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THE IMPACT OF THE ECB'S QUANTITATIVE EASING POLICY ON CAPITAL FLOWS IN THE CESEE REGION

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Abstract

This paper attempts to empirically assess the impact of the ECB's quantitative easing policy on capital flows in the countries of the Central and South Eastern region. Given the tight trade and financial linkages of the region with the euro area, one should expect that the buoyant liquidity provided by the ECB might affect the size of the capital inflows. We test this hypothesis by employing panel estimation on a sample of 14 countries CESEE countries for the 2003-2015 period. Contrary to the expected outcome, the results reveal either negative or insignificant impact of the change in the ECB balance sheet on the different types of capital inflows. The results suggest that the magnitude of the crisis, to which the ECB responded was immense, hence precluding any significant impact of the monetary easing on capital flows in the region. The inclusion of a dummy in the model, to control for the 2008 crisis, confirms the findings from the first specification and does not change the finding on the ECB quantitative easing impact on the capital flows. The impact of the crisis dummy on capital flows is negative and it holds for almost all types of capital inflows, except for the government debt flows, which is consistent with the countercyclical fiscal policies and rising public debt after the crisis.

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Introduction

Since the beginning of the economic crisis, the European Central Bank (ECB) has been providing unprecedented monetary stimuli with a view to stabilising financial markets and encouraging aggregate demand to achieve its inflation target and thus support economic recovery. Monetary stimulus has been provided through a number of standard and non-standard instruments, with non-standard measures ranging from significant changes in the operational framework of open market operations to asset purchase programs that have resulted in increased ECB balance sheet. A decade after the global crisis outburst, the ECB monetary policy remains accommodative as evidenced through ultra-low interest rate environment, including negative interest rate, and enlarged central bank balance sheet.

To respond to unprecedented shocks and risks, the ECB complemented standard policy tool kit with various asset purchase programs. It started with the adoption of the covered bond purchase program in 2009 aimed at restoring the functioning of the covered bond market that is an essential source of bank funding. This program, although with modified features, was subsequently extended two times. Following emergence of sovereign debt markets' tensions in certain euro area countries in 2010, the ECB introduced the Securities Markets Program involving the purchase of euro area government bonds to contain rising sovereign spreads deemed to be excessive, especially at the long-end of the curve. In September 2012, at the height of the sovereign debt crisis, Outright Monetary Transactions program was adopted involving the purchase of unlimited sovereign bonds at a government request under certain conditionality (although it has never been implemented). Later, the ECB also started with the public sector purchase program.

To further support lending to the real economy in October 2014, the ECB started with outright purchases of asset-backed securities that diversified funding sources of banks and stimulated the issuing of new securities, and then in 2015 with the purchase of corporate sector bonds. In January 2015, all existing public and private asset purchase programs (covered bond purchase program, asset-backed securities program, public sector purchase program and corporate sector purchase program) were clustered in an expanded asset purchase program amounting to monthly purchase of 60 billion euro, first until September 2016 and then the program was prolonged three times. In October 2017, the Program was extended at least to September 2018, but in any case until there are sustained adjustments in the path of inflation in line with the price objective, and the monthly purchase amount is reduced to 30 billion euro. Many authors provide timeline on the ECB monetary accommodation, including Bastidon, Gilles & Huchet (2016), who provide several theoretical and practical aspects of the ECB monetary policy and its potential implications.

The effectiveness of the ECB monetary policy measures and, more generally, monetary policy measures of advanced economies, and the spillover effects to other economies have been at the heart of the policy debate. According to Kyriazis (2017), "a voluminous extent of concern is therefore raised by the self-perpetuating character that unconventional policymaking has shown to present, if the necessity of new rounds of QE in US, UK, Japan, and the Eurozone is considered". The assessment of the spillovers, especially of non-standard policies, to emerging economies is important for better understanding of transmission channels, direction, and magnitude of the impact on financial and economic variables, which is important for adequately calibrating domestic monetary policy responses. Furthermore, it can shed some light on the vulnerabilities and risks that these economies face amidst forthcoming monetary policy normalization process. The spillover policy debates especially intensified in spring 2013 in the context of the announced US monetary policy tapering that negatively affected investors' sentiment, in particular for the emerging economies recipients of capital inflows.

At the current juncture, when the normalization of the US monetary policy is already underway and European monetary policy is still accommodative but expected to change its course in not so distant period, policymakers' vigilance is needed as more abrupt changes in the capital flows may negatively affect asset prices and pose wider macroeconomic concerns. Possible negative implications will depend on many factors, including first of all the intensity of the capital inflows in specific economies, the nature and structure of the inflows, the level of development of the financial markets, and fundamentals of the economy. In this context, investigation of the direction, magnitude and transmission mechanisms of the spillovers is of crucial importance for policy makers to design and implement adequate policies for better coping with the spillovers and the possible reversal process.

Research interest in international spillovers from quantitative easing policies of the advanced economies has increased, but it is mostly focused on the effects of the US monetary policy. A lot of research has been focused on the impact the Fed policy had on the American economy, per se, which indirectly can create outward spillovers. For instance, Jakl (2017) used an event study and SVAR analysis and revealed significant impact of the Fed announcements concerning the QE on US treasury yields and an intermediary impact of these changes on other assets in the economy. He argues that the Fed virtually overcame limitations of its conventional monetary policy and used this unconventional measure to further ease credit conditions in the economy beyond the standard framework.

Research on the ECB policies so far has remained scarce. In this paper, we investigate the effects that the ECB non-standard monetary toolkit produces on 14 countries of Central and South-Eastern Europe (CESEE) given the close links with the European economy. All economies in the region are open economies with strong trade and financial linkages with the EU, implying that there are a couple of channels through which the accommodative monetary policy of the ECB may be transmitted to the region. The EU is a main trading partner of these economies, banking systems in CESEE are dominantly owned by EU banking groups, the EU is the main source of foreign direct investment inflows and incoming remittances in the region. In this paper, we focus only on the portfolio rebalancing channel, i.e. we investigate whether and to what extent the ECB asset purchase programs have affected the dynamics and the structure of the capital inflows by specifying a rather simple model that encompasses some of the core "pull" and "push" factors for capital inflows.

The remaining part of the paper is organised as follows. Section 2 includes review of literature on the spillover effects of the non-standard ECB policies. Section 3 provides a short analysis of the dynamics and structure of the capital inflows in the CESEE region during 2009-2016. The empirical estimate and main results of the effects of the ECB quantitate easing policies on the capital flows in the region are discussed in Section 4 and 5, and Section 6 gives conclusions.

1. Review of Literature

The research interest in non-standard policies implemented by the central banks of advanced economies and their spillovers to emerging economies has been increasing. Effectiveness of the non-standard toolkit in influencing financial markets and real economy in advanced economies, as well as the size and channels of transmission of the impact to emerging economies are some of the key aspects subject to research. The literature identifies a couple of channels of transmission of the non-standard measures in domestic economy and internationally, including portfolio rebalancing, international bank lending channel, signalling and confidence channel. Channels of transmission interrelate, they are not mutually exclusive and it is difficult to disentangle the effects of a particular channel.

Portfolio rebalancing channel broadly implies that central bank policy measures induce changes in private sector balance sheets toward more risky assets by altering risk perceptions, confidence, and yields or by crowding out investors from some market segments, which in turn positively affects financial assets' prices in the domestic economy and spills over to other economies (Fratzscher, Lo Duca & Straub, 2014). In particular, purchase of long-term assets increases the liquidity holdings of the seller being conducive to rebalancing of the investors' portfolio towards the preferred risk adjusted return. The ECB purchases of short-term and long-term euro area sovereign bonds to contain the sovereign risk premiums, if excessive and not in line with the economic fundamentals, may lead to portfolio rebalancing towards other assets in the euro area, but also wider in emerging economies. The purchase of longer-term asset on banks' balance sheet increases the availability of liquid funds and thus contributes to the eased financial conditions and improved credit support of the private sector, including cross border lending (Lim, Mohapatra & Stocker, 2014). More broadly, eased financial conditions in the euro area, i.e. increased banking liquidity, decreased liquidity premium, functioning money markets, and rather easy bank access to other sources of finance (debt instruments) may also be beneficial for other economies where the banking systems are dominated by parent banks from the EU (international bank lending channel).

Furthermore, central bank non-standard measures (announcements or actual implementation) may positively affect the confidence, lower uncertainty, increase risk appetite of investors thus positively affecting financial flows, including cross-border capital flows, and asset prices. Improved confidence in the euro area may induce cross border capital flows to other economies, especially the ones closely connected to the European economy, reflecting a search for higher yield or even induce more stable flows driven by more structural factors. Also, central bank signalling of accommodative monetary policy for a prolonged period may affect long-term interest rates through the expectations hypothesis of the term structure (Chinn, 2013). Forward guidance of the ECB and related downward adjustment of the euro-area yields may be conducive to the rebalancing of investors' portfolios towards assets of emerging economies. In addition, the signalling of a prolonged accommodative monetary policy in the EU-anchor economy may positively affect the perceptions of domestic investors in emerging economies closely linked with the European economy.

The available research primarily focuses on the international spillover effects of the US monetary policy (Neely, 2010, Chen, Filardo, He & Zhu, 2012, Lim at al., 2014, Gilchrist, Yue and Zakrajsek, 2014). The studies generally indicate that unconventional US monetary policy had significant spillover effect on capital flows and asset prices. The research on the spillover effects of the ECB non-standard policies is rather scarce and is primarily based on the event study technique. Analysing the impact of the ECB non-standard measures undertaken in the period 2007-2012 through a number of transmission channels Fratzscher et al. (2014) find evidence of a positive impact in advanced and emerging economies though lower compared to the impact of the US monetary policy. They find that the ECB policies spilled over to global markets by lowering risk aversion, increasing equity prices, and lowering credit risk of sovereigns and global banks. There is no evidence for portfolio rebalancing channel, i.e. the response of international capital flows to ECB measures was found to be small pointing that the positive effect on asset prices reflected mainly domestic investors' decisions.

Georgiadis and Grab (2015) concentrate on the effects of the ECB extended asset purchase programme announced in January 2015. They find that the announcement of the measure benefited global financial markets mostly through the signalling channel, i.e. the measure was perceived by the markets as signalling accommodative monetary stance for a prolonged period. The announcement caused a broad-based euro depreciation and boost to equity prices, with muted effect on bond prices. The effects were slightly stronger in emerging economies and cross-country heterogeneities reflected different factors such as financial openness, exchange rate regime, integration with the euro area, and attractiveness for carry trade.

There are a couple of studies focused on spillover effects of the ECB non-standard measures on the Central and South-Eastern European economies that largely focus on the short-term impact on different financial variables. Falagiarda, McQuade & Tirpák (2015) focus on the effects of the announcements of a range of ECB measures adopted during 2007-2015 in four Central and Eastern Europe countries and find evidence for strong spillovers, particularly on sovereign bond yields. The most pronounced were the effects of the Securities Market Programme through the portfolio rebalancing and signalling channel, while spillovers from Outright Monetary Transactions and Public Sector Purchase Program were rather limited and mostly felt through the confidence channel. Ciarlone and Colabella (2016) investigate the short-term and long-term impact of the ECB's non-standard monetary policy into 11 CESEE. The event study analysis points that the announcements of the ECB non-standard measures in a short-term affected the nominal exchange rate, long-term sovereign yield, stock market indices and portfolio inflows. Over a longer-term horizon, they find evidence that announcements and actual implementation of the policy measures had a positive impact on capital flows, including cross-border banking flows. In their recent research, Ciarlone and Colabella (2017) focus on financial volatility spillovers to 6 Central European economies from different waves of ECB asset purchase programs. They provide evidence that non-standard ECB measures contributed to taming of volatility developments on stock markets, government bond yields and foreign exchange market reflecting risk-taking and liquidity channels of transmission.

A more comprehensive study employing BVAR models that assesses the economic impact of the euro area non-standard measures in Southeast Europe is done by Moder (2017). The results suggest that the non-standard measures had pronounced effects on output and prices in all countries through both real and financial transmission channels, though to a varying degree. Output response is biggest for Serbia, Montenegro, and Croatia, suggesting that the exchange rate regime does not play a significant role in affecting the size of the impact (though it can explain price level and export responses). Similarly, Halova and Horvat (2015) provide evidence that output fluctuations in the Central and Southeast Europe countries can to a great extent be explained by non-conventional ECB policies. On the contrary, Bluwstein and Canova (2015) find that output effect was insignificant for Central European economies and slightly negative for Southeast Europe economies, impact on inflation was slightly positive, and that the exchange rate regime cannot explain different reactions of macroeconomic variables across countries.

## 2. Stylized facts on capital inflows in the CESEE countries

By screening the balance of payments data, in this section we analyse the pattern, dynamics, and structure of financial flows in the fourteen countries of the CESEE region[1]. We will observe the period before and after the economic crisis to see whether and to what extent asset purchase programs and related injection of liquidity by the ECB was reallocated to the CESEE markets. In principle, unprecedented injection of liquidity by the ECB could stimulate cross-border flows and thus lead to compression of yields of private and public sector debt instruments, affect stock market indices and nominal exchange rates, as well as stimulate bank lending to the private sector.

Capital inflows in the CESEE region have continued after 2008 but at a much slower pace compared to the pre-crises period. While the region faced buoyant capital inflows during 2005-2007 that averaged 17% of GDP, during 2008-2012 they decelerated to 8.5% of GDP and in the more recent period (2013-2016) further to 3.7% of GDP. Slowdown of the capital inflows was present across all

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[1] The CESEE region for the purpose of the paper is comprised of the following countries: Estonia, Lithuania, Latvia (Baltics); Poland, Romania, Slovenia, Czech Republic, Hungary (CEE); Albania, Serbia, BiH, Macedonia, Bulgaria, Croatia (SEE).

countries with highest slowdown in Baltic States, though from very high levels in the pre-crisis period. Still, the most recent data (2013-2016) point to weakest flows in Central European economies (CEE) that on average amount to -0.1% of GDP in comparison with 6.7% of GDP in South European economies (SEE) and 5% of GDP in the Baltic States. Thus, despite ample liquidity on the European markets, data do not point to intensified cross-border financial flows in the region, including the most recent period when the ECB launched extended asset purchased program that resulted in notable increase of its balance sheet.

Figure 1 External liabilities, flows
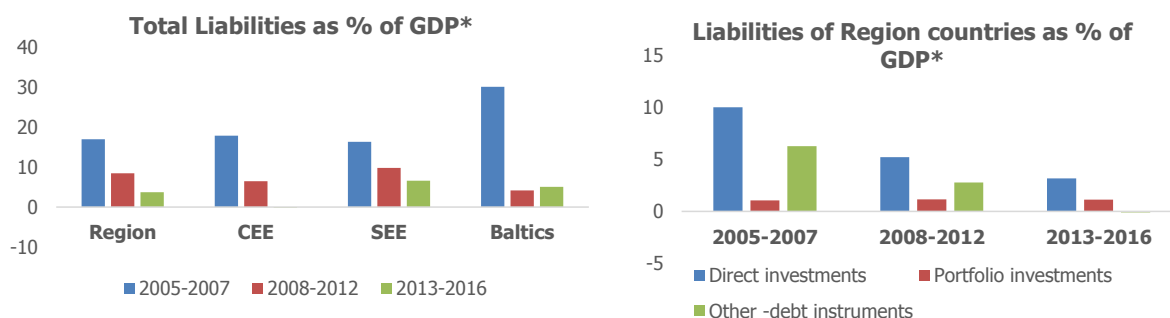
Source: International Monetary Fund, Balance of Payments Statistics.
*Other debt instruments for the whole region in 2013-2016 were zero on average. Same for the total liabilities of CEE countries in 2008-2012.

The structure of capital inflows in the region points to broad-based deceleration across almost all types of debt creating and non-debt creating inflows. Foreign direct investments (FDIs) continued in the region, but markedly decelerated to about 3% of GDP on average (from 10% of GDP in the pre-crisis period). Highest deceleration of FDIs is evidenced for the CEE region and lowest for the SEE region, the latter having highest FDIs in the period following the crisis (about 5% of GDP). Similarly, debt inflows significantly decelerated and turned slightly negative to about -0.1% of GDP for the region as a whole. This downward adjustment was in particular pronounced in the Baltic States, also reflecting the highest pre-crisis inflows. Portfolio inflows remained broadly stable at around 1.1% of GDP driven by stepped up sovereign borrowing that offset weaker private portfolio inflows.

Figure 2 Debt-creating liabilities, flows
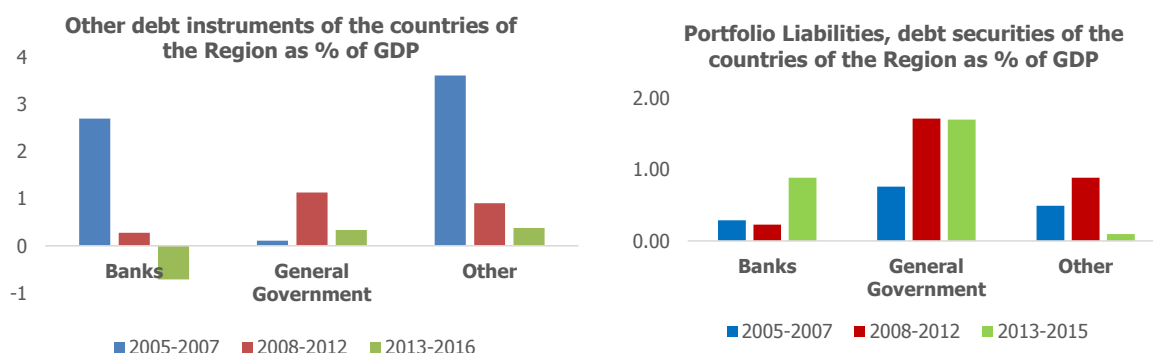
Source: Source: International Monetary Fund, Balance of Payments Statistics.

From a sectoral point of view, debt inflows were mostly channelled to the government sector. The largest part of the debt portfolio inflows and other debt flows was directed to the government sector reflecting expansionary fiscal policies and related rising financing needs amidst favourable terms of financing at financial markets. This is particularly obvious in the case of debt portfolio inflows that notably increased since 2008. Banking systems in the region faced capital outflows against the background of the deleveraging process underpinned by the impaired balance sheet of European banking groups and strengthened European financial regulation, with the highest outflows registered in the Baltic States. Similarly, in most of the analysed countries, non-financial private sector encountered significant deceleration of debt flows reflecting their impaired balance sheets in the context of the pre-crisis intensive trend of rising external borrowing and increased debt levels. This indicates possible positive spillover effects from the ECB policies for the government sector, while there is no evidence that increased liquidity of European banks has led to increased cross-border lending to their subsidiaries in the CESEE region.

Overall, the balance of payments data analysis indicates that since the outburst of the global crisis the financial inflows in the region have continued, but with a notable deceleration almost across all types of inflows. Given that during this period the ECB has provided unprecedented liquidity, as visible through its significantly enlarged balance sheet, one may infer that the region has not benefited a lot from these policies through capital inflows channel, with the exception of the government sector. Still, drawing firm conclusions based on these data is difficult, as the region might have faced higher deceleration of capital inflows in the absence of such non-standard ECB policies.

3. Model specification, data and methodology

3.1. Model specification

The foundation of the chosen empirical model, to test the link between the ECB quantitative easing policy and capital flows in the region, relates to empirical work on the determinants of capital flows. These determinants could roughly be structured as "push" factors, or determinants which are common shocks - key crisis events, as well as changes to global liquidity and risk, and "pull factors", which are country-specific determinants (Fratzscher, 2011). Recently, the International Monetary Fund (2013), shed a light on the matter again by disentangling between "temporary factors" (that may be at greater risk of reversal) and "structural" (slow moving factors). Although there is no complete overlap between the abovementioned nomenclatures, yet generally they strive to capture the difference between some global shocks, which might be common shocks and presumable of a temporary nature and factors that are of a more structural and permanent nature (growth prospects of the country, financial development, soundness of policies, institutional features).

Given the main motivation of the study, which is to empirically assess the impact of the ECB quantitative easing on capital flows in countries of the CESEE region, we try to specify a rather simple model that will encompass some of the core "pull" factors, as well as "push" factors. The latter are also supposed to depict the ultra-accommodation of the ECB monetary policy, which is a common shock for the region and should be of temporary nature. Hence, our generic specification is as follows:

$$TF_{it} = \alpha + \sum_{j=1}^{n} \beta GDPPC_{it} + \sum_{j=1}^{n} \gamma IR_{it} + \delta ECBAS_t + \omega_{it} \qquad (1)$$

Where TF represents total capital inflows to GDP, or its specific components, GDPPC refers to GDP per capita based on purchasing power parity in current international dollars, IR refers to the interest

rate on long term government securities issued on the domestic market, if available. ECBAS denotes the balance sheet of the European Central Bank, i.e. its assets to GDP. Its change reflects the magnitude of the ECB monetary accommodation, through the quantitative easing policy. The subscripts i denotes i'*th* country and t refers to the t'*th* year, while ω denotes the error terms.

The model specification aims at incorporating two main country specific factors, which should be a proper representative of the fundamentals of the economy. Although they are far from exhaustive, given the data limitation in terms of the cross sections and the time span, as well as the main aim of the study, we have decided to keep the model as parsimonious as possible.

The inclusion of some **measure of economic activity** in the capital flows function is a rather standard practice. Very often, in an attempt to assess the cyclicality of the capital flows, some measure of the economic cycle is included (see for instance, Araujo, David, Hombeeck & Papageorgiou, 2015). Yet, in our case as we do not aim at assessing the cyclicality of capital flows, but only to capture a proper measure of the economic fundamentals, the GDP per capita was a proper candidate for it. It depicts the potential of the economy to grow, and the change of it might indicate whether the economy is in "growing" or "receding" phase. The a priori assumption would be that there should be a positive linkage between the capital flows and the change in the GDP per capita, as investors would strive to allocate their capital in economies that are growing on sound grounds, and where the probability for return on investments is higher. Of course, GDP per capita, on a standalone basis, does not always perfectly depict the soundness of the economy, but might be a good indication of it. Broner, Didier, Erce & Schmukler (2012) for example, on a wide sample of countries, do employ GDP growth as the main control variable in explaining the dynamics of gross capital inflows.

The second variable to be chosen **is some measure of the yield on foreign capital** invested in the host country. Though not all types of capital flows have the same type of yield, nor all of them are interest rate sensitive by nature, still some type of representative interest rate of the country could be a good proxy for the potential yield that the investment could bear. In our case, with few exceptions, we use the long term interest rate on government securities issued on the domestic market. Again, one would expect that higher interest rate should have a positive impact on capital flows, and hence a positive relation between the two variables is expected. On the other hand, the actual relation might not always be straightforward. Part of the inflows in the economy is debt based, and hence the rise in the domestic interest rate; as long as it is synchronized with the international terms of financing, might discourage the borrowing and the inflows based on it. Consequently, an inverse relationship between the interest rate and some components of the capital inflows can also be expected.

A variable of main interest is a measure of the ECB quantitative easing policy. We use the balance sheet of the ECB (ECB assets) as a conventional measure to assess the scale of the unconventional monetary policy, similar to Halova and Horvath (2015) and Moder (2017).

4. Data and methodology

The dataset comprises of fourteen countries from Central Eastern and South Eastern Europe, for the period starting in 2003 and ending in 2015. The data used is with annual frequency. Capital inflows are proxied with the liabilities flows in the balance of payments, sourced from the Balance of Payments statistics of the International Monetary Fund. We disentangle among several types of capital inflows, direct investments, portfolio investment (of which debt portfolio and debt government portfolio), and other debt investments (of which government and banks debt liabilities). Data on GDP

per capita are sourced from the IMF, World Economic Outlook database, while the interest rate data for most of the countries are sourced from the Eurostat, and refer to the long term interest rate, as a Maastricht convergence criterion. As this is not available for all countries, for some we used the available national data on interest rates on government securities or, in few cases, the interest rate on corporate deposits, as an indication of yield in the economy. The ECB balance sheet is measured relative to GDP ratio, and it is sourced from the ECB. More detailed description of the variables and details on the data series such as variability by country and over time are presented in the Appendix.

Table 1: Data definitions and descriptive statistics

	Description	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
TL_GDP	Total Liabilities to GDP	10	8	59	-21	11	178
DIL_GDP	Direct investment liabilities to GDP	5	4	51	-16	7	178
PIL_GDP	Portfolio Liabilities to GDP	1	1	13	-10	3	169
DEBTPORT	Debt Portfolio Liabilities to GDP	1	1	13	-6	3	169
DEBPORTGOV	Government Debt Portfolio Liabilities to GDP	1	0	11	-6	2	156
ODL_GDP	Other labilites, debt component, to GDP	3	3	37	-14	7	178
ODLGG_GDP	Other labilites, government, debt component, to GDP	1	0	15	-6	2	178
ODLLB_GDP	Other labilites, banks, debt component, to GDP	1	0	27	-16	5	178
GDP_PC_USD	GDP per capita based on PPP, in current international dollars	17792	18075	32076	5352	6711	182
IR	Interest Rate	6	5	21	0	3	182
ECB_GDP	ECB balance sheet, assets to GDP	20	21	30	11	6	182

Source: Balance of Payments Statistics and World Economic Database, IMF, Eurostat, National central banks.

The choice of the estimation method is defined by our sample, the nature of the data and the research question which we try to tackle. We run a two-step approach. Given the rather limited sample of fourteen cross sections and thirteen years, and at the same time acknowledging the endogeneity problem in the data, we have opted for first round VAR estimations, as an approach to handle the endogeneity issue. The estimated VAR is not based on panel estimates, but it is rather simple OLS estimation on the sample, using stacked panel data set, and allowing the lag operators not to cross through different cross sections. The aim of the first round estimates is to check some tentative Impulse Response Functions (IRF's), as an indication of the responsiveness of capital inflows to shocks to the ECB assets in particular, as well as in the main control variables, such as GDP and interest rate.

The second step is the panel estimation. We apply the mean-group estimator (MG) to deal with the small sample constraint. This method was introduced by Pesaran and Smith in 1995 and is the least restrictive procedure that allows for heterogeneity of all the parameters (imposes no cross-country restriction) meaning that the intercept, slope coefficients and error variances may vary across cross-sections. It consists of estimating separate regressions for each country and computing averages of the country-specific coefficients, which will provide consistent estimates of the long-run coefficients, which are of our interest. However, we also have to mention that the assumptions are quite strong; they require that the group-specific parameters are distributed independently of the regressors and that the regressors are strictly exogenous. In addition, this approach does not take into account the fact that certain parameters may be the same across groups.

5. Results

5.1. Non-structural VAR estimations

We first look at the impulses from the simple VAR models. Although this is non-structural VAR, we try to impose structure through the ordering of the variables, treating the ECB assets as the most exogenous, and capital inflows as the most endogenous variable. As the data is annual and the sample is limited, we limit the lag structure to one lag, which is supposed to be sufficient for transmission of the shocks.

Figure 3: Response of total capital inflows and FDI inflows
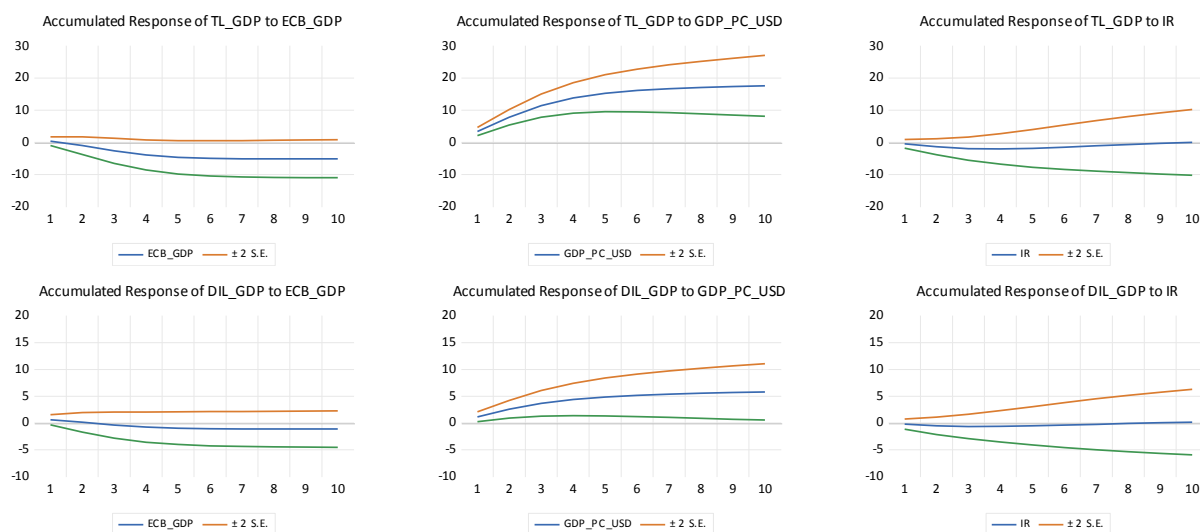
Impulse response functions (IRF's) derived from the VAR estimations do not provide evidence on the impact of shocks in the ECB balance sheet on the total capital inflows in the region. Moreover, a positive shock to the ECB balance sheet has an adverse impact on total capital flows in the region (similar to the inference from the stylized facts section) and the impact is not significant. On the other hand, the results support the hypothesis that shock to the growth of GDP per capita stimulates capital inflows, while the impact of shock on the interest rate level does not prove to be significant. We proceed with the formal investigation by employing more granular approach, and including different types of capital flows in the specification. The responses of inflows based on foreign direct investments (FDI) are very similar to the responses of total capital inflows. Their reaction to the ECB balance sheet and the interest rate is not significant, while positive response to a shock in GDP per capita is found to be statistically significant. Hence, based on the non-structural VAR estimates one can conclude that shocks to the growth performances of the economy affect the behaviour of the total capital inflows in the economy, and foreign direct investments in particular. The results are expected and intuitive, given the fact that FDI inflows represent a longer term involvement of investors, and in that respect, fundamentals of the given economy should be taken into account.

Same as for the total inflows and FDI, the results of the VAR estimates for portfolio inflows show statistically insignificant response to shocks in the magnitude of the ECB's balance sheet. On the other hand, no significant reaction to shocks in GDP was found for these types of inflows either, while a positive innovation in the interest rate level produces statistically significant impact on inflows based on portfolio investments. These results are pertinent to total portfolio investments, as well as to their debt component and government debt portfolio part. The results are somewhat counterintuitive as they imply that government borrowing through bond instruments on the international market rises, while interest rates increase. This might reflect a mode in which rising domestic interest rate, as a country specific event, pushes the government to borrow on international market, thus substituting domestic with foreign sources of financing. Though it is difficult to prove this hypothesis through the lenses of the simple model that we have, still these findings are also visible through the responses based on the estimations on "other" capital flows, where government borrowing through financial loans is included.

11

Figure 4: Response of portfolio inflows
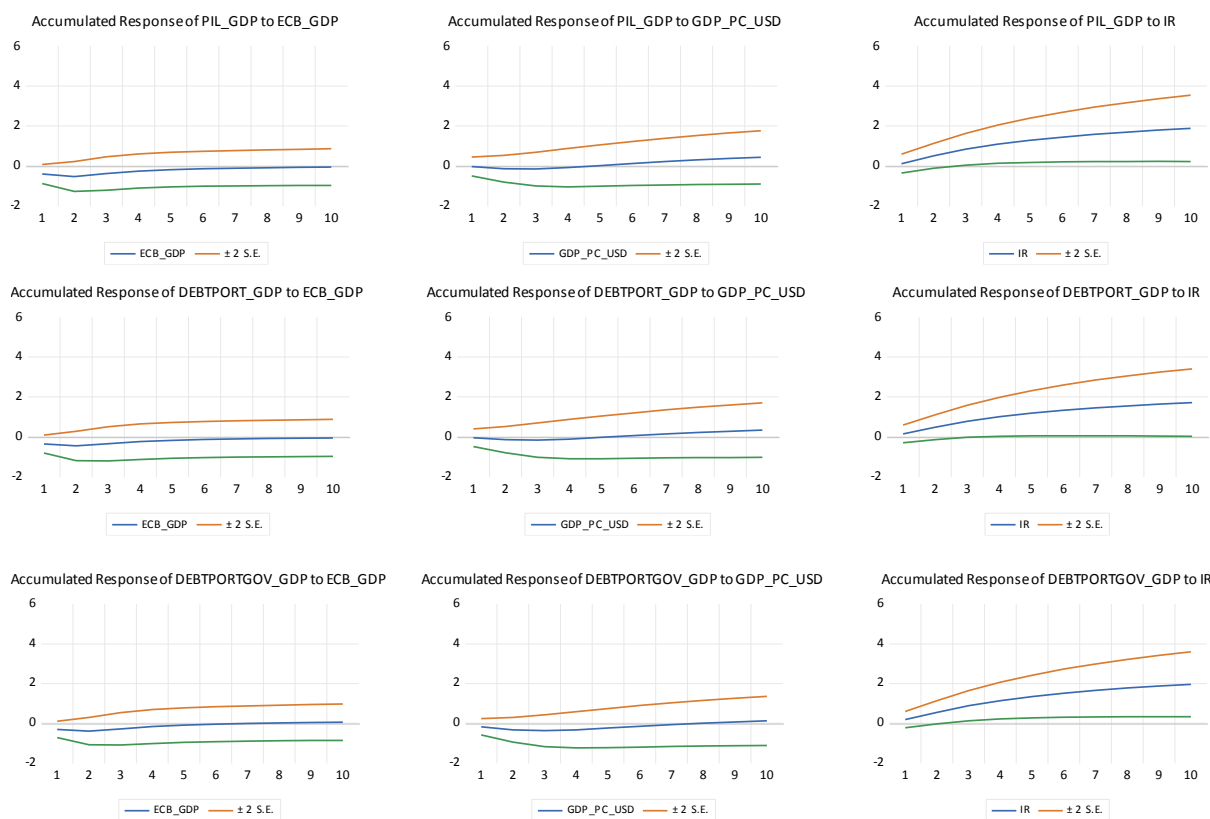
The **other capital flows**, which in fact pertain to the other debt flows in the balance of payments of a country, are **estimated on an aggregate level, followed by sectoral estimations**. More precisely, we run separate estimations for other debt inflows of the government sector and for the debt inflows of the banking system. The impulse response functions reveal several possible conclusions. **First,** total debt inflows, as well as debt inflows of the banking system unveil positive response to shocks in the GDP. This is not the case with the government debt inflows, where the relationship with the GDP is inverse and might be related to the counter-cyclical behaviour of the fiscal policies and government borrowing. **Second,** total and debt inflows of the banking system reveal statistically significant and inverse reaction to a positive shock in the interest rate. Whereas, same as with the government portfolio flows, this is not the case with the government debt inflows, where the relationship is once again inverse. **Third**, same as with the other types of capital flows, a positive shock in the ECB balance sheet does not seem to affect these other debt flows. As an exception, the response of the banking debt flows might be considered significant and, as discussed in the section on stylized facts, the relationship is of inverse character. This can be explained by the behaviour of European banks, which against the backdrop of the global crisis and their troubled balance sheets, opened a deleveraging process, reducing their exposures to the subsidiaries in the region. The latter result suggests that the impact of the crisis on the confidence and banks' balance sheets was immense and precluded any positive impact of quantitative easing and liquidity injection on the region. In addition, what should also be mentioned in this context is the regulatory overhaul which occurred after the financial crisis outbreak. The introduction of the new financial regulation posed stricter liquidity and capital requirements. In some countries in the region, this has resulted in reduced exposure of international banks to their regional subsidiaries, leading to lower capital inflows in the regional banking system. An exception that is worth to mention is the positive response of the

government debt inflows to the change in the ECB balance sheet. Though the impulse is not significant, it still supports the inference from the data inspection of the government sector in the region being the main "beneficiary" of the ample liquidity created by the ECB.

Figure 5: Response of other debt inflows
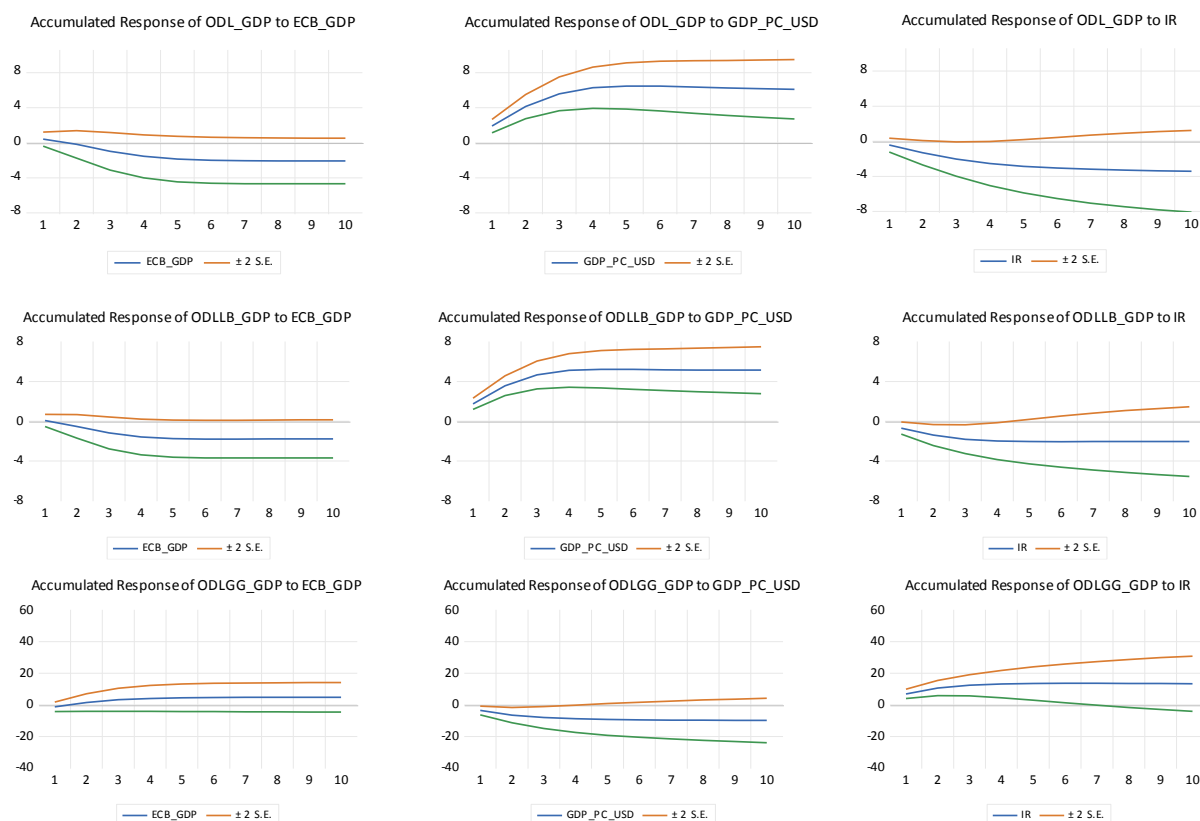
To recap, the simple VAR approach does not reveal any significant impact of the ECB quantitative easing, neither on the total capital flows in the region nor on any specific type of capital inflows. The results support to some extent the stylized fact findings on inverse impact of the burdened balance sheets of European banks on the bank leverage in the region. In addition, they pinpoint the government debt flows, as a sole component with a positive response to the ECB easing. The results also give an indication for stronger reaction of the regional capital flows to some domestic fundamental factors, rather than to the ECB`s quantitative easing itself.

5.2. Mean Group Panel Estimations

We proceed with the formal investigation, with a more rigorous empirical approach. As noted in the methodology, we employ panel estimation technique, more specifically mean group estimator, which is believed to be the best-solution approach in our case. Contrary to the IRFs from the VAR estimation, the base panel specification reveals **statistical significance** of the ECB balance sheet on some capital flows, such as total flows, direct investments, debt flows and debt flows of the banking system. However, the estimates again confirm the result of an inverse direct impact of the ECB quantitative easing on the region. On the other hand, we do not find statistically significant impact on

portfolio flows. The latter results are different compared to the Ciarlone and Colabella (2016), who perform event study analysis and employ weekly data on portfolio inflows, finding a significant and positive impact of the ECB announcement on quantitative easing policies on the portfolio flows in the CESEE economies. In line with the impulse responses of the VAR estimates, the income and the interest rate proved to have positive and significant impact on total inflows although we were not able to detect significance of the income level for the separate type of capital flows.

Table 2: Results of the panel estimates - Mean group estimator

VARIABLES	(1) TL_GDP	(2) DIL_GDP	(3) PIL_GDP	(4) DEBTPORT	(5) DEBTPORTGOV	(6) ODL_GDP	(7) ODLGG_GDP	(8) ODLGB_GDP
logecb_gdp	**-0.596***	**-0.326***	-0.00326	-0.0224	0.115	**-0.660***	-0.0138	**-0.457***
	(0.184)	(0.119)	(0.0335)	(0.1000)	(0.0748)	(0.224)	(0.0995)	(0.159)
loggdp_pc_usd	**0.812***	0.603	0.0654	0.272	-0.394	0.640	0.1000	0.386
	(0.458)	(0.378)	(0.101)	(0.289)	(0.689)	(0.457)	(0.194)	(0.273)
ir	**0.0525***	**0.0342**	0.00659	**0.0251**	-0.00023	**0.0320**	**0.0261***	0.0102
	(0.0192)	(0.0139)	(0.00425)	(0.0127)	(0.0311)	(0.0158)	(0.0149)	(0.0131)
Constant	-3.060	-1.966	2.784***	-0.306	5.650	-1.735	1.175	0.329
	(4.153)	(3.512)	(0.948)	(2.706)	(6.494)	(3.979)	(1.711)	(2.341)
Observations	178	178	169	169	156	178	178	178
Number of country	14	14	14	14	14	14	14	14

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The findings from the base specification do not go in line with our prior findings that the expansion of the ECB's balance sheet created spillovers to the region in the form of a direct impact on the amount of capital inflows. Even more, the impact, if any, seems to be inverse and pertinent for the aggregate inflows in the region, direct investments, and for the borrowing of the domestic banks abroad, in particular. The findings suggest that the magnitude of the global crisis, which the ECB reacted to, was immense, and it hit the overall confidence and thus precluded any significant impact on the capital flows to the region. Even more, as the region is financially integrated with the EU through the banking system in particular, and large cross-border banks responded to the crisis by reducing their exposure to the region, despite the ECB easing policy, maybe the decreasing of capital flows to the region was to be expected.

Given the magnitude and length of the global crisis, which in fact is lingering throughout a large part of the time horizon employed in the estimations, we proceed further by **including a crisis dummy variable, starting as of 2008**. The results reveal statistically significant impact of the crisis dummy almost across all types of capital flows, except for the portfolio inflows. They also suggest, as expected, that the impact on the capital flows is negative. Hence the results support the general stylized fact on slowdown of capital flows in the post crisis-period, reflecting the rising risk-averseness and falling confidence in the period of global distress, despite the liquidity glut. The only exception from this pattern is the inflow based on government borrowing abroad. The reaction of these flows to the crisis dummy is significant and positive, which to some extent goes in line with the fiscal expansion after the burst of the crisis, and the rising public debt. The inclusion of the crisis dummy did not change much the finding of negative or non-significant impact of expansion of the ECB balance sheet on the capital flows in the region.

Table 3: Results of the panel estimates - Mean group estimator – crisis dummy inclusion

VARIABLES	(1) TL_GDP	(2) DIL_GDP	(3) PIL_GDP	(4) DEBTPORT	(5) DEBTPORTGOV	(6) ODL_GDP	(7) ODLGG_GDP	(8) ODLGB_GDP
logecb_gdp	**-0.171***	0.0261	-0.0199	0.0701	0.0701	-0.303	-0.128	-0.161
	(0.0993)	(0.0863)	(0.0654)	(0.120)	(0.120)	(0.232)	(0.113)	(0.106)
loggdp_pc_usd	**0.845***	**0.626***	0.156	-0.356	-0.356	0.562	0.0400	0.354
	(0.448)	(0.374)	(0.140)	(0.692)	(0.692)	(0.500)	(0.221)	(0.272)
ir	**0.0586*****	**0.0395****	0.00785	0.00316	0.00316	**0.0337****	0.0246	0.0129
	(0.0204)	(0.0158)	(0.00506)	(0.0316)	(0.0316)	(0.0165)	(0.0158)	(0.00998)
dum	**-0.354*****	**-0.292****	-0.0118	0.0205	0.0205	**-0.271****	**0.118*****	**-0.235****
	(0.0955)	(0.126)	(0.0424)	(0.0660)	(0.0660)	(0.136)	(0.0355)	(0.0923)
Constant	-4.423	-3.070	1.964	5.371	5.371	-1.844	1.995	-0.0762
	(4.266)	(3.797)	(1.274)	(6.503)	(6.503)	(4.427)	(1.925)	(2.479)
Observations	178	178	169	156	156	178	178	178
Number of country	14	14	14	14	14	14	14	14

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

6. Conclusion

In this paper, we investigated the impact of the ECB quantitative easing policy on the countries of Central and South-Eastern Europe (CESEE). Given the strong trade and financial links with EU, one should expect that the ECB asset purchase programs and the enduring monetary accommodation had an impact on the countries in the region. The literature identifies several possible channels of transmission, such as portfolio rebalancing channel, international bank lending channel, signalling and confidence channel. We focused on the effects of the ECB enlarged balance sheet on capital flows in the region, i.e. on portfolio rebalancing channel. More specifically, we try to answer whether and to what extent the ECB asset purchase programs have affected the dynamics and structure of capital inflows in CESEE countries by specifying a rather simple model of the core "pull" and "push" factors for capital inflows. We tested this model using two approaches. First, we looked at the impulse response functions of a simple VAR model as an indication of responsiveness of the capital flows on shocks in the ECB policy, and on two control variables, GDP, and interest rate. As a second step, we performed a more formal investigation by panel estimation on the same model.

The results that we obtained to a certain extent differ from the expected outcome of the expansion of the ECB balance sheet that should have created spillovers to the region by increasing the amount of capital inflows. The simple VAR approach does not reveal any significant impact of the ECB quantitative easing, neither on the total capital flows in the region nor on any specific type. At the same time, the results indicate a stronger reaction of the regional capital flows to some domestic fundamental factors, rather than to the ECB quantitative easing itself. These findings are also evidenced by the mean group panel estimation. Formal estimations reveal either negative or insignificant impact of the change in the ECB balance sheet on the different types of capital inflows. This rather robust outcome leads us to a conclusion that the magnitude of the crisis to which the ECB responded was immense, hence precluding any significant impact of the monetary easing on capital flows in the region. In this context, the region's financial integration with the EU through the banking system (large presence of European banks in the region) and their response to the crisis (reduced

exposure to the region, despite the ECB easing policy), may have also contributed to a decline in the capital flows. In order to take into account the effect of the crisis that dominated the period of the analysis, a crisis dummy was included in the model. The results were again robust. The impact of the crisis dummy on capital flows is negative, and it holds for almost all types of capital inflows, except for the government debt flows, which is consistent with the countercyclical fiscal policies and rising public debt after the crisis.

Our paper contributes to the proliferation of the literature on spillover effects of the ECB accommodation on countries in the region, which is rather scarce and usually employs event studies and simultaneously explores several channels. However, we should interpret the results with caution, as the approach used has some caveats. First, the data set is small and the applied techniques face small sample limitations. Second, we focus only on one aspect of the transmission, yet there are several possible channels and our results do not exclude the possibility that the ECB`s monetary accommodation influenced the region through some of them.
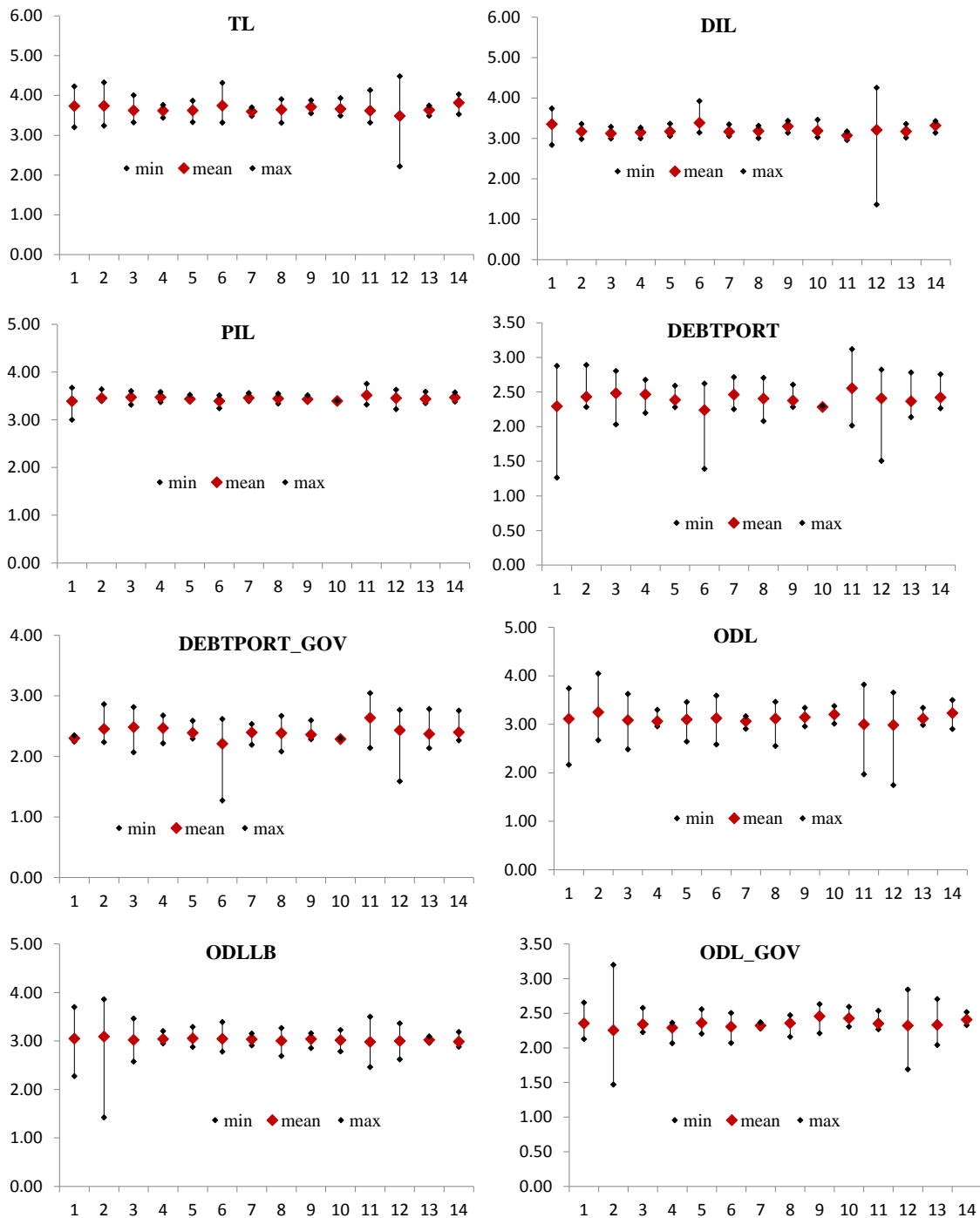
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5.2. Appendix

Descriptive statistics, variability by country

Descriptive statistics, variability by time