besides depreciating exchange rate which has no significant impact on output growth) may be critical for alleviating adverse effects. Second, stability of banks i.e. avoiding severe banking sector problems like in Latvia and Slovenia saves several percentages of GDP. This is in line with earlier research that showed significantly negative effects of banking crisis. It also shows benefits of international financial integration because Latvia and Slovenia had the lowest share of banks' total assets controlled by international banks in the sample of 11 CESEE countries before the crisis. Last but not least, the results have shown that (1) there is a positive relationship between credit to households and output growth: moreover, strength of positive relationship is magnified at times of crisis; (2) positive relationship between corporate credit and output growth breaks down at times of crisis: parameter becomes insignificant. Key policy implication is that maintaining the flow of credit to households has higher importance in combating the crisis in the short run than stimulating the flow of credit to non-financial corporations. Also, crisis-related household sector deleveraging may be much more costly in terms of output loss, than corporate sector deleveraging.

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## Appendix: Results

Table A1.1 (Prefix L stands for lag, standard errors in parentheses)

VERSION 1	Fiscal balance	Fdiflow	Exchange rate	Gov. revenues	Gov. expendit.	Household loans_real	Corporate loans_real
L.growth	0.36 (0.09)***	0.43 (0.08)***	0.38 (0.09)***	0.42 (0.08)***	0.35 (0.08)***	0.26 (0.09)***	0.28 (0.08)***
L2.growth	-0.21036 (0.07)***	-0.23587 (0.07)***	-0.27838 (0.07)***	-0.2305 (0.07)***	-0.1997 (0.07)***	-0.23957 (0.06)***	-0.27049 (0.06)***
dummy2008	5.3 (1.69)***	6.16 (1.75)***	6.24 (1.73)***	5.85 (1.75)***	5.04 (1.67)***	5.22 (1.63)***	4.16 (1.62)**
L.dummy2008	-5.71 (1.80)***	-6.39 (1.90)***	-6.57 (1.84)***	-6.47 (1.88)***	-6.21 (1.77)***	-4.59 (1.77)***	-4.72 (1.72)***
dummyshock09	-3.07 (1.18)***	-3.92 (1.21)***	-3.94 (1.20)***	-4.29 (1.22)***	-3.69 (1.15)***	-3.76 (1.12)***	-3.89 (1.09)***
L.dummyshock09	4.72 (1.25)***	4.74 (1.31)***	4.34 (1.30)***	4.44 (1.33)***	4.15 (1.25)***	3.25 (1.25)***	3.44 (1.22)***
bankcrisisls	-2.3 (1.50)	-2.71 (1.58)*	-2.51 (1.53)	-3.02 (1.55)*	-2.72 (1.47)*	-3.25 (1.45)**	-2.93 (1.41)**
L.bankcrisisls	2.94 (1.58)*	2.62 (1.64)	2.36 (1.62)	2.59 (1.64)	3.01 (1.56)*	1.91 (1.54)	2.46 (1.49)*
export_growth	0.07 (0.02)***	0.07 (0.02)***	0.07 (0.02)***	0.07 (0.02)***	0.05 (0.02)**	0.09 (0.02)***	0.08 (0.02)***
L.export_growth	0.0 (0.02)	-0.01 (0.02)	-0.02 (0.02)	-0.01 (0.02)	-0.01 (0.02)	0.01 (0.02)	-0.01 (0.02)
Fiscal_balance	0.35 (0.11)***						
L.fiscal_balance	-0.04 (0.11)						
bis2008	-16.16 (3.05)***	-18.3 (3.13)***	-18.25 (3.09)***	-17.86 (3.13)***	-16.09 (3.01)***	-14.77 (2.99)***	-13.3 (2.99)***
L.bis2008	6.25 (3.37)*	7.63 (3.52)**	7.21 (3.45)**	8.49 (3.50)**	7.52 (3.30)**	4.96 -3.31	6.03 (3.18)*
bis	3.59 (3.98)	4.88 (4.32)	6.8 (4.04)	6.76 (4.16)	4.91 (3.92)	0.36 (3.99)	-0.55 (3.94)
L.bis	-0.61 (4.69)	-0.86 (5.12)	-2.96 (4.79)	-2.85 (4.93)	-0.71 (4.67)	3.03 (4.65)	1.73 (4.53)
fdiflow		0.07 (0.06)					
L.fdiflow		-0.04 (0.06)					
Exchange_rate			0.06 (0.04)				
L.exchange_rate			-0.05 (0.03)**				
gov_revenues				-0.1 (0.12)			
L.gov_revenues				0.04 (0.11)			
gen_gov_expend					-0.38 (0.10)***		
L.gen_gov_expend					0.14 (0.1)		
loanhouse_growth_real						0.03 (0.01)***	
L.loanhouse_growth_real						0.02 (0.01)**	
loancorp_growth_real							0.05 (0.02)***
L.loancorp_growth_real							0.05 (0.02)***
_cons	3.51 (0.84)***	2.09 (0.69)***	2.12 (1.98)	4.48 (4.08)	12.28 (3.94)***	1.29 (0.64)**	2.7 (0.61)***
Sargan test	117.2	117.7	114	120.1	118.2	106.4	112.8
chi2	586.92	530.6	549.49	529.92	601.25	634.84	669.71
Number of instruments	136	136	136	136	136	134	134
Sargan p-value	0.5295	0.5165	0.6123	0.4545	0.5035	0.7489	0.5926

\*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

Table A1.2

VERSION 2	Fiscal balance	Fdiflow	Exchange rate	Gov. revenues	Gov. expendit.	Household loans real	Corporate loans real	BIS
L.growth	0.25 (0.07)***	0.3 (0.07)***	0.3 (0.07)***	0.3 (0.07)***	0.23 (0.07)***	0.29 (0.07)***	0.3 (0.08)***	0.31 (0.07)***
L2.growth	-0.22239 (0.05)***	-0.2362 (0.05)***	-0.2367 (0.05)***	-0.23571 (0.05)***	-0.21478 (0.05)***	-0.23641 (0.05)***	-0.23782 (0.05)***	-0.22897 (0.055)***
bankcrisis	-3.01 (1.12)***	-3.71 (1.16)***	-3.89 (1.13)***	-3.7 (1.15)***	-3.19 (1.09)***	-3.8 (1.16)***	-3.79 (1.14)***	-3.56 (1.16)***
dummy2008	-3.04 (0.94)***	-3.26 (0.97)***	-3.45 (0.98)***	-3.05 (0.98)***	-2.98 (0.92)***	-3.2 (0.98)***	-3.25 (0.98)***	-3.53 (1.12)***
L.dummy2008	1.49 (1.18)	2.18 (1.22)*	2.1 (1.22)*	1.75 (1.23)	1.4 (1.16)	1.91 (1.27)	1.82 (1.22)	2.11 (1.27)*
dummyshock09	-6.13 (1.16)***	-6.89 (1.19)***	-6.92 (1.19)***	-6.77 (1.20)***	-6.07 (1.15)***	-6.83 (1.22)***	-6.77 (1.20)***	-6.93 (1.27)***
L.dummyshock09	2.31 (1.19)*	2.14 (1.23)*	2.03 (1.22)*	2.14 (1.24)*	1.99 (1.16)*	2.01 (1.23)	2.19 (1.27)*	2 (1.27)
export_growth	0.08 (0.02)***	0.09 (0.02)***	0.09 (0.02)***	0.09 (0.02)***	0.06 (0.02)***	0.09 (0.02)***	0.09 (0.02)***	0.09 (0.02)***
Fiscal_balance	0.3 (0.09)***							
loanhouse_growth_real	0.03 (0.01)***	0.03 (0.01)***	0.03 (0.01)***	0.04 (0.01)***	0.03 (0.01)**	0.03 (0.01)***	0.03 (0.01)***	0.04 (0.01)***
L.loanhouse_growth_real	0.02 (0.01)**	0.02 (0.01)***	0.03 (0.01)***	0.02 (0.01)**	0.03 (0.01)***	0.03 (0.01)***	0.03 (0.01)***	0.02 (0.01)**
loanhouse_growth_real_08	0.1 (0.05)**	0.12 (0.05)**	0.13 (0.05)***	0.11 (0.05)**	0.11 (0.05)**	0.11 (0.05)**	0.11 (0.05)**	0.12 (0.05)**
L.loanhouse_growth_real_08	0.09 (0.05)*	0.08 (0.05)	0.09 (0.05)*	0.07 (0.05)	0.07 (0.05)	0.08 (0.05)	0.08 (0.05)	0.08 (0.05)
fdiflow		0.06 (0.05)						
exchange_rate			-0.02 (0.02)					
gov_revenues				-0.06 (0.09)				
gen_gov_expend					-0.37 (0.10)***			
L.gen_gov_expend					0.17 (0.09)*			
loanhouse_real						0 0		
loancorp_real							0 0	
bis								1.2 (1.41)
_cons	3.13 (0.64)***	1.47 (0.56)***	3.47 (1.68)**	4.19 (3.33)	10.79 (3.71)***	1.87 (0.51)***	1.87 (0.61)***	1.43 (0.56)**
Sargan test	127	129.8	127.3	127.4	126	123.3	125.6	122.5
chi2	683.5	632.73	631.51	611.44	712.9	624.53	622.66	609.06
Number of instruments	138	138	138	138	136	138	139	138
Sargan p-value	0.4086	0.3428	0.4013	0.3989	0.3595	0.5009	0.4681	0.5212

\*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

Table A1.3

VERSION 3	Fiscal balance	Fdiflow	Exchange rate	Gov. revenues	Gov. expendit.	Household loans_real	Corporate loans_real	BIS
L.growth	0.33 (0.08)***	0.35 (0.08)***	0.33 (0.08)***	0.32 (0.08)***	0.3 (0.08)***	0.32 (0.08)***	0.33 (0.08)***	0.33 (0.08)***
L2.growth	-0.26048 (0.06)***	-0.29513 (0.06)***	-0.30566 (0.06)***	-0.27994 (0.06)***	-0.242 (0.06)***	-0.28318 (0.06)***	-0.28894 (0.06)***	-0.28144 (0.06)***
dummy2008	-2.71 (0.84)***	-2.66 (0.83)***	-2.82 (0.83)***	-2.79 (0.83)***	-2.52 (0.80)***	-2.77 (0.84)***	-2.59 (0.84)***	-2.04 (0.97)**
L.dummy2008	0.4 (1.07)	0.62 (1.1)	0.44 (1.07)	0.55 (1.07)	0.15 (1.03)	0.95 (1.12)	0.54 (1.07)	0.16 (1.09)
dummys shock09	-4.79 (1.15)***	-5.4 (1.17)***	-5.2 (1.15)***	-5.16 (1.14)***	-4.42 (1.13)***	-5.76 (1.19)***	-5.29 (1.14)***	-4.64 (1.20)***
L.dummys shock09	3.87 (1.26)***	3.51 (1.29)***	3.34 (1.28)***	3.2 (1.29)**	3.35 (1.22)***	3.21 (1.28)**	3.3 (1.29)**	3.61 (1.29)***
bankcrisis	-3.41 (1.42)**	-3.44 (1.47)**	-3.64 (1.44)**	-3.72 (1.43)***	-3.4 (1.38)**	-3.88 (1.45)***	-3.63 (1.44)**	-3.48 (1.46)**
L.bankcrisis	2.53 (1.56)	2.3 (1.58)	2.17 (1.56)	2.3 (1.56)	2.58 (1.50)*	2.14 (1.57)	2.2 (1.57)	2.28 (1.58)
export_growth	0.08 (0.02)***	0.08 (0.02)***	0.08 (0.02)***	0.07 (0.02)***	0.06 (0.02)***	0.08 (0.02)***	0.08 (0.02)***	0.09 (0.02)***
L.export_growth	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)	0 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)
Fiscal balance	0.27 (0.12)**							
L.fiscal_balance	-0.07 (0.11)							
loancorp_growth_real_08	0.03 (0.05)	0.02 (0.05)	0.03 (0.05)	0.02 (0.05)	0.02 (0.05)	0.02 (0.05)	0.02 (0.05)	0 (0.05)
L.loancorp_growth_real_08	0.06 (0.06)	0.05 (0.06)	0.04 (0.06)	0.01 (0.06)	0.02 (0.06)	0.07 (0.06)	0.04 (0.06)	0.02 (0.06)
loancorp_growth_real	0.05 (0.02)***	0.06 (0.02)***	0.06 (0.02)***	0.06 (0.02)***	0.05 (0.02)***	0.06 (0.02)***	0.07 (0.02)***	0.06 (0.02)***
L.loancorp_growth_real	0.05 (0.02)***	0.05 (0.02)***	0.05 (0.02)***	0.05 (0.02)***	0.05 (0.02)***	0.05 (0.02)***	0.05 (0.02)***	0.06 (0.02)***
fdiflow		0.05 (0.06)						
L.fdiflow		-0.01 (0.06)						
exchange_rate			0.02 (0.04)					
L.exchange_rate			-0.02 (0.03)					
gov_revenues				-0.18 (0.11)				
L.gov_revenues				0.12 (0.11)				
gen_gov_expend					-0.34 (0.10)***			
L.gen_gov_expend					0.21 (0.10)**			
loanhouse_real						0 0		
loancorp_real							0 0	
bis								-2.88 (3.91)
L.bis								0.42 (4.28)
_cons	3.26 (0.77)***	2.34 (0.62)***	3.18 (2.03)	4.96 (3.85)	8.07 (3.98)**	2.51 (0.57)***	2.73 (0.66)***	2.91 (0.63)***
Sargan test	128.5	126	123.9	130.5	128.3	123.5	124.7	122.1
chi2	618.15	597.07	601.87	604.94	662.83	599.22	598.81	596.75
Number of instruments	134	134	134	134	134	134	134	134
Sargan p-value	0.2201	0.2685	0.3135	0.1857	0.2238	0.3225	0.2959	0.3549

\*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$