Home-host banking issues and financial stability – evidence from Central and Eastern Europe

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Abstract

This paper investigates the role of home monetary policy stance and banking regulation on the noncore funding in Central, Eastern and Southeastern Europe using a sample of local subsidiaries. I find that the accumulation and dynamic of the noncore funding differ significantly between subsidiaries in EU vs. non-EU host countries. Moreover, I find that while the direct impact of home monetary policy is rather limited, it is amplified through several channels. The characteristics of the parent banks seems to be the most potent of them. Thus, parent bank capitalization, liquidity, loan growth aggressiveness and provisioning policies all play a significant role. I also find that the relative size of the parent banks vis-à-vis its subsidiary is an important amplifier of the monetary policy shock at home. Finally, regulation has only marginal effects and seems to be more potent for the subsidiaries operating in the EU countries. At the same time, host bank regulation seems neutral to the dynamics of the noncore funding and risk build-up on the liability side of the subsidiaries operating under those regimes.

Key words: noncore funding, internal capital markets, cross-border banking, monetary policy, bank risk

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Introduction

The Great Recession has put into debate several issues. One of them is the role the international banks played in the transmissions of shocks from one country to another. In the European context this has at least two dimensions. First, according to (Schoenmaker & Wagner, 2013), the European banking sector is closely inter-related with the USA financial system and less connected to alternative banking centers, which by itself was one of the main vulnerabilities during the crisis. Second, the European banking sector seems to have a double-tier structure in which western European banking groups – apart from the businesses operated in Western Europe – own and operate businesses in Central, Eastern and Southeastern Europe through an extensive network of subsidiaries and branches. This structure – as the crisis highlighted – played an important role in the transmission of the crisis from the US financial sector to the western European counterparts and then, through the means of the internal capital markets, to the subsidiaries in the CESEE. The real consequences of this mechanism – materialized in a contraction of the crediting activity and an acute shortage of financing for the SMEs in the region and a reversal of investment flows from CESEE to parent bank centers – has raised questions regarding the sustainability of such a model. Several components stand out in the debate. First, there is an emerging need to understand the role of the monetary policy for the risk taking behavior of banks (Angeloni, Faia, & Lo Duca, 2010), (Borio & Zhu, 2012), (Smets, 2013) or (Angeloni & Faia, 2013). Second, to the extent that monetary policy is non-neutral from a financial stability perspective, the next obvious question is to understand its effect in a cross-border banking environment, and test the functionality of the bank internal capital markets, (Campello, 2002) and (Cetorelli & Goldberg, 2012), and the international shock transmission mechanism (Cetorelli & Goldberg, 2011). Yet finally, in the context of the European Union and its peculiar institutional set-up – a unique monetary policy run by ECB for all the Euro Area (EA) member states, but different credit and economic cycles and different banking supervisory arrangements – the natural question is to what extent this fragmentation was or still is an important factor in the dynamics of risk accumulation in the banking sectors of the CESEE countries.

A growing body of literature suggests that the monetary policy has a non-neutral effect on the bank risk taking and financial stability. Rajan (2005) sets the tone of the debate on the risk taking channel of the monetary policy by arguing that under a persistent low interest rate environment banks take on a considerable amount of risk which might then turn unsustainable under a sudden contraction. The empirical evidence to this date provides some support for such a view. For instance (Jiménez, Ongena, Saurina, & Peydró, forthcoming) find – using firm and bank level data for the Spanish banking sector – that low overnight interest rates induces weakly capitalized banks to expand credit to riskier firms. In a somewhat different set-up, (Maddaloni & Peydró, 2011) and (Maddaloni & Peydró, 2013), using answers from ECB's Bank Lending Survey and US lending survey, provide evidence that an expansionary monetary policy in the EA led to a softening of bank lending conditions, which subsequently increased the risk taking behavior of banks. Other evidence on the risk taking channel were provided by (Altunbas, Gambacorta, & Marques-Ibanez, 2010) and (Altunbas, Gambacorta, & Marques-Ibanez, 2014) for samples of international banks or (Angeloni, Faia, & Lo Duca, 2010) using a VAR set-up. The argument is further scrutinized in (Cetorelli & Goldberg, 2012) who emphasize the role of the internal-capital markets of global banks in the amplification of the monetary policy effects. To this end however, the complete mechanism of the transmission remain elusive. The evidence suggests that the liability side of the balance sheet played a significantly greater role than the asset side, (Angeloni, Faia, & Lo Duca, 2010) and (Adrian & Shin, 2008). Thus it seems that, aside from an increase in loan growth and riskier investments, banks were also more susceptible to an increasing reliance on short-term non-core funding in financing their expansionary activity.

From a slightly different perspective, the natural extension to the debate on the risk taking channel of the monetary policy, is to what extent it remains operational in a cross-border banking environment? To this end, there is a wealth of evidence on the role of internal capital markets, of internationally active banks, in the transmission of shocks from home countries to host countries, (Peek & Rosengren, 1997), (Cetorelli & Goldberg, 2011) or (Cetorelli & Goldberg, 2012), yet the role of home monetary policy on risk taking abroad remains generally untackled. The role of foreign bank ownership in the international transmission of shocks converges to the idea that it had a sizeable impact in the contraction of credit in the host countries. Yet, the empirical evidence is more nuanced at a closer look. Thus, (de Haas & van Lelyveld, 2014) provide evidence that foreign banks – which relied more on wholesale

funding – contracted credit more considerably than domestic banks. Claessens & van Horen (2014), provide a more nuanced story, arguing that the credit decisions of banks were influenced by the local conditions as well as the importance of the subsidiary for the group's business – banks prefering to keep a high degree of engagement in markets with significant exposures. For CESEE, the evidence to this date supports the view that during the crisis most of the foreign banks contracted their lending activity throughout the whole region. Thus, using answers from the Business Environment and Enterprise Performance Survey (BEEPS) conducted by EBRD, (Popov & Udell, 2012), find that firms dealing with foreign subsidiaries of banks with lower Tier 1 capital ratios or generally weaker financial conditions were more credit constrained. In a similar empirical set-up, (Ongena, Popov, & Udell, 2013) find that crediting activity abroad is influenced by the regulatory stance banks face at home. Overall, the results point to the fact that home-host conditions and bank characteristcs are important determinants of the activity of the banks in foreign markets.

The evidence on the impact of monetary policy and banking regulation on the foreign banks activity in CESEE remains scarce. There are only a few papers addressing these issues to some extent. Agoraki, Delis, & Pasiouras (2009), investgate the interaction between banking regulation and bank market power on the risk taking behaviour of banks in CESEE countries. They find evidence suggesting that banks with more market power take less risk and have lower probability of default. At the same time their results sugest that capital requirements mitigate risk taking, although the effects diminish considerably for banks with more market power. Ongena, Popov, & Udell (2013), take a slightly different view, and provide evidence that banking regulation at home has important implications abroad. They argue that a more stringent banking regulation at home makes banks take more risks abroad. The effects are further strengthened when the banking supervison at home is less efficient and the results hold even after controling for host regulation. Finally, turning to the effect of monetary policy on the bank activity in the host countries, (Popov, 2013), finds that expansionary monetary policy had a positive effect on bank risk taking and further exacerbated the extension of bank loans to ex-ante risky firms. Consistent with other studies it finds that the impact is greater for poorly capitalized banks.

All of the provided evidence, however, investigates as possible propagation channels of monetary or regulatory shocks the weakness of the banks on the capital side or through the income account. We take a slightly different view and propose an alternative explanation to the shock propagation mechanism by emphasizing the role of short-term non-core funding and therefore modeling it explicitly. The rationale for such an approach is based on the following considerations. The interbank market is an important component of the payment system and, at the same time, of the banks' liquidity management capabilities. Timely and unhindered access to wholesale funding market, is therefore a crucial ingredient not just for the liquidity of the bank, but more generally for the financial stability of a banking sector (Rochet & Tirole, 1996). For subsidiaries of the internationally active banking groups, this also served, in the period before the crisis, as an important source of cheap funding supporting the crediting booms in the host countries. This is supported by the following empirical evidence. Hahm, Shin, & Shin (2013) for instance, document that non-core funding played a great role in amplifying the the deleveraging effects and the vulnerability of the financial sector while Angeloni, Faia, & Lo Duca (2010) argue that it strengthened the impact of the balance sheet channel. On the other hand, the inteconnectedness of the financial conglomerates and their subsidiaries has increased markedly in the period prior to the financial crisis and decreased subsequently in the aftermath, (Minoiu & Reyes, 2013) or (Degryse, Elahi, & Penas, 2010). Taken together these evidence provides grounds for a more granular investigation of the non-core funding in the CESEE banking sectors.

Therefore we investigate in this paper the liability side of the bank balance sheet channel by modelling the short-term non-core funding of the subsidiaries in CESEE countries. In particular we are interested in the impact of the home monetary policy stance on the level of non-core funding subsidiaries chose to hold in the host countries. At the same time, given the differing bank regulatory regimes in the EU countries we explore the variation to account for the impact of regulation on the level of non-core funding. Finally, we investigate the impact of parent-subsidiary balance sheet structural differences and their impact on the non-core funding decissions. The identification strategy rests on the following characteristics of the data. First, we match the parent and subsidiaries balance sheet data, in this way we are able to control explicitly for the intra-group variation. Secondly, we use the difference in

institutional quality between EU member states and non-EU members – as a possible channel of shock propagation. The main rationale for this approach is that banks from the western European countries might prefer institutional set-ups which resemble more closely their own, and in the event of an important shock at home they might have a prefered pecking order. Moreover, this division of banks also accounts for the different degree of banking sector development between EU and non-EU memebers and to a certain degree the physical distance between head office and the main subsidiaries.

The rest of the paper is organized in the following way. In the second section we introduce and describe the data used for the analysis and describe the main features of the dataset. In the third section we describe the methodology and then we provide a discussion of the main results. We finally provide some robustness checks and further discussions. We then conclude.

Data

In this section we present the main sources of data and the arguments for the choice of variables in our analysis. The section presents firs all the bank level variables and then discusses the monetary policy variable and the bank regulatory and supervisory variables.

Bank level variables

The initial sample comprises 161 subsidiaries of about 63 banking groups operating in CESEE countries over the period 2003 – 2011. It covers the following 18 countries from the region: Albania, Bosnia & Herzegovina, Bulgaria, Czech Republic, Estonia, Croatia, Hungary, Lithuania, Latvia, Moldova, Montenegro, FYR Macedonia, Poland, Romania, Serbia, Slovenia, Slovak Republic and Ukraine.

A key step in our analysis is matching the subsidiary with parent bank data. In order to perform this exercise we first establish the ownership of all banks in the region. To do that we use the Zephyr database from Bankscope, but we also double check the obtained information with publicly disclosed ownership data on each of the banks' websites. As such we do not find any major discrepancies between these two sources, but we manage to fill the gaps for the cases where at least one of the sources provides incomplete information. This exercise results in identifying 63 banking groups operating in the region, of which 41 are from Euro Area countries such as Austria, Belgium, Germany, Spain, France, Greece, Ireland, Italy, Netherlands, Portugal and Slovenia and the remaining 22 come from Denmark, Croatia, Hungary, Israel, Norway, Russia, Sweden and Turkey. However, the non-EA owned banks are an insignificant group in the whole sample, reaching a total number of 32 banks. This indicates that most of the non-EA groups own on average just one subsidiary in the region. In contrast the EA banking groups own on average at least 3 subsidiaries in the region.

The main variable of interest for our analysis is the level of short term non-core funding. We define short term non-core funding as the difference between total deposits and money market short term funding and total customer deposits. This leaves in the structure of the short term non-core funding all bank deposits and the money market short term funds. For the regression analysis we scale this variable by the value of total assets, therefore our dependent variable is the ratio between short-term non-core funding and total assets.

This variable captures at least three dimensions of bank activity. On one hand, it can be viewed as a proxy for risk on the liability side of the balance sheet and a good predictor for currency and credit crises, (Hahm, Shin, & Shin, 2013). On the other hand, the level of non-core funding could be viewed as an indicator of financial pro-cyclicality, amplifying the booms and busts, (Hahm, Mishkin, Shin, & Shin, 2011). In other words banks that face an increasing loan demand in the boom period – unable to attract at a reasonable speed the necessary customer deposits, banks resort to the interbank or money market for alternative funding sources. For the CESEE banks this was further facilitated by the strong parent banks with ready access to the international money markets. Finally, non-core funding is used as a proxy for the liability side of the balance sheet channel, (Angeloni, Faia, & Lo Duca,

2010). Since our definition of non-core funding does not include the long term non-depository funding, in the robustness checks we modify the definition by including the later, but also by restricting the definition to interbank deposits only.

Table 1 below summarizes the main bank level variables used in the analysis.

Table 1: Descriptive Statistics by Country: 2003-2011

	ST Non-core Funding	Interbank Ratio	Equity Ratio	Liquidity	LTD Ratio	LLP	Loan Growth	Bank Size
				Means				
				Non-EU				
Albania	0.178	1.529	-0.046	-0.062	0.029	-0.003	0.300	-2.449
Bosnia & Herzegovina	0.177	1.656	-0.046	0.045	0.036	-0.002	0.291	-3.043
Bulgaria	0.174	3.161	-0.060	0.058	0.029	0.000	0.483	-2.656
Croatia	0.197	2.074	-0.050	-0.015	0.049	-0.006	0.191	-3.856
Moldova	0.182	1.973	-0.155	0.068	-0.078	-0.007	0.549	-2.861
Montenegro	0.132	3.082	-0.044	0.104	0.005	0.008	0.397	-1.912
Macedonia, FYR	0.145	1.749	-0.081	0.028	0.010	-0.010	0.336	-2.752
Romania	0.158	1.372	-0.073	-0.022	0.006	0.004	0.540	-3.712
Serbia	0.205	2.053	-0.136	-0.057	4.937	-0.043	0.515	-3.414
Ucraine	0.191	0.684	-0.082	0.122	-0.149	-0.060	0.478	-4.376
				EU				
Bulgaria	0.224	1.219	-0.063	0.110	0.001	-0.002	0.215	-2.791
Czech Republic	0.223	1.284	-0.012	-0.021	0.047	0.005	0.271	-3.342
Estonia	0.167	0.477	-0.032	0.097	0.028	-0.004	0.180	-3.067
Hungary	0.207	0.591	-0.028	0.091	0.003	0.002	0.213	-3.905
Lithuania	0.185	0.244	-0.011	0.087	-0.026	-0.019	0.253	-2.334
Latvia	0.209	1.780	-0.034	0.112	-0.135	-0.024	0.404	-3.247
Poland	0.214	1.132	-0.039	0.086	-0.059	-0.014	0.188	-3.872
Romania	0.191	0.648	-0.057	-0.025	-0.012	-0.013	0.308	-3.795
Slovenia	0.204	0.214	-0.017	0.112	-0.025	-0.001	0.180	-2.901
Slovakia	0.224	1.547	-0.022	-0.062	0.053	0.001	0.196	-2.862

Notes: Interbank Ratio is the ratio of total interbank assets over total interbank liabilities; LTD stands for Loan-to-Deposits; "LLP" stands for loan loss provisions and bank size is the natural logarithm of total bank assets.

The sample split in EU and non-EU countries highlights some differences between them. First, the average level of short-term non-core funding in the EU sample is about 3pp higher than in the non-EU subsample. Yet, as can be seen from the table, there is considerable variation between the countries. The highest value in the non-EU sample is for Serbian banks, with about 20.5% of total assets while the lowest is for banks from Montenegro, 13.2%. In the EU sample the lowest level of non-core funding is registered for Estonia, at just 16.7% of total assets, while the highest value is registered for Bulgarian and Slovak banking sectors, 22.4%. Interestingly, for both Romania and Bulgaria the average values of non-core funding are higher after they joined the EU – for Bulgaria it increased from 17.4% to 22.4% and for Romania it increased from 15.8% to 19.1%. Another difference between these two samples is given by the interbank ratio, which is defined as the ratio between interbank assets over interbank liabilities. The general pattern indicates that an average bank is a net creditor on the interbank market in non-EU countries and a net debtor in the EU countries. However, as in the case of non-core funding, there is considerable variation across countries in both samples.

Equity, liquidity, LTD and the LLP ratios presented in Table 1 are defined as individual subsidiary level differences from the parent level values. Thus, the formula for computing the above mentioned variables takes the following form.

$$Ratio\ Difference_{it} = Ratio_{pt} - Ratio_{st}$$

where subscript *p* stands for parent bank and subscript *s* stands for subsidiary. In this way we obtain the distance between the parent bank respective ratio and the subsidiary ratio. The rationale for using the variables in this manner rests on the assumption that parent banks impose some target level ratios which each of the subsidiaries should attain, and deviations from these targets drive the centralized decision making process of banks aimed at correcting these deviations. For instance, it could very well be that banks aim at reaching a certain level of leverage, both at individual as well as at consolidated level. In case, the subsidiary is not leveraged enough, due to scarce domestic depository funding for instance, the central office could increase the interbank support for that specific subsidiary. Thus, a bigger difference between the parent and subsidiary equity ratio could drive the non-core funding ratios of the subsidiary higher. The same rationale applies for the remainder of the ratios. Looking at the difference in the equity ratios we can notice that banks from the non-EU countries have higher negative values than banks from the EU sample. This indicates that subsidiaries in the EU have closer ratios to the parent banks.

Finally, by looking at the average annual loan growth ratios we can notice a buoyant dynamic across all countries. Yet, the ratios are somewhat higher for the non-EU countries. Croatia, for the non-EU sample, registered the lowest average during the period, at approximately 19%, while Estonia and Slovenia registered the lowest growth rates, 18%, for the EU sample. On the other end of the spectrum Moldovan banking sector registered the fastest loan expansion for the non-EU sample, 55%, while Romania for the EU sample, 30.8%.

Monetary Policy and Banking Regulation Variables

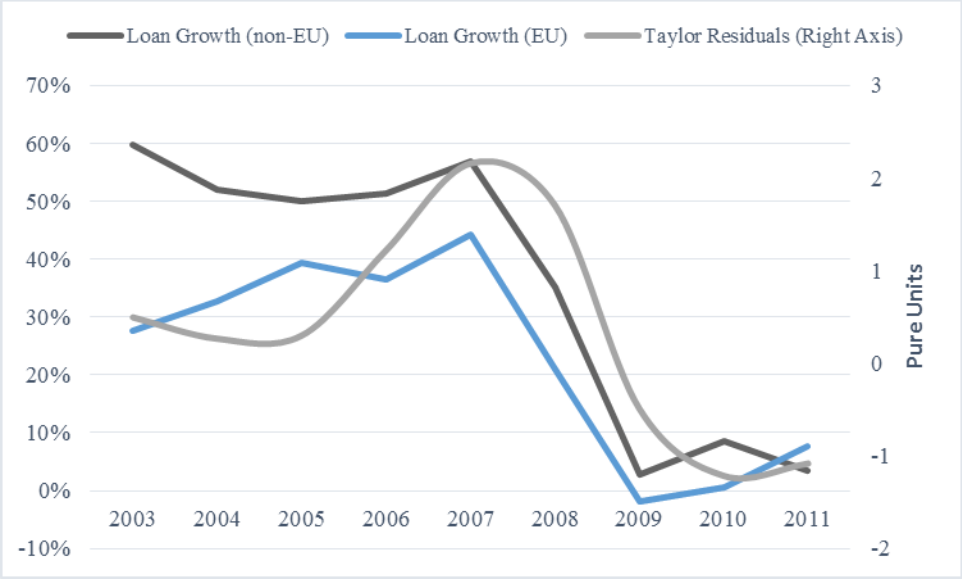
We complement the bank level data with a set of macro variables, monetary policy and bank regulation and supervision indexes. We define and discuss all of these variables and the rationale for their use below.

To define the monetary policy stance in the home countries of the parent banks we use the approach of (Maddaloni & Peydró, 2013) and estimate a Taylor-like rule by regressing the overnight rate over GDP growth rates and inflation rates. We estimate the residuals from the regression and use them as a proxy for the stringency of the monetary policy. Positive residuals indicate a tight monetary policy (higher monetary policy rates than implied by the Taylor rule) while negative residuals represent a soft monetary policy stance. Similar approaches are used for instance in (Altunbas, Gambacorta, & Marques-Ibanez, 2014). The data for the Taylor rule estimation come from OECD database.

Along with the Taylor rule residuals another measure of monetary policy stance and of the interbank market situation is the change in short-term money market interest rates. We obtain the interest rate data from the OECD database as well. However, due to high correlation with the Taylor rule residuals, 76%, we use this measure only in the robustness check estimations.

The main monetary policy developments in home countries and average loan growth ratios in host countries are presented in Figure 1 below. Taylor rule residuals display considerable variation during the analyzed period. The average values were close to zero just before the crisis, then they increased and peaked up in 2007, subsequently falling considerably in 2009, 2010 and 2011. It can be easily noticed that the bank loan developments both in EU and non-EU samples were similar to each other during the period. However, the average growth ratios were higher in the non-EU sample up to 2011, when the EU sample had a slightly higher average loan growth rate compared to the non-EU sample. It also looks that the crisis peaked in the EU sample in 2009, when an average negative loan growth rate was registered (-2%). As such the relationship between the Taylor rule residuals in home countries and loan development in host countries seems complex. Up to 2006 soft monetary policy stance is associated with a considerable loan expansion, this relationship brakes, however, in the following period.

Figure 1: Average Taylor Rule Residuals for EA (changing composition) and Average Loan Growth Developments in host countries



Note: Taylor residuals are obtained from regressing short term interest rate on GDP growth and CPI. The presented in the figure is only for the Euro Area countries; Loan growth averages are derived from the average bank loan growth of the banks in our sample;

An important aspect for bank activity and its propensity for risk taking, is the power and quality of the banking regulatory and supervisory environment. Agoraki, Delis, & Pasiouras (2009) investigate for a sample of 13 CESEE countries the effect of domestic regulation on bank risk taking. They find that supervisory power and bank capital restrictions have a direct impact on bank risk taking, however they also show that bank market power can dampen some of the effects. We take a slightly different venue. First, we are interested in understanding how bank regulation at home influences the level of non-core funding of subsidiaries abroad. This basically restricts our sample to the EU countries only, and therefore limits the variation in regulatory standards. This consideration forces us to consider the regulatory indexes which provide enough cross-country variation. Second, we try to capture three major dimesnions of bank regulation: the supervisory authority power, the external governance in the banking sector and the degree to which the banking activity is exposed to moral hazard considerations. These concerns focus our attention on the following indexes from Barth, Caprio & Levine (2013): (a). Prompt corrective power index; (b). Moral Hazard Mitigation Index; and, (c) Strength of External Audit Index.

The prompt corrective power index can take a valoe from 0 to 6 (higher values representing more promptness in responding to problems) and represents the promptness with wich the banking supervisor can intervene in the bank activity should the solvency of the bank deteriorate considerably. Barth, Caprio, & Levine, (2006) argues that this index captures both the independence of the banking supervisor from the political decision makers, while at the same time eliminating the discretionary element from the supervisory decissions. As such the impact such an index might have on the level of non-core funding is not outright clear. While a prompter and more transparent supervisory review and intervention process could encourage banks to take more riks on the balance sheet – as they know how far or how close they are to breaching the regulatory triggers – the banks should also be sure that such an action will be certainly pursued once there is a breach. However this should not necessarily be the case. Thus, banks might be more fearful of the discretionary actions of the bank supervisor and behave in a more cautios manner.

The strength of the external audit is one of the four elements of the external governance index. It can take values from 0 to 7 (the higher the more effective the external audits are). In principle the indicator shows to what extent the auditor reports are relevant for the bank supervision and whether or not the auditors are accountable for the quality and relevance of their reports. The index is build using the following questions: (1) Is an external audit

compulsory?; (2) Are there specific requirements for the extent of audit?; (3) Are auditors licensed or certified?; (4) Is auditor's report given to supervisory agency?; (5) Can supervisors meet external auditors to discuss report without bank approval?; (6) Are auditors legally required to report misconduct by managers/directors to supervisory agency?; and (7) Can legal action against external auditors be taken by supervisor for negligence? If the answers are "Yes" to all seven questions the index takes a value of "7". Given the construction of the index, our expectation is that a higher value would be negatively related with the level of non-core funding, as a more effective external auditor would increase the transparency and quality of the disclosed information and would prompt the banks to abide by a more prudent behaviour.

Finally, the moral hazard mitigation index represents the measures undertaken to mitigate the moral hazard in the banking sector and is comprised from quantifying the answers to the following three questions: (1) Is the deposit insurance scheme funded by the government, banks or both?; (2) Do deposit insurance fees charged to banks vary based on some assessment of risk?; and (3) Is there formal coinsurance, that is, are depositors explicitly insured for less than 100% of their deposits? If the answer to the first question is "banks" and "yes" to the second and third question the index takes a maximum value of 3. The minimum possible value for the index is 0. Thus, in banking sectors with a higher moral hazard mitigation index banks have more incentives to behave in a responsible way and get less exposed to risks, (Barth, Caprio, & Levine, 2006).

Table 2: Bank Regulatory Variables: 2003-2011

Region		Period	Prompt Corrective Power	External Auditor Strength	Moral Hazard Mitigation	Supervisory Power
Host Countries	non-EU	2003-2007	4.546	5.998	0.974	10.048
		2008-2011	5.593	6.505	0.666	11.055
	EU	2003-2007	3.621	6.191	1.700	11.620
		2008-2011	3.387	6.183	1.379	11.634
Home countries		2003-2007	2.135	6.419	1.668	10.168
		2008-2011	3.544	6.183	1.193	10.650

Source: (Barth, Caprio, & Levine, 2013), compiled by aiuthor;

All the regulatory indexes are derived from four different survey waves conducted by World Bank, covering 1999, 2003, 2007 and 2011 years. We use 2003, 2007 and 2011 waves and match it with our banking data. We use the average values of two waves of the survey for the years in between. This differs slightly from (Agoraki, Delis, & Pasiouras, 2009) who use the figures from the earliest survey to cover the gaps between the surveys. The main argument for averaging the indicators rather than using previous survey values, is driven by the common practice of transitional requirements in banking supervision, and the forward-looking reaction of banks to bank regulation, (Herrala, 2014).

The banking regulation haronization process in EU, up until recently, allowed a high degree of discretion in chosing the model of bank regulation and supervision. The EU banking Directives, while smoothing the differences by imposing some minimum requirements across all member states, did not force states to have similar capital or other prudential requirements, therefore many states chose to impose standards above the minimum required tresholds. This circumstance explains the variation we find in terms of prompt corrective power, external auditor strength, moral hazard mitigation or supervisory power (see Table 2). The differences are generally more pronounced along the moral hazard mitigation and the prompt corrective power lines. The non-EU countries generally prefer a stronger and prompter supervisor, 4.5 (before the crisis) and 5.6 (in the aftermath), than the EU countries which had an average index ranging from 2.1 before the crisis to 3.5 after the crisis. On the flip side, the EU countries – both home and host – have more moral hazard mitigation techniques put in place. The average indexes for these countries reach 1.7 before the crisis and decrease sligthly, to 1.4 for the EU host countries and 1.2 for the home countries. This dynamic seems to be the result of the need for intervention from the governments to suplement the deposit insurance funds and stabilize the crisis. The non-EU sample has very low moral hazard mitigation indexes (0.9 before and 0.7 after the crisis). In most cases the only measures put in place is the functioning of a deposit insurance scheme funded by the banking sector.

A more detailed view at the bank regulation indexes would uncover significant differences in the regulatory approaches of the countries represented in the sample. For in the home country sample, there are countries such as Austria which has a strong and prompt supervisor (Prompt Corrective Power Index = 6) which can intervene more readily in the activity of the supervised banks. On the other hand the situation is starkly different in Belgium, France and Portugal, where no regulatory provisions give the right nor prescribe any type of bank supervisor intervention in the banks' activity (Prompt Corrective Power Index = 0). There is also a case of a sudden shift in supervisory power as a result of the 2007-2009 crisis. The Dutch supervisory authority had a prompt corrective power of 0 for the whole period before the crisis and increased it to the maximum value of 6 during and in the immediate aftermath of the crisis. Among the host countries there are no clear preferences as well. Poland for instance has an index of 0 while Romania and Slovakia have in place the full corrective powers (6). Interestingly, among the non-Eu host countries there is almost universal consensus that the bank supervisor has to have full corrective powers, the sole exceptions being Croati and Serbia, which nonetheless retain half of the corrective power,(3), of the peers with maximum scores.

In terms of moral hazard it seems that none of the home countries has in place all three measures. The highest value registered in the sample is 2 (Germany, Italy and Ireland), while the lowest is 0 (Austria). Germany achieves a value of 2, for example, because it has a deposit insurance scheme funded by banks, and the contribution of the banks to the fund is a function of the risk profile of the bank. There are also some countries which have at least one moral mitigation measure in place – in Slovenia and Denmark for instance the existing deposit insurance is funded by banks. In the EU host sample Hungary stands out as the country with the highest moral hazard mitigation index, 3 while on the other end of the spectrum is Bulgaria and Romania with an index of 1. It can generelly be noted that the newest EU member states implemented just the minimum requirement of the 1994 European directive on Deposit Insurance Schemes – creating the deposit insurance funds and requiring banks to fund them. The non-EU sample stands out with very low indexes. Moldova, Macedonia and Ucraine managed to put in place a deposit insurance scheme funded by banks only recently, and have indexes of 0 for the largest part of the analyzed period. Other non-eu countries have a deposit insurance fund but do not have in place neither a more risk sensitive contribution scheme nor a coinsurance scheme.

The strength of external audit is rather homogenous in the home country sample. The lowes index value is at 5 for France and 6 for Germany, while most of the other countries score a maximum value of 7. In the EU host countries group Czech Republic has the weakest external audit among all other countries, 5 out of 7. The relatively low score for Czech republic is because the auditors cannot meet with the banking supervisor without the prior approval of the bank and the supervisor cannot take legal action against the auditor for negligence. Finally, non-EU host countries have weaker external audit – the range stretching from a minimum of 4 for Serbia to a maximum value of 7 for Croatia or Moldova.

In addition to the monetary stance and bank regulation variables we add annual GDP growth and the annual CPI growth in the regression to control for the macroeconomic conditions. GDP growth is in particular a control for the credit demand conditions while the CPI controls for the inflationary pressure and price stability. The remaining macroeconomic variables, their definitions, sources and the summary statistics are presented in the Appendix in Table A.

Methodology

The main aim of this paper is to investigate the impact of home country monetary and bank regulation policies on the non-core funding accumulation on the balance sheets of the subsidiaries in CESEE countries. The main question is how a change in monetary policy can affect the balance sheet structural features of a subsidiary operating in a different country? Altunbas, Gambacorta, & Marques-Ibanez (2010) and Altunbas, Gambacorta, & Marques-Ibanez (2014) provide evidence that the risk taking channel of the monetary policy is functional in an international set-up, and that internationally active banks – irrespective of their foreign operations – are still sensible to monetary policy changes in the home country. Turning to our set-up, this would mean that any changes in the monetary policy at

home, would induce parent banks to change their appetite (aversion) for risk and thus either shift a part of their exposures to foreign markets, or recalibrate the business by witholding funds from some of the subsidiaries abroad. In other words, if there is a monetary policy contraction at home, the parent bank might decrease its lending to the subsidiaries abroad – consequently leading to a lower level of non-core funds those subsidiaries hold on their balance sheets. Yet, the relationship should not ncessarily be so simple. The banks might respond differently if they view the cool down at home as a posibility for expansion abroad. In this case, a contraction in monetary policy would lead to a contraction in lending at home and an increase in exposures abroad. Therefore, ex ante there are no clear expectations regarding the nature of the relationship.

It clearly appears that the banking sectors in non-EU countries have on average higher capitalization ratios, higher weight of the loan portfolio in total assets and a more domestically anchored funding structure. Moreover, there also are significant disparities in the bank regulatory practices between the non-EU and EU member states. The EU banking regulation harmonization has diminished the gaps in banking standards between the old and new member states, while the non-EU countries remain still distant from the common practices in the area. There is also plentiful evidence that from an institutional perspective, the EU member states are a more homogenous group, and at least from this perspective, the business environment even in the newest members states is more appealing for the western banking groups. These pieces of evidence points out to a potential transmission channel from home to host countries through the EU membership status. Therefore we split the sample into EU and non-EU host country samples. We expect to find well pronounced differences between these two samples.

One concern with the sample split is that, rather than capturing an institutional difference aspect we might be just capturing a size effect. Generally, the non-EU CESEE economies are somewhat smaller than the EU CESEE economies, in consequences hosting smaller banks. Therefore, any differences in the non-core determinants could be driven exclusively by the relative importance of the subsidiaries for the parent banks (see Claessens & van Horen, 2014). We therefore pu this consideration to the test in our robustness test section.

The biggest challenge in this set-up remains the correct identification of the monetary policy and regulatory shocks – which could pick up explanatory power from the missing explanatory variables in the regression. Having a home and a host economic environment means that we have to identify the loan supply and demand shocks in both regions. Moreover, due to the fact that most of the subsidiaries are part of banking groups active in several countries the loan and demand schedule of these banks could be affected by shocks in a third market. Thus, in order to single out the effects of the home monetary and regulatory conditions we have to account for all these posibilities. First, using the level of non-core funding as an independent variable we exclude the host supply shocks. In principle, this becomes our variable of interest. Therefore we are now only left with identifying the loan demand drivers. To account for them we use the bank loan growth and host country GDP growth and include a set of host country dummies to control for any other host demand-supply shocks. In order to account for the home demand and supply shocks we also include home country dummies in the regression. Finally, to account for third country effects that might influence the balance sheet management of a subsidiary we include a set of banking group dummies and a set of banking group level variables which account for structural differences between the parent and its subsidiaries in the group. The baseline specification than takes the following form.

$$Y_{it} = \gamma + \beta_0 Y_{it-1} + \beta_1 Taylor_{pt} + \beta_2 R_{pt} + \beta_3 X_{gt} + \beta_4 M_{ht} + \delta D_{host} + \vartheta D_g + \mu D_{home} + \pi D_{year} + \varepsilon_i \quad (1)$$

where Yit is the ratio of non-core funding to total assets, Taylorpt are the residuals from a Taylor rule regression of short term interest rates on the GDP growth and inflation growth; Rpt is a vector of home country regulatory variables which includes the moral hazard mitigation index, the strength of external audit and the prompt corrective power of the bank supervisor. Xgt is a vector of bank specific variables capturing the differences in balance sheet structure of the parent and subsidiary. It includes the difference between parent and subsidiary capitalization, liquidity, loan-to-deposit and loan loss provision ratios. Dhost, Dg, Dhome are a set of dummy variables for host

countries, banking grousp and home countries, respectively; Dyear are year dummies included in the regression to account for year specific shocks; and ε is the error term.

There are several concerns we have to adress before the estimation of the model. First we have a short panel. Second we include in our regression the lagged dependent variable which in short panels, with fixed effects, is known to cause the so called (Nickell, 1981) bias. Moreover, given that some of our explanatory variables are not exactly exogenous, we use the system dynamic panel estimation of (Arellano & Bover, 1995) and (Blundell & Bond, 1998) with standard robust errors.This estimator – under the conditions of no serial correlation of order two and the validity of instruments – ensures efficiency and consistency.

In order to fully grasp the driving forces of the non-core funding accumulation in the region we extend the baseline model in several ways, accounting for the possible non-linearities, the role of banks as creditor or debtors on the interbank market, the strength of the parent banks, the size of the banks, the crisis effects, the differences in banking regulation between home and host countries, the borrowing conditions on the interbank markets and the host country bank regulation conditions. All the extensions to the baseline model are presented separately in the discussions to the Results section of the paper.

Results

Baseline estimations

The results from the baseline regression are presented in Table 3 below. In column 1 we present the results for the full sample. In Columns 2 and 3 we present the results for the EU host sample and non-EU host sample. In Columns 4 and 5 we run the estimatimations by including the short-term interest rates instead of Taylor rule residuals.

In Column 1 we find that our measure of home monetary policy enters the regression with a negative sign but is insignificant. This means that on average the monetary policy at home is neutral for the level of non-core funding abroad. Moving to our measures of bank regulation we find two out of three of them significant, that is, strength of external audit and moral hazard mitigation enter the regression with a negative sign and a 10% significance level. This indicates that home audit efficiency and moral hazard mitigation generally have a negative impact on the level of non-core funding the subsidiaries hold on their balance sheets. Prompt correctvive power index enters with a positive sign but is insignificant across all the regressions.

Turning to the bank level variables we identify several significant drivers of non-core funding. First, banks with a higher interbank ratio also have higher non-core funding. Second, a more leveraged subsidiary relatve to its parent in the previous period, has a lower level of non-core funding in the current period. The effect is significant at least at 5% level. We find insignificant liquidity and loan loss reserves ratios. CPI and host country GDP growth are insignificant as is the loan growth of the parent bank. Finally, we find that larger banks have somewhat lower levels of non-core funding and lagged loan growth of the subsidiary is an important driver in the regression and a contributor to risk accumulation on the liability side of the balance sheet. The lagged dependent variable enters the regression with an expected positive sign and is significant, indicatiing the existence of a an adjustment process of non-core funding.

The main conclusion from the sample split is that subsidiaries in EU host countries and non-EU host countries are starkly different. Interestingly, we find that the monetary policy measures, while still insignificant in the EU host countries sample, enters with a negative sign and is significant in the non-EU sample. This implies that for the non-EU subsidiaries an interest rate below the implied rate increases the level of non-core funding. The relationship is weak however, the significance is only at 10%.

Table 3: Baseline Estimation Results

	Short-Term Non-Core Funding

Variables	Full sample	EU Sample Taylor Res.	Non-EU Sample Taylor Res.	EU Sample ST IR	Non-EU Sample ST IR
	1	2	3	4	5
Lagged dependent	0.585***	0.749***	0.121	0.737***	0.123
	[0.182]	[0.268]	[0.102]	[0.255]	[0.101]
Taylor residuals (home, t-1)	-0.01	0.004	-0.016*		
	[0.012]	[0.016]	[0.009]		
Short-Term Interest Rate (home, t-1)				-0.004	-0.014**
				[0.015]	[0.007]
Strength of External Audit, (home, t-1)	-0.656*	-1.249**	-0.824	-1.157**	-0.846
	[0.359]	[0.519]	[0.594]	[0.552]	[0.586]
Prompt Corrective Power, (home, t-1)	-0.0329	-0.0537	-0.1	-0.0384	-0.081
	[0.094]	[0.131]	[0.174]	[0.132]	[0.177]
Moral Hazard Mitigation, (home, t-1)	-0.373*	-0.678*	-0.561	-0.658*	-0.516
	[0.224]	[0.375]	[0.593]	[0.371]	[0.594]
Interbank Ratio, (t-1)	0.00942**	0.0110**	-0.00138	0.0112**	-0.00103
	[0.004]	[0.005]	[0.004]	[0.005]	[0.004]
Equity Ratio Diff., (t-1)	-0.406**	-0.703*	0.057	-0.687	0.0582
	[0.183]	[0.424]	[0.175]	[0.423]	[0.179]
Liquidity Ratio Diff., (t-1)	0.0228	-0.0201	0.230**	-0.0117	0.231***
	[0.064]	[0.086]	[0.089]	[0.086]	[0.089]
Loan Loss Reserve Diff.	-0.462	-2.706*	-0.26	-2.554*	-0.294
	[0.307]	[1.463]	[0.221]	[1.474]	[0.218]
Lagged Loan Loss Reserve Diff.	0.126	1.215	0.0955	1.128	0.112
	[0.119]	[0.910]	[0.128]	[0.877]	[0.132]
Loan-to-Deposit Ratio Diff., (t-1)	0.000*	0.212	0.000	0.203	0.000
	[0.000]	[0.158]	[0.000]	[0.148]	[0.000]
Lagged CPI, (host)	0.00273	0.00226	0.00105	0.0026	0.00097
	[0.002]	[0.003]	[0.002]	[0.004]	[0.002]
Annual GDP Growth, (host, t-1)	0.001	0.002	0.002	0.001	0.002
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Lagged Size (log Total Assets)	-0.086***	-0.106*	-0.0599*	-0.104**	-0.060*
	[0.027]	[0.054]	[0.035]	[0.052]	[0.035]
Lagged Loan Growth, (subsidiary)	0.017**	0.033**	0.025*	0.033***	0.024*
	[0.008]	[0.013]	[0.013]	[0.012]	[0.013]
Lagged Loan Growth, (parent)	0.00157	-0.0125	-0.00391	-0.0126	-0.0038
	[0.008]	[0.022]	[0.013]	[0.021]	[0.012]
Nr. Banks	162	85	90	85	90
AB Test (p-value)	0.61	0.75	0.57	0.77	0.58
Sargan Test (p-value)	0.22	0.42	0.40	0.34	0.45

*Notes: The regression includes year, host country, home country and banking group fixed effects. *, **, *** represent respectively 10%, 5% and 1% significance levels reported from robsut estimations. ST IR stands for short-term interest rates;*

Bank regulation also seems to have a differentiated impact. As for the full sample the strength of audit and moral hazard mitigation has a negative impact on non-core funding in the EU sample, these effects vanish in the non-EU sample. Generally speaking, the non-EU sample of subsidiaries seems to be insensitive to the regulatory measures in the home countries, even though all the indexes enter the regressions with an expected negative sign.

Turning to the bank level variables we notice further differences among the samples. In the Eu sample the capital position retains the negative sign, albeit its effect diminishes, while in the non-EU sample the effect is insignificant. On the other hand, it seems that the liquidity position of the parent bank relative to its subsidiary is a very important factor for the non-EU subsidiaries (Column 3). It enters the regression with a positive sign (5%) and indicates that subsidiaries with more liquid parent banks have higher non-core ratios than those which have more similar liquidity profiles. Finally, in the EU sample, subsidiaries whose parent banks have higher loan loss reserves have lower non-core funding. The relationship does not hold for the non-EU sample. The remaining findings for the full sample hold for the sub-samples, i.e. larger banks have lower non-core funding and subsidiaries with higher loan growth have higher non-core funding.

Monetary Policy and Parent Characteristics

The weak indication of an cross-border risk channel and the significant differences between the EU and non-EU host countries suggests that the relationship between monetary policy and bank regulation at home might be more complex. The literature on the monetary transmission mechanisms distinguishes between certain bank characteristics which might strengthen the operationality of the monetary policy measures. Some authors, (Kashyap & Stein, 1995), (Kashyap & Stein, 2000), (Kishan & Opiela, 2000), (Campello, 2002) and (Gambacorta & Mistrulli, 2004) argue that bank lending, and therefore risk taking – is influenced by several bank characteristics, such as its liquidity, capitalization and size. Generraly they argue that larger, better capitalized and more liquid banks are more insulated in the face of monetary or, for the same matter, other shocks.

We take this considerations to our data and reestimate Equation (1) by including four interaction terms between the monetary policy measure (Taylor residuals) and parent cank equity, liquidity, loan loss reserves and loan growth ratios. We run the regressions for the EU sample and non-EU sample separately. Table 4 summarizes the results.

Table 4: Monetary Policy and Parent Bank Characteristics in EU host sample

Short-tern Non-core Funding					
EU Host Countries					
	1	**2**	**3**	**4**	**5**
Lagged Dependent	0.800***	0.779***	0.787***	0.782***	0.804***
	[0.245]	[0.243]	[0.246]	[0.242]	[0.242]
Taylor residuals (home, t-1)	0.183	0.118*	0.161*	0.0841	0.337***
	[0.129]	[0.072]	[0.087]	[0.068]	[0.128]
Taylor (home) x Parent Bank Equity Ratio, (t-1)	-0.727				-1.651*
	[0.846]				[0.863]
Taylor (home) x Parent Bank Liquidity, (t-1)		0.0781			0.23
		[0.937]			[1.024]
Taylor (home) x Parent Bank Loan Loss Reserves, (t-1)			-3.68		-7.131*
			[4.804]		[4.571]
Taylor (home) x Parent Bank Loan Growth, (t-1)				0.03	0.0208
				[0.031]	[0.030]

Parent Bank Equity Ratio, (t-1)	-0.543	-0.552	-0.561	-0.494	-0.54
	[0.802]	[0.796]	[0.789]	[0.786]	[0.813]
Parent Bank Liquidity Ratio, (t-1)	0.289*	0.286*	0.313*	0.296*	0.327*
	[0.191]	[0.194]	[0.196]	[0.196]	[0.205]
Parent Bank Loan Loss Reserve (t-1)	3.656	3.576	2.935	2.995	2.911
	[2.816]	[2.801]	[2.725]	[2.563]	[2.893]
Lagged Loan Growth, (parent)	-0.038**	-0.04***	-0.044**	-0.06*	-0.064*
	[0.015]	[0.014]	[0.017]	[0.032]	[0.034]
Nr. Banks	86	86	86	86	86
AB Test (p-value)	0.66	0.70	0.76	0.75	0.79
Sargan Test (p-value)	0.29	0.24	0.23	0.23	0.35

*Notes: The regression includes all bank level and bank regulation variables as the baseline model. It also includes year, host country, home country and banking group fixed effects. *, **, *** represent respectively 10%, 5% and 1% significance levels.*

The findings indicate that there are indeed important non-linearities in the relationship between our monetary measure and non-core funding. The Taylor rule coefficient gains significance in these series of regressions. The positive sign indicates that a contraction in the monetary policy at home is associated with an increase in non-core funding on the balance sheet of subsidiaries. The interpretation of the results is not straightforward as we do not have explicit data on the flows of the interbank funds. Moreover, while certainly members of a functional internal capital markets within the banking groups, the subsidiaries are also connected to the local interbanket markets, which makes any strong conclusion impossible. Nevertheless there could be two alternative explanations for such a relationship. On one hand, an interest rate level above the implied one could mean that parent banks shift part of their funds from their home markets towards the host markets. On the other hand, it is also possible that parent banks raise more funds through the internal capital markets in alternative locations and thus the subsidiaries increase their borrowing activity on the local interbank markets. This latter possibility seems to be supported by the sign on the interaction term between parent bank capitalization and Taylor rule residuals. It yields a negative sign, indicating that subsidiaries with better capitalized parent banks have lower non-core funding when the interest rate is above the Taylor rule implied rate. This would also fit the hypothesis that better capitalized banks are better insulated from the monetary shocks, (Altunbas, Gambacorta, & Marques-Ibanez, 2010), (Altunbas, Gambacorta, & Marques-Ibanez, 2014), (Gambacorta & Mistrulli, 2004). Alternatively, the negative interation sign could indicate that a contraction in monetary policy at home, for more leveraged parents would simply imply higher non-core funding for the subsidiaries.

In terms of liquidity, although the interaction term is positive, it is not significant. The parent bank liquidity ratio, however, enters with a positive sign indicating that a subsidiary with a more liquid parent bank has on average more non-core funding on its balance sheet. Finally, we also find that subsidiaries with parent banks which have higher loan loss reserves have lower levels of non-core funding after a contraction in monetary policy. It seems that the risk apetite of the parent banks plays a significant role in the balance sheet management of the subsidiaries. Although, the loan loss reserves should not necesarily represent bank risk, rather a perception of the banks of the expected credit risk and their prudence in dealing with it, the result points to the importance of risk measures in the transmission of the monetary policy shocks. A final measure of risk is the loan growth of the parent banks. While the interaction term is insignificant, we find that the loan growth of parent banks itself is negative and marginally significant at 10%. This indicates that subsidiaries with parents facing a higher loan demand would have lower non-core funding.

We now turn to the non-EU sample. We repeat the exercise we ran for the EU sample and include four interactions between the monetary policy measure and parent bank characteristics. We summarize the results in Table 5 below.

Table 5: Monetary Policy and Parent Bank Characteristics in non-EU host sample

Non-core Funding					
Non-EU Host Countries					
	1	**2**	**3**	**4**	**5**
Lagged Dependent	0.12	0.0621	0.0999	0.0985	0.0814
	[0.131]	[0.122]	[0.129]	[0.127]	[0.121]
Taylor residuals (home, t-1)	-0.170*	-.320***	-0.178	0.0107	-0.155
	[0.118]	[0.109]	[0.186]	[0.067]	[0.339]
Taylor (home) x Parent Bank Equity Ratio, (t-1)	1.177				2.187
	[1.963]				[2.100]
Taylor (home) x Parent Bank Liquidity, (t-1)		-3.55**			-4.01***
		[1.403]			[1.362]
Taylor (home) x Parent Bank Loan Loss Reserves, (t-1)			2.577		-6.348
			[5.610]		[8.179]
Taylor (home) x Parent Bank Loan Growth, (t-1)				-.93**	-1.04**
				[0.386]	[0.475]
Parent Bank Equity Ratio, (t-1)	0.784	0.860*	0.716	0.796*	1.035*
	[0.563]	[0.517]	[0.530]	[0.530]	[0.558]
Parent Bank Liquidity Ratio, (t-1)	0.331*	0.307	0.356*	0.363*	0.274
	[0.220]	[0.216]	[0.216]	[0.203]	[0.212]
Parent Bank Loan Loss Reserve (t-1)	0.532	1.209	0.812	1.233	0.885
	[1.264]	[1.436]	[1.505]	[1.332]	[1.519]
Lagged Loan Growth, (parent)	-0.000	-0.002	-0.002	0.048*	0.056*
	[0.017]	[0.016]	[0.016]	[0.026]	[0.031]
Nr. Banks	77	77	77	77	77
AB Test (p-value)	0.80	0.83	0.86	0.83	0.84
Sargan Test (p-value)	0.34	0.35	0.35	0.43	0.46

*Notes: The regression includes all bank level and bank regulation variables as the baseline model. It also includes year, host country, home country and banking group fixed effects. *, **, *** represent respectively 10%, 5% and 1% significance levels.*

The Taylor rule residuals term retains its sign throughout all of the regressions and is significant in the first and second columns. We do not find a significant interaction between the monetary policy and parent capitalization. We also yield an insignificant interaction between monetary policy and loan loss reserves ratio. On the other hand an important factor turns out to be the liquidity of the parent banks. The interaction coefficient yields a negative and significant term – subsidiaries in non-EU with more liquid parent banks have lower non-core funding under a monetary policy contraction in the home country of the parent bank. The same results is obtained for the interaction between monetary policy and parent bank loan growth ratio. This generally indicates that home loan demand is a sensible determinant of the balance sheet management decissions of subsidiaries in non-EU countries. Altogether the results show that the parent bank characteristics alter the negative general negative impact of the home monetary policy contraction.

Summarizing the results, it apears that liability side management of the balance sheets by the subsidiaries is significantly driven by both, the characteristics and strength of the parent banks as well as the shocks at home.

However it also apears that EU-hosted subsidiaries differ considerably from non-EU hosted subsidiaries. Overall the evidence points to a rather complex and nuanced story regarding the impact of foreign banks in these regions, (van Horen & Claessens, 2014).

Relative Size of Parent Banks

In this section we extend our tests by looking at the effect of the parent bank size on the transmission of monetary shocks to subsidiaries. The argument ex ante can go both ways. On one hand, it can be fairly safely argued that big banks should be able to absorb any trype of shocks easier than small banks and shoud therefore not be affected by them. This also means that large banks could efficiently insulate themselves from any change in the monetary stance. On the other hand however – and this has also been proved empirically – big banks might not be as immune as thought. For instance (Altunbas, Gambacorta, & Marques-Ibanez, 2010) finds that even internationally active banks with operations in several countries are sensitive to the monetary policy stance. The effects, the authors argue, could be even larger if not for the international dimension of their operations. The natural question then is whether the subsidiaries are insulated from such shocks. It might be argued that large international banks could mitigate some of the effects by shifting some of the burden to its subsidiaries and in this way alter the balance sheet of the later. At the same time, the larger the parent bank the more power it has to determine the operations of its subsidiaries – therefore, we hypothesize that larger parents could have a larger imapct on their subsidiaries then the smaller parents. We take this hypothesis to the test and summarize the results in Table 6 below.

Table 6: Monetary Policy and Parent Bank Characteristics

Non-Core Funding						
	Full Sample					
	1	**2**	**3**	**4**	**5**	**6**
Lagged Dependent	0.629***	0.578***	0.599***	0.613***	0.594***	0.585***
	[0.197]	[0.183]	[0.185]	[0.182]	[0.187]	[0.183]
Taylor residuals (home, t-1)	-0.00827	-0.0124	-0.0139	-0.0158	-0.0106	-0.0138
	[0.012]	[0.013]	[0.013]	[0.013]	[0.016]	[0.013]
Taylor residuals (home, t-1) x Small Subsidiary	-1.991**					
	[0.774]					
Small Subsidiary, (t-1)	-0.0404					
	[0.414]					
Taylor residuals (home, t-1) x Large Parent Bank		-0.0144*	-0.0191*			
		[0.009]	[0.010]			
Large Parent Bank, (t-1)		0.0477*	0.0461			
		[0.033]	[0.034]			
Taylor residuals (home, t-1) x Large Parent Bank x Pre-Crisis			0.0187*			
			[0.011]			
Taylor residuals (home, t-1) x Illiquid Parent				0.00417		
				[0.007]		
Illiquid Parent, (t-1)				-0.0662*		
				[0.037]		
Taylor residuals (home, t-1) x Poorly Capitalized Parent					-0.00242	
					[0.010]	
Poorly Capitalized Parent, (t-1)					0.0215	

					[0.028]	
Taylor residuals (home, t-1) x Low Loan Loss Reserves						0.00973
						[0.008]
Low Loan Loss Reserves						-0.0115
						[0.026]
Nr. Banks	163	163	163	163	163	163
AB Test (p-value)	0.43	0.50	0.41	0.56	0.54	0.55
Sargan Test (p-value)	0.33	0.11	0.17	0.14	0.18	0.15

*Notes: The regression includes all bank level and bank regulation variables as the baseline model. It also includes year, host country, home country and banking group fixed effects. *, **, *** represent respectively 10%, 5% and 1% significance levels. Small subsidiary is a dummy that takes a value of 1 if the weight of total assets of the subsidiary in total assets of the parent nbank is in below the 10th percentile; Large parent bank is a dummy which takes the value of 1 if the bank's total assets are in the 90th percentile; Illiquid parent bank is a dummy which takes a value of 1 if the liquidity ratio is below 10th percentile; Poorly capitalized parent bank is a dummy which has a value of 1 if the equity to asset ratio is below 10th percentile;Low loan loss reserves is a dummy which takes a value of 1 if the parent bank's loan loss reserves is below the 10th percentile; Pre-crisis period is a summy chich takes a value of 1 for yeach year from 2003 up to, and including 2007.*

The regression in Column 1 highlights the effects of a loose monetary policy on the small subsidiaries in the sample. The interaction term between monetary policy and the dummy variable for a small subsidiary (in the 10th percentile of the weights) yields a significant negative coefficient. It indicates that small subsidiaries relative to their parent banks increase their non-core funding if the interest rates are below the Taylor implied rates. In Columns 2 and 3 we re-run the regression by including a dummy for large parent bank. In Column 2 we interact it with the Taylor rule residuals and in Column 3 we interact it with the pre-crisis period dummy as well. Interestingly we find a similar result as in Column 1, i.e. subsidiaries of large banks seem to be more sensitive to the home monetary policy stance and build up more risk on the liability side during a relaxed monetary policy. In column 3 however the triple interaction coefficients indicates that during the pre-crisis period this effect was somewhat diminished.

In the remaining 3 columns of Table 6 we test whether the effects were in any way altered by the illiquidity, undercapitalization and provisioning policy of the parent banks. We do not yield any significant results, except that subsidiaries with more illiquid parents have lower non-core funding on their balance sheets, which is in line with the previous results using the liquidity ratio in the regression.

Host Regulation – does it matter?

In this section we extend the analysis to the question of whether the host monetary policy is relevant for the subsidiaries of the large banking groups or not. The question is important as it has been often argued that host bank regulators were unable to limit the aggressive expansion of loans during the boom period and this ultimately led to increased vulnerability, both on the liability side because of the unsustanably high levels of noncore funding and on the asset side, due to large loan portfolios which in the downturn became riddled by poor quality loans. We summarize the main results of the regression in Table 7 below.

Table 7: Home Monetary Policy and Host Regulation

Short-Term Non-core Funding				
	EU	**Non-EU**	**EU**	**Non-EU**
Lagged Dependent	0.706***	-0.0759	0.639***	-0.136
	[0.221]	[0.148]	[0.234]	[0.131]
Taylor residuals (home, t-1)	0.0119	-0.0135**	0.0168	-0.0347***
	[0.013]	[0.006]	[0.014]	[0.011]
Strength of External Audit, (home, t-1)	-1.042**	-0.819	-1.105**	-0.619

	[0.454]	[1.216]	[0.446]	[1.150]
Strength of External Audit, (host, t-1)	-0.00819	0.0109	-0.0188	-0.0103
	[0.014]	[0.035]	[0.014]	[0.038]
Taylor Residuals x Strength of External Audit, (host, t-1)			-0.0000533	-0.00844
			[0.004]	[0.007]
Prompt Corrective Power, (home, t-1)	-0.185	0.000624	-0.169	-0.176
	[0.140]	[0.205]	[0.135]	[0.209]
Prompt Corrective Power, (host, t-1)	0.00377	-0.00572	0.000427	-0.00255
	[0.012]	[0.011]	[0.012]	[0.011]
Taylor Residuals x Prompt Corrective Power, (host, t-1)			-0.000661	0.000938
			[0.002]	[0.004]
Moral Hazard Mitigation, (home, t-1)	-0.453	0.439	-0.239	0.216
	[0.429]	[0.829]	[0.444]	[0.849]
Moral Hazard Mitigation, (host, t-1)	0.0565	-0.04	0.0441	-0.0109
	[0.041]	[0.030]	[0.034]	[0.034]
Taylor Residuals x Moral Hazard Mitigation, (host, t-1)			-0.0202**	-0.0273**
			[0.008]	[0.011]
Nr. Banks	86	77	86	77
AB Test (p-value)	0.9	0.84	0.94	0.75
Sargan Test (p-value)	0.45	0.78	0.46	0.81

*Notes: The regression includes all bank level and bank regulation variables as the baseline model. It also includes year, host country, home country and banking group fixed effects. *, **, *** represent respectively 10%, 5% and 1% significance levels.*

In the first two columns of Table 7 we just include the host country bank regulation indices along with all other variables of the model. The results from the baseline regression remain intact. However, we do not yield any significant host regulatory indexes. It looks that the home regulation dominates the host one. At least in the EU sample the strength of the external auditors seems to have a mitigating effect on the level of noncore funding.

In columns 3 and 4 we include an interaction term between Taylor residuals and host Moral Hazard Mitigation index2. The term enters with a negative sign for both samples. It implies that higher moral hazard mitigation index in the host economies amplifies the noncore funding of subsidiaries if the interest rates at home are below Taylor implied rates.

Robustness checks

In this section we present the main robustness check results. Table 8 summarizes them. We undertake several modifications of our regression strategy to confirm our main findings. First we use instaead of the level of Taylor rule residuals their change. The results in Column 1 and 2 for the EU and non-EU sample remain virtually unchanged. We than add a measure of host monetary policy as it might well be argued that the local conditions could be more important than the conditions in the parent banks' home country. The results render the host Taylor rule residuals insignificant while the main results remain unaltered. In the third test we include instead of subsidiary loan growth ratios, the excess loan growth. The resulst remain unchanged. In columns 7 and 8 we modify the definition of the dependent variable. Using the HP filter we extract the cyclical component of the noncore funding and use it instead. The variables retain the signs, however Taylor rule residuals lose their significance in the non-EU sample. The strength of external audit retains the sign and significance in the EU sample. Moral hazard mitigation index and prompt corrective index also turn significant in this regression. Finally we modify the definition of

[2] We actually include the interaction between the Taylor residuals and all host bank regulatory indexes, however for brevity we only present the one which yielded a significant coefficient.

noncore funding to include the long term non-depository funding as well. The results are presented in the last two columns. The results hold to this modification as well.

Table 8: Robustness Checks

	EU	non-EU	EU	non-EU	EU	non-EU	EU	non-EU	EU	non-EU
	Short-term Non-core Funding						Non-core funding cyclical component		Non-Core Funding (incl. Long Term)	
Lagged Dependent	0.775***	0.0695	0.777***	0.104	0.895***	0.689***	0.358***	0.111	0.702***	0.688***
	[0.209]	[0.129]	[0.210]	[0.113]	[0.141]	[0.081]	[0.097]	[0.151]	[0.136]	[0.087]
Change Taylor residuals (home, t-1)	0.00971	-0.0054**								
	[0.010]	[0.003]								
Taylor residuals (home, t-1)			0.0141	-0.018**	0.012	-0.0266*	0.01	-0.00963	-0.00143	-0.0197*
			[0.015]	[0.009]	[0.015]	[0.016]	[0.015]	[0.008]	[0.012]	[0.013]
Taylor residuals (host, t-1)			0.000	-0.000						
			[0.005]	[0.002]						
Strength of External Audit, (home, t-1)	-0.0306*	-0.00434	-0.0299*	-0.00227	-0.0247	-0.0279	-0.0228*	-0.0129	-0.0288*	-0.0294
	[0.019]	[0.018]	[0.018]	[0.018]	[0.019]	[0.026]	[0.012]	[0.024]	[0.015]	[0.022]
Prompt Corrective Power, (home, t-1)	0.000	0.00113	0.000	-0.0004	-0.00381	-0.0021	0.0155*	-0.000	0.00939	-0.00688
	[0.011]	[0.010]	[0.011]	[0.011]	[0.011]	[0.012]	[0.009]	[0.008]	[0.010]	[0.012]
Moral Hazard Mitigation, (home, t-1)	-0.0151	-0.0178	-0.0203	-0.0187	-0.041*	-0.0375	-0.057**	-0.0151	-0.057**	0.00113
	[0.029]	[0.029]	[0.029]	[0.030]	[0.027]	[0.036]	[0.023]	[0.022]	[0.029]	[0.033]
Nr. Banks	82	75	82	75	82	75	82	75	82	75
AB Test (p-value)	0.6154	0.9167	0.4809	0.916	0.6154	0.9167	0.2989	0.5266	0.8069	0.349
Sargan Test (p-value)	0.5884	0.3259	0.6737	0.4092	0.5884	0.3259	0.1579	0.386	0.2837	0.3967

*Notes: The regression includes all bank level and bank regulation variables as the baseline model. It also includes year, host country, home country and banking group fixed effects. *, **, *** represent respectively 10%, 5% and 1% significance levels.*

Conclusions

Using a sample of subsidiaries from Central Eastern and Southeastern Europe we study the impact of home monetary policy stance and bank regulation on the level of short term noncore funding. Several findings stand out. First, there are significant differences between the EU and non-EU subsidiaries although most of them are part of the same western European banking groups. Second, while in the baseline regression the home monetary policy is weak in explaining the level of noncore funding of subsidiaries, the picture is more nuanced and its impact seems to materialize through some of the characteristics of the parent banks. Generally, the findings are in line with previous empirical evidence and they point out the importance of capitalization, liquidity, provisioning and banks' risk profile or rather the home loan demand for the level of noncore funding subsidiaries in CESEE chose to hold on their balance sheets.

One important channel through which the home monetary policy seems to operate more potently is the relative size of the parent bank in comparison with its subsidiary. It seems that larger parent banks have more power to influence the balance sheet structure of their subsidiaries than small banks. This makes their subsidiaries more vulnerable to the monetary stance at home. This has potentially important implications for the policy making, both in the home countries and in the host countries. This type of behavior of large international banks means that they can avoid the restrictions at home and move some of their exposures abroad, even in spite of the regulatory and monetary stance in the host countries. This implies that bank regulators in both jurisdictions should be more proactive in their regulatory approach and that, the EU states which are still not part of the new SSM framework should aim at joining it in the view of converging in terms of bank regulation standards and requirements. This would eliminate any remaining regulatory arbitrage. At the same time, it seems that apart from paying a close attention to the local developments, bank regulators should keep a vigilant eye on the monetary and economic developments in the home countries.

Further analysis should be undertaken in order to understand how parent banks manage their subsidiaries and how the EU debt crisis influenced the management of the subsidiaries in the region.

References

Adrian, T., & Shin, H. (2008). Financial Intermediaries, Financial Stability and Monetary Policy. *Kansas City Fed Symposium*, (pp. 21-23). Jackson Hole.

Agoraki, M.-E., Delis, M. D., & Pasiouras, F. (2009). Regulations, Competition and bank risk-taking in transition countries. *MPRA Paper Nr. 16495*.

Altunbas, Y., Gambacorta, L., & Marques-Ibanez, D. (2010). Bank risk and monetary policy. *Journal of Financial Stability, 6*, 121-129.

Altunbas, Y., Gambacorta, L., & Marques-Ibanez, D. (2014, March). Does Monetary Policy Affect Bank Risk? *International Journal of Central Banking, 10*(1), 95-136.

Angeloni, I., & Faia, E. (2013). Capital regulation and monetary policy with fragile banks. *Journal of Monetary Economics, 60*, 311-324.

Angeloni, I., Faia, E., & Lo Duca, M. (2010). Monetary Policy and Risk Taking. *Bruegel Working Paper*.

Arellano, M., & Bover, O. (1995). Another Look at the Instrumental Variable Estimation of Error-Components Models. *Journal of Econometrics, 68*, 29-51.

Barth, J. R., Caprio, G. J., & Levine, R. (2006). *Rethinking Bank Regulation - Till Angels Govern.* New York: Cambridge University Press.

Barth, J. R., Caprio, G., & Levine, R. (2013). Bank regulation and supervision in 180 countries from 1999 to 2011. *Journal of Financial Economic Policy, 5*(2), 111-219.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics, 87*, 115-143.

Borio, C., & Zhu, H. (2012). Capital regulation, risk-taking and monetary policy: A missing link in the transmission mechanism? *Journal of Financial Stability, 8*, 236-251.

Campello, M. (2002, December). Internal Capital Markets in Financial Conglomerates: Evidence from Small Bank Responses to Monetary Policy. *The Journal of Finance, LVII*(6), 2773-2805.

Cetorelli, N., & Goldberg, L. S. (2011, April). Global Banks and International Shock Transmission: Evidence from the Crisis. *IMF Economic Review, 59*(1), 41-76.

Cetorelli, N., & Goldberg, L. S. (2012, October). Banking Globalization and Monetary Transmission. *The Journal of Finance, LXVI*(5), 1811-1843.

Claessens, S., & van Horen, N. (2014, January). Foreign Banks: Trends and Impact. *Journal of Money, Credit and Banking, 46*(1), 295-326.

de Haas, R., & van Lelyveld, I. (2010, January). Internal capital markets and lending by multinational bank subsidiaries. *Journal of Financial Intermediation, 19*(1), 1-25.

de Haas, R., & van Lelyveld, I. (2014). Multinational Banks and the Global Financial Crisis: Weathering the Perfect Storm? *Journal of Money, Credit and Banking, 46*(1), 333-364.

Degryse, H., Elahi, A., & Penas, M. (2010). Cross-Border Exposures and Financial Contagion. *International Review of Finance, 10*(2), 209–240.

Dincer, N., & Eichengreen, B. (2014, March). Central Bank Transparency and Independence : Updates and New Measures. *International Journal of Central Banking, 10*(1), 189-253.

Gambacorta, L., & Mistrulli, P. E. (2004). Does bank capital affect lending behavior? *Journal of Financial Intermediation, 13*(4), 436–457.

Hahm, J.-H., Mishkin, F. S., Shin, H., & Shin, K. (2011). Macroprudential policies in open emerging economies. *Proceedings* (pp. 63-114). San Francisco: Federal Reserve Bank of San Francisco.

Hahm, J.-H., Shin, H., & Shin, K. (2013, July). Noncore Bank Liabilities and Financial and Financial Vulnerability. *Journal of Money, Credit and Banking, 45*(1), 1-36.

Herrala, R. (2014, March). Forward-looking Reaction to Bank Regulation. *ECB Working Paper Series, 1645*.

Jiménez, G., Ongena, S., Saurina, J., & Peydró, J.-L. (forthcoming). Hazardous Times for Monetary Policy: What do 23 Million Loans Say About the Impact of Monetary Policy on Credit Risk-Taking? *Econometrica*.

Kashyap, A. K., & Stein, J. C. (2000). What do a million observations on banks say about the transmission of monetary policy. *The American Economic Review, 90*(3), 407–428.

Kashyap, A., & Stein, J. C. (1995). The Impact of Monetary Policy on Bank Balance Sheets. *In: Carnegie Rochester Conference Series on Public Policy, 42*, 151–195.

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2010). The Worldwide Governance Indicators : A Summary of Methodology, Data and Analytical Issues. *World Bank Policy Research Working Paper, 5430*.

Kishan, R. P., & Opiela, T. P. (2000). Bank size, bank capital and the bank lending channel. *Journal of Money, Credit and Banking, 32*(1), 121–141.

Maddaloni, A., & Peydró, J.-L. (2011). Bank Risk-taking, Securitization, Supervision, and Low Interest Rates: Evidence from the Euro-area and the U.S. Lending Standards. *Review of Financial Studies, 24*(6), 2121-2165.

Maddaloni, A., & Peydró, J.-L. (2013). Monetary Policy, macroprudential Policy, and Banking Stability: Evidence from the Euro Area. *International Journal of Central Banking, 9*(1), 121-171.

Minoiu, C., & Reyes, J. A. (2013, June). A network analysis of global banking: 1978–2010. *Journal of Financial Stability, 9*(2), 168-184.

Nickell, S. (1981, November). Biases in Dynamic Model with Fixed Effects. *Econometrica, 49*(6), 1417-1426.

Ongena, S., Popov, A., & Udell, G. F. (2013, June). When the cat's away the mice will play": Does regulation at home affect bank risk-taking abroad? *Journal of Financial Economics, 108*(3).

Peek, J., & Rosengren, E. (1997, September). The International Transmission of Financial Shocks: The Case of Japan. *American Economic Review, 87*(4), 495-505.

Popov, A. (2013, September). Monetary Policy, Bank Capital and Credit Supply: a Role for Discouraged and Informally Rejected Firms. *ECB Working Paper Series, 1593*.

Popov, A. (2013, September). Monetary Policy, Bank Capital, and Credit Supply: A Role for Discouraged and Informally Rejected Firms. *ECB Working Paper Series, 1593*.

Popov, A., & Udell, G. F. (2012). Cross-border banking, credit access, and the financial crisis. *Journal of International Economics, 87*(1), 147–161.

Rajan, R. (2005). Has financial development made world riskier? *Proceedings - Economic Policy Symposium* (pp. 313-369). Jackson Hole: Federal Reserve Bank of Kansas City.

Rochet, J.-C., & Tirole, J. (1996, November). Interbank Lending and Systemic Risk. *Journal of Money, Banking and Credit, 28*(4), 733-762.

Schoenmaker, D., & Wagner, W. (2013). Cross-Border Banking in Europe and Financial Stability. *International Finance, 16*(1), 1-22.

Smets, F. (2013). Financial stability and monetary policy: How Closely Interlinked? *Penning- och valutapolitik, 3*(Jubileumsnummer).

van Horen, N., & Claessens, S. (2014). Foreign banks: Trends and impact. *Journal of Money, Credit and Banking, 46*(1), 295-326.