Cardiff Economics Working Papers

Working Paper No. E2017/3

Foreign Banks and The Bank Lending Channel

Piotr Denderski and Wojciech Paczos

May 2017

ISSN 1749-6010

Cardiff Business School
Cardiff University
Colum Drive
Cardiff CF10 3EU
United Kingdom
t: +44 (0)29 2087 4000
f: +44 (0)29 2087 4419
business.cardiff.ac.uk

This working paper is produced for discussion purpose only. These working papers are expected to be published in due course, in revised form, and should not be quoted or cited without the author's written permission.
Cardiff Economics Working Papers are available online from:
http://econpapers.repec.org/paper/cdfwpaper/ and
business.cardiff.ac.uk/research/academic-sections/economics/working-papers
Enquiries: EconWP@cardiff.ac.uk

Foreign Banks and The Bank Lending Channel*

Piotr Denderski†, Wojciech Paczos ‡

This Version: May 2017

Abstract

We provide new evidence on the bank lending channel of monetary policy using bank-level data of 440 banks from eleven CEE transition economies between 1998 and 2012. Our findings are: i) banks adjust their loans to changes in host country's monetary policy, ii) foreign-owned banks are less responsive to monetary policy of a host country than domestic-owned banks in both normal and crisis times, iii) foreign parent bank characteristics are irrelevant for the bank lending channel. We propose *market segmentation* hypothesis that can account for those facts better than the alternative, the *internal market* hypothesis. Foreign banks have a competitive advantage so that their loan portfolio adjusts less to changes in monetary policy. As a consequence, an increase in foreign penetration of the banking sector does not render monetary policy less effective.

JEL classification: E44, E50, G21

Keywords: banks, bank ownership, bank lending channel, monetary policy

* We would like to thank Árpád Ábrahám, Eric Bartelsman, Krzysztof Jackowicz, Yuriy Gorodnichenko, Oskar Kowalewski, Iman van Lelyveld, Jaromir Nosal, Stefano Neri, Federico Signoretti, and the participants of the research seminars at the National Bank of Poland, EUI Florence, VU Amsterdam the 3rd Conference of International Association for Applied Econometrics in Milan and the 2017 RES Conference in Bristol for comments and discussions. The research project was carried out in the framework of the National Bank of Poland competition for research projects designed to be implemented in 2014 and was financed by the National Bank of Poland under the title: "Wpływ struktury własnościowej banków na miedzynarodową transmisję szoków, efektywność polityki monetarnej, stabilność sektora bankowego i politykę makroostrożnościową"

† University of Leicester, University Road, Leicester, LE1 7RH, United Kingdom, piotr.denderski@leicester.ac.uk.

‡ Cardiff University, Aberconway Building, Colum Drive, CF10 3EU, Cardiff, United Kingdom, paczosw@cardiff.ac.uk.

1 Introduction

Financial liberalization has led to an increased integration of financial markets over the last 30 years. The emerging and developing countries, however, entered this process with under-capitalized and weak banks. In result, large shares of the financial sector in these countries are controlled by subsidiaries of foreign banks. Thus, the financial integration was accompanied by a development of asymmetric cross-border owner-subsidiary relationships. It has been a long-standing concern for policy makers that increased foreign penetration may weaken the bank lending channel of monetary policy and put the economy at risk of financial crisis contagion. In this paper we investigate the working of the bank lending channel and the role of foreign-owned banks.

We explore the consequences of this asymmetric integration in the particular area of the Central and Eastern Europe (CEE). Banks dominate the financial structure of the CEE economies and the most of these banks are majority foreign-owned following a period of rapid increase in foreign penetration of the banking sector in the late 90s. As of 2009 the share of foreign banks in the total assets of the banking sectors in the CEE economies was greater than 80 percent. In other European Union member states this number stood at 25 percent[1].

We collect data on credit growth and ownership for 440 banks in the eleven CEE countries[2] in the years 1998-2012. We regress the real rate of growth of net credit on the foreign ownership dummy, the change in the monetary policy rate and their interaction (plus bank-level and macroeconomic controls). We make three contributions to the empirical literature on the bank lending channel. First, we document the existence of the bank lending channel in the CEE economies in both tranquil and crisis times. Second, we show that lending in foreign banks is less responsive to both tightening and loosening of host country's monetary policy in both tranquil times and during financial crisis. That is, the bank lending channel is more tamed via foreign banks. The two results come out as robust finding after a battery of additional checks that include, among others, removal of years of change of bank ownership and controlling for potentially different behavior of state-owned banks.

Third, we investigate the reasons for the observed difference between foreign and domestic banks. We go "inside" the bank lending channel as in Gambacorta (2005) and interact monetary policy with bank controls. We show that the bank lending channel operates mostly through size (in full sample) and profitability (in foreign banks). We find that differences between foreign and domestic bank reaction to monetary policy can be attributed to within-group and between-group heterogeneity, leaving no role for the type of ownership on top of balance sheet differences. We also go "outside" the bank lending channel and check how foreign banks react to economic conditions in their home country and financial conditions of their parent bank. We

[1] Own calculations based on Claessens and Van Horen (2013). In 2009 in the eleven CEE economies this number varies between 64 and 99 percent. In the non-CEE EU economies foreign bank penetration is more heterogeneous and varies from 2 percent (Spain and Netherlands) to 95 percent (Luxembourg), with Ireland, Belgium and Luxembourg having more than 50 percent of their banking system foreign-owned.

[2] Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia.

find no systematic responses to either parent country or parent bank controls.

Thus, we can contrast our findings with the *internal capital market* hypothesis as in (Campello, 2002, de Haas and van Lelyveld, 2010, Wu et al., 2011). This hypothesis proposes, that a foreign bank can easily obtain surplus liquidity from either the parent bank or other subsidiaries within the financial conglomerate. It can also be forced to transfer liquidity away when other banks within the conglomerate are in trouble. Foreign banks operations are thus less dependent on macro conditions in the host country and more dependent on macro conditions in the home country, compared to domestic banks. On aggregate, the higher is foreign penetration of the banking sector, the less effective is the bank lending channel of monetary policy. We can test the *internal market* hypothesis only indirectly, as our sample does not include subsidiaries in developed economies. We find that the parent bank characteristics are largely irrelevant for explaining bank lending channel differential between domestically and foreign-owned banks. Given the importance of the parent bank in financial conglomerates we conclude that our data do not offer strong support for the *internal market* hypothesis.

In contranst, we propose an alternative explanation, the *market segmentation* hypothesis. Foreign banks may inherit credit relationships with clients of their parents' (e.g. lending to subsidiaries of firms that entered CEE via foreign direct investments or take-overs). If there is selection into foreign expansion, then foreign-owned banks will lend to more productive clients. When foreign-owned banks have better know-how (e.g. screening technology or marketing) then they can grant credit to more reliable clients, who can service their liabilities even under high interest rates. Under this hypothesis the bank lending channel effectiveness is independent of the level of foreign penetration of the banking sector. We show that data partially supports the *market segmentation* hypothesis.

The relationship between bank ownership and the growth of credit has been receiving an increased interest in the literature since Peek and Rosengren (1997), who show that Japanese-owned banks in the US contracted their lending in a response to the slump in the Japanese stock market. The CEE transition countries are a natural field for empirical studies of foreign-owned banks behavior. De Haas and van Lelyveld (2006) is the first study that looks at the relationship between foreign ownership in the CEE countries and the growth of credit. They find a positive relationship between foreign banks and the private sector credit growth; that during crisis periods domestic banks contract their credit base, but greenfield foreign banks do not; and that conditions in the home country matter for foreign banks' growth of credit. Aydin (2008) further confirms that credit growth is higher in foreign banks. Contrary to the former, she shows that conditions in the home country do not matter for the foreign banks' growth of credit. Allen et al. (2015) show that during domestic financial crises foreign banks provide credit, while government banks contract and that the reverse has happened during the global financial crisis[3]. Bonin et al. (2005) find that in the CEE countries foreign-owned banks are more cost-efficient and provide better services, while Naaborg and Lensink (2008) in the similar sample find a somewhat contrary result, that foreign-owned banks are less profitable. None

[3] Another contributions that look at the role of foreign banks during the global financial crisis in a wider geographical setting are Adams-Kane et al. (2013) and Ongena et al. (2013).

of the cited studies however, takes into account the monetary policy in a host country. A situation when bank lending changes after a change in nominal interest rates in known in the literature as the bank lending channel of the monetary policy. In this paper we ask, whether the bank lending channel operates differently via domestic and foreign banks.

The bank lending channel pioneered by Bernanke and Blinder (1992) on aggregate data and Kashyap and Stein (2000) on bank-level data assumes that, at the bank-level, deposits and other sources of financing are imperfect substitutes. Therefore, when a central bank raises interest rates, the supply of credit at the bank level goes down. Wu et al. (2011) study the bank lending channel jointly in the CEE, Latin America and South-East Asia economies. They find that after a monetary policy contraction the growth of credit in foreign banks goes down less compared to in domestic banks (and the reverse is true after a monetary policy expansion). They claim that this is due to a foreign banks access to funding from parent banks through an internal capital market. However, the bank lending channel operates only in times of crises and not in tranquil times.

The remainder of the paper is organized as follows. Section 2 lays our data sources, data construction and the empirical procedure. We present our three central results and robustness checks in Section 3. We discuss the *internal market* and *market segmentation* hypotheses in Section 4. Last section concludes.

2 Data and Estimation Procedure

We construct our dataset using bank-level balance sheet and macroeconomic data. We acquired bank-level data from Bankscope, a commercial database maintained by Bureau van Dijk. Bankscope comprises a large number of standardized, comparable indicators at annual frequency. We measure bank credit by net loans and create our dependent variable *D.NetLoans*, the growth of net loans at the bank level (measured in real terms). Then, we account for distributional differences constructing four independent variables. First, we measure size (*Size*) as a share of bank's total assets in all banks' assets in a given country in a given year. Next, we define profitability (*Prof*) as a ratio of operating profit over total assets. We then have capitalization (*Cap*) as a ratio of total equity over total assets. We take a ratio of liquid assets over total assets to be a measure of liquidity (*Liq*).

Identification of bank ownership was done in several steps, as this information is not easily available. In particular, Bankscope only provides information about the owner in the most recent year. Apart from Bankscope, we used the database provided by Claessens and Van Horen (2013). For banks not covered there we had to resort to individual banks' websites and financial reports and track changes in ownership back in time.

We have two variables that control for bank ownership: foreign and state ownership dummies: *FGN* and *GOV*. *FGN* takes value of 1 if at least 50% of bank capital is owned by foreign entities. This variable captures potentially different management practices and know-how in foreign banks and their ease in access-

Table 1: Bank ownership, means difference test

	Domestic	Foreign	Difference	P-value (one-sided)
D.NetLoans	12.20	11.18	1.03	(0.17)
Size	4.03	4.68	-0.65*	(0.01)
Liq	31.37	26.31	5.05***	(0.00)
Cap	13.88	11.83	2.06***	(0.00)
Prof	0.76	0.90	-0.14	(0.07)
Observations	1217	1900	3117	

Notes: one-sided t-test with Welch correction, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

ing additional sources of capital (from the parent bank). GOV is defined respectively. State-owned banks might behave differently because of political pressures or catering different clients (for example, state-owned non-financial companies) as in Micco and Panizza (2006).

In our sample we have 440 banks in eleven CEE countries that have been active at least for a year between 1998 and 2012 (out of the total number of 514 CEE banks registered in Bankscope), giving rise to a total of 4008 bank-year observations[4] after removal of outliers. Our final sample with identified ownership covers on average 97.25% of the volume of net loans reported in Bankscope. Tables 12 and 13 in Appendix 6.2 present data coverage of our sample broken down by countries and years. The coverage of the ownership data is reasonably balanced across years and countries. We construct analogous bank-level characteristics for the parent banks identifying 124 parent banks yielding 2151 bank-year observations. This is a reasonably high number of banks and observations, given that not every bank in our sample has a foreign owner, that many foreign banks may have the same owner and that many foreign-owned banks have dispersed ownership and non-bank owners.

The second key variable in our study is the nominal interest rate set by a central bank. We collect data on central bank monetary policy instruments from the Eurostat and central banks' websites. Our variable of interest is a change in the yearly average of the short term interest rate. The sample covers rich variation in the stance of monetary policy. Between 1998 and 2012 negative interest rate changes stood for about 60% of all covered cases. The pre-2008 sample is more balanced: negative changes correspond to 55% of all cases. We use the same sources for the other macro controls: real GDP growth and inflation.

We take the first, unconditional look at the data in Tables 1 and 2. In Table 1 we document between-group differences splitting the sample into foreign-owned and domestic banks. We find that foreign banks are on average larger, less liquid and less capitalized than domestic banks. We also find no significant difference in the rates of growth of credit between domestic and foreign banks.

In Table 2 we report unconditional correlations between descriptive bank-level variables. We find that the growth of credit is positively correlated with the bank profitability and that size is negatively correlated with capitalization, as in Allen et al. (2015). Contrary to their data, however, we see that liquidity is

[4] Schmitz (2004) compares Bankscope data with the IFS data and finds that approximately 70% to 90% of total banking assets is covered by Bankscope for the CEE countries. Mathieson and Roldos (2001) on the other hand estimate data coverage to be about 90% of the total banking assets in the CEE countries. The coverage of Bankscope data increases in time due to market concentration and data quality improvements.

Table 2: Unconditional Correlations

	D.Net Loans	Liq	Size	Cap	Prof	Prof_P	Cap_P	Liq_P
D.Net Loans	1							
Liq	0.0378	1						
	(0.108)							
Size	0.0151	-0.0192	1					
	(0.521)	(0.414)						
Cap	-0.0583*	0.0885***	-0.122***	1				
	(0.013)	(0.000)	(0.000)					
Prof	0.204***	0.0708**	0.133***	0.128***	1			
	(0.000)	(0.003)	(0.000)	(0.000)				
Prof_P	0.0328	0.0388	-0.0256	-0.0422	0.0581*	1		
	(0.163)	(0.099)	(0.276)	(0.073)	(0.013)			
Cap_P	-0.00549	-0.0771**	-0.00985	-0.0854***	0.0463*	0.636***	1	
	(0.816)	(0.001)	(0.676)	(0.000)	(0.049)	(0.000)		
Liq_P	-0.0129	-0.1000***	0.112***	-0.145***	0.0502*	0.0587*	0.230***	1
	(0.585)	(0.000)	(0.000)	(0.000)	(0.033)	(0.013)	(0.000)	
Observations	1806							

Notes: p-values in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

positively correlated with capitalization and profitability and that capitalization is positively correlated with profitability. The correlations between subsiadiary and parent bank are of the same sign as in Allen et al. (2015): more capitalized parent bank have more profitable and less liquid subsidiaries. As our geographical and time coverage of data is similar to theirs, we report similar, albeit not identical summary statistics.

We document the cross-sectional facts about foreign and domestic banks and their evolution in time in further detail in Appendix 6.1. We also find that the capitalization and liquidity were decreasing in time in both groups. The average size of a domestic bank declined sharply after 2002 which roughly corresponds to the end of the biggest wave of penetration of local markets by foreign banks.

2.1 Estimation Specification

We estimate the model of the real rate of growth of loans of bank i in country j at time t, denoted by $D.NetLoans_{ijt}$. To test if there are differences between foreign and domestic banks reactions to monetary policy we employ several variants of the following model specification:

$$D.NetLoans_{ijt} = \beta_0 + \beta_1 FGN_{it} + \beta_2 MP_{jt} + \beta_3 MP_{jt} * FGN_{it} + \beta_4 \text{Bank}_{it} + \beta_5 \text{Economy}_{jt} + \varepsilon_{it}. \quad (1)$$

In this, we label FGN both subsidiaries of foreign banks operating in host country j and independent banks that have majority ownership located abroad. If foreign banks have different credit policies then this estimate should be significant, as in Aydin (2008) and Allen et al. (2015). Our main variables of interest are: the change in the monetary policy instrument in country j in time t denoted by MP_{jt} and its interaction

with the foreign dummy $MP_{jt} * FGN_{it}$. If the bank lending channel is at work then the first estimate will be significant and negative. If the bank lending channel operates differently in foreign and domestic banks then the second estimate will be significant. If foreign banks react more to changes in monetary policy then we should see a negative estimate of the interaction term. If on the other hand, they react less, we should see a positive estimate of the interaction term. Apart from the foreign dummy we employ four bank controls $Bank_{it}$ of bank i in time t including size $Size_{it}$ (0), liquidity Liq_{it} (+/-), capitalization Cap_{it} (-) and profitability $Prof_{it}$ (+) with expected estimate signs in parentheses. We also introduce lagged dependent variable, the real rate of net loans, *L.D.NetLoans* (+) as explanatory variable[5].

We also use macroeconomic conditions $Economy_{jt}$ differing across countries j and time t. We utilize the growth rate of the real GDP per capita (GDP_{jt}) and the inflation rate π_{jt} to control for possible demand effects and economic instability of high inflation. We expect credit growth to respond positively to GDP growth and negatively to inflation. The details of construction of the all variables are provided in the Appendix 6.1.

It is well recognized (Adams-Kane et al., 2013, Brzoza-Brzezina et al., 2010, Claessens and Van Horen, 2013, Gambacorta, 2005, Wu et al., 2011) that the presence of bank-specific controls induces an endogeneity problem in the estimation of equation 1. Thus, our method of choice is the "system-GMM" approach based on the Arellano and Bond (1991) estimator and further augmented in the works of Arellano and Bover (1995) and Blundell and Bond (1998). In this estimation we allow the dependent variable ($D.NetLoans_{ijt}$) to be potentially autocorrelated and contemporary bank controls ($Size_{it}$, Liq_{it}, Cap_{it} and $Prof_{it}$) to be endogenous. We allow for up to 4 lags to serve as instruments. However, as system-GMM approach may easily fall into a problem of too many instruments, for each regression we report the number of instruments and the results of the Hansen test. To confirm the stability of our estimates we additionally report results from the pooled OLS and panel regression with time and country fixed effects. Country fixed effects control for country-specific legal and cultural differences. Time fixed effects remove the effects of aggregate shocks that affect all countries symmetrically.

3 Results

3.1 Benchmark

We begin with our benchmark estimation comparing the results from three models: a pooled OLS, a panel with country and time fixed effect and a system-GMM approach. The results are presented in Table 3. First, the results confirm the existence of the bank lending channel. Banks contract their credit after an increase in the monetary policy rate (and expand after a decrease in the MP rate). The estimates of MP variable

[5] Out of the four most related studies to ours Wu et al. (2011) do not report estimates of bank controls, others find consistently that size does not matter for credit growth, Allen et al. (2015) find positive estimate of profitability, negative of liquidity and capitalization to be not significant, De Haas and van Lelyveld (2006) find positive estimate of profitability and capitalization and liquidity to be not significant, while Aydin (2008) finds mixed evidence for profitability and positive estimate for liquidity.

are negative and highly significant in all three estimations. This is the first main result of our paper. We further confirm this results in various robustness checks in the next subsection.

The estimates of the FGN are only highly significant in the OLS model, but lose any significance in the system-GMM model. We conclude, that foreign banks do not have different lending policies compared to domestic private banks *per se* as in Allen et al. (2015). What we find however is that the bank lending channel works differently via foreign compared to via domestic banks.

In the second main result of this paper, we find that foreign banks react differently than domestic banks to changes in the monetary policy rate. The reaction of their credit is more tamed. After an increase in the monetary policy rate foreign banks contract their credit less than domestic banks (and expand their credit less than domestic banks after a decrease in the rate). We find the difference to be highly significant in all three specifications. The result is robust to various alternative specifications, which we show in the next subsection. Then, in the following subsections we explore what stands behind and what are possible consequences of this result.

In Table 3 we report the estimates for the full set of controls. All estimates are in line with an economic intuition. Other than for foreign, we also control for the public ownership of banks with a GOV dummy. By interacting GOV dummy with the monetary policy MP variable we are able to assess whether the bank lending channel also works differently via government banks compared to private domestic banks. As in Allen et al. (2015) in the similar sample (but contrary to Micco and Panizza (2006) in the global sample) we do not find GOV variable to be significant. We conclude that public banks do not have different lending policies than domestic private banks *per se*. We also find that the bank lending channel does not differ via government banks compared to private domestic banks. The results are robust across all specifications, therefore in the following subsections we do not report the estimates.

Loans are slow moving and autocorrelated with one lag. We formally test for autocorrelation of the dependent variable. We reject the null that AR(1) coefficient is equal to zero, but fail to reject the null that the AR(2) coefficient is equal to zero. This validates our specification with one lag dependent variable and the use of a system-GMM estimation.

We find that credit grows faster in smaller banks. More liquid banks and better capitalized banks extend less credit (as in Allen et al. (2015)). As expected, profitability increases the growth of credit at the bank-level in all three estimations. Finally, we find that the growth of bank loans increases with the GDP growth and decreases with inflation. Estimates of the bank and macro controls are robust across all specifications, therefore in the following subsections we do not report the estimates.

3.2 Robustness and Further Evidence

Ownership Endogeneity. Our benchmark results reported in Table 3 may suffer from possible endogeneity of the take-over decision by foreign investors. First, the timing of a take-over may be determined by the previous performance which can be correlated with the past credit growth. Second, bank-specific

Table 3: Benchmark Model

	(1) OLS	(2) FE	(3) GMM
FGN	-2.800***	-1.981*	-1.518
	(1.062)	(1.090)	(1.599)
MP	-2.091***	-1.877***	-1.619**
	(0.555)	(0.562)	(0.634)
FGN*MP	1.572**	1.658***	1.411**
	(0.643)	(0.624)	(0.683)
GOV	-1.991	-1.080	2.981
	(1.862)	(1.835)	(3.198)
GOV*MP	0.727	0.654	0.106
	(1.083)	(1.077)	(1.010)
L.D.Net Loans	0.336***	0.284***	0.214***
	(0.0240)	(0.0278)	(0.0375)
Size	0.0356	0.00433	-0.661***
	(0.0561)	(0.0564)	(0.210)
Liq	0.00218	-0.0733*	-0.344***
	(0.0341)	(0.0380)	(0.0927)
Cap	-0.177**	-0.224***	-0.639***
	(0.0710)	(0.0778)	(0.230)
Prof	1.323***	1.308***	1.612***
	(0.285)	(0.308)	(0.417)
GDP	1.753***	0.774***	0.693***
	(0.119)	(0.200)	(0.245)
Pi	-0.574***	-1.033***	-1.272***
	(0.127)	(0.166)	(0.202)
Country FE	No	Yes	Yes
Year FE	No	Yes	Yes
Observations	2019	2019	2019
No. banks			329
No. instruments			323
R^2	0.31	0.36	
F	72.24	37.62	36.10
AB AR(1) test			0.00
AB AR(2) test			0.88
Hansen J			0.40

Notes: The dependent variable is the real rate of growth of net loans at the bank level. The sample is 440 banks in 10 CEE countries in years 1998-2012. $L.D.NetLoans$ is the lagged dependent variable, FGN and GOV are dummy variables for foreign and government ownership and MP is a change in the average nominal interest rate (monetary policy). Details of all variables construction and data sources are described in the Appendix. (1) is the pooled OLS regression, (2) is an OLS regression with time and country fixed effects, (3) is a system-GMM regression. Estimates are reported for the full set of regressors. Robust standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

characteristics may change abruptly in the wake of a take-over.

To confirm the robustness of our benchmark results we run two alternative specifications of our benchmark model. First, we exclude the take-over observations, that is, the bank-year observations where FGN changes from 0 to 1. We label this exercise as "no switch years" and present the results in columns (1)-(3) of Table 4. Second, we remove all banks that ever experienced a change in FGN from 0 to 1. We label this exercise as "no switch banks" and present the results in columns (4)-(6) of Table 4. The two main findings of this paper are robust: the existence of the bank lending channel (negative and significant MP estimate) and the differences in the bank lending channel between foreign and domestic private banks (positive and significant estimate of the interaction term $FGN * MP$).

Table 4: Robustness - Ownership

	(1) OLS	(2) FE	(3) GMM	(4) OLS	(5) FE	(6) GMM
FGN	-3.206***	-2.413**	-2.134	-2.953***	-2.355*	-3.823**
	(1.066)	(1.099)	(1.609)	(1.130)	(1.218)	(1.571)
MP	-2.072***	-1.851***	-1.619**	-1.688***	-1.610**	-1.557**
	(0.553)	(0.562)	(0.649)	(0.598)	(0.647)	(0.661)
FGN*MP	1.628**	1.690***	1.519**	1.414**	1.481**	1.359*
	(0.634)	(0.616)	(0.661)	(0.708)	(0.720)	(0.744)
Country FE	No	Yes	Yes	No	Yes	Yes
Year FE	No	Yes	Yes	No	Yes	Yes
Observations	1950	1950	1950	1518	1518	1518
No. banks			326			264
No. instruments			323			270
R^2	0.33	0.37		0.31	0.35	
F	74.21	37.79	27.53	63.89	29.04	39.59
AB AR(1) test			0.00			0.00
AB AR(2) test			0.90			0.41
Hansen J			0.34			0.43

Notes: The dependent variable is the real rate of growth of net loans at the bank level. The sample is 440 banks in 10 CEE countries in years 1998-2012. FGN is a foreign ownership dummy and MP is a change in the average nominal interest rate (monetary policy). Details of all variables construction and data sources are described in the Appendix. Models (1)-(3) are "no switch years": all observations when FGN changes from 0 to 1 are excluded. Models (4)-(6) are "no switch banks": all observations for all banks that have experienced a change in FGN from 0 to 1 are excluded. Estimates for macro and bank controls are suppressed. Robust standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Monetary Policy Independence. Our sample consists of countries with similar, albeit not identical monetary policy arrangements. While in the analyzed period the majority of the countries followed an independent monetary policy interest rate setting rule, some countries had their exchange rate pegged to the euro and some did not enjoy an independent monetary policy at all, due to their presence in the common currency area. Our hypothesis is that banks, when deciding on their credit growth, take into account monetary policy rate regardless of what a monetary policy regime produced that rate. Thus, we expand our baseline model to include the dummy variable $FixedXR$ for a fixed exchange rate. It takes 1 for all observations from a country that in a given year either was in the Eurozone or had its currency pegged to the euro. We also include an interaction term between $FixedXR$ and monetary policy variable MP, to control whether the bank lending channel works differently in economies with a fixed exchange rate.

Results of this analysis are reported in columns (1)-(3) of Table 5. The estimates of the $FixedXR$ are insignificant, thus a monetary policy arrangement does not affect the growth of credit at the bank-level. Also, the estimates of the interaction term are insignificant, thus we do not find differences in the operations of the bank lending channel in economies with fixed compared to floating exchange rate. The estimates of FGN, MP and their interaction term are the same as in the benchmark model.

Financial Crisis. Next, we distinguish between reactions to monetary policy in normal times and during the global financial crisis. We introduce a crisis dummy (equals 1 for years 2008-2010) and its interaction with the monetary policy variable MP. Naturally, in the three models that include time dummy for the financial crisis, we abstract from the time fixed effects, due to collinearity. The results of the exercise are presented in

Table 5: Further Tests - Monetary Policy Independence and Crisis

	(1) OLS	(2) FE	(3) GMM	(4) OLS	(5) FE	(6) GMM
FGN	-2.898***	-1.990*	-1.581	-2.184**	-1.748	-1.522
	(1.062)	(1.089)	(1.589)	(1.055)	(1.098)	(1.603)
MP	-2.064***	-1.852***	-1.572**	-1.941***	-1.728***	-1.774**
	(0.569)	(0.584)	(0.652)	(0.608)	(0.598)	(0.695)
FGN*MP	1.562**	1.648***	1.408**	1.671***	1.646***	1.497**
	(0.647)	(0.628)	(0.686)	(0.636)	(0.623)	(0.713)
FixedXR	-1.038	0.394	4.139			
	(1.219)	(2.590)	(3.164)			
FixedXR*MP	-0.277	-0.152	-0.0296			
	(0.849)	(0.894)	(0.816)			
Crisis				-9.921***	-11.60***	-17.22***
				(1.188)	(1.271)	(1.994)
Crisis*MP				0.247	1.758	-1.268
				(1.128)	(1.372)	(2.884)
Country FE	No	Yes	Yes	No	Yes	Yes
Year FE	No	Yes	Yes	No	No	No
Observations	2019	2019	2019	2019	2019	2019
No. banks			329			329
No. instruments			325			313
R^2	0.32	0.36		0.34	0.35	
F	61.37	35.56	36.41	71.14	46.02	33.63
AB AR(1) test			0.00			0.00
AB AR(2) test			0.90			0.87
Hansen J			0.37			0.40

Notes: The dependent variable is the real rate of growth of net loans at the bank level. The sample is 440 banks in 10 CEE countries in years 1998-2012. FGN is a foreign ownership dummy and MP is a change in the average nominal interest rate (monetary policy). Models (1)-(3) include fixed exchange rate dummy $FixedXR$ and its interaction with MP. Models (4)-(6) include financial crisis dummy and its interaction with MP. Details of all variables construction and data sources are described in the Appendix. Estimates for macro and bank controls are suppressed. Robust standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

columns (4)-(6) of Table 5. During financial crisis of 2008-2010 bank lending contracted sharply. Therefore it is not surprising that the estimates of the financial crisis dummy are negative, statistically significant (at 1% confidence level) and large in absolute values. Bank lending in a crisis year was growing between 9 and 17 percentage points slower than in a tranquil year.

This specification provides the most powerful robustness check, as the results are markedly different than Wu et al. (2011). They observe the difference in the bank lending channel between foreign and domestic banks only in crisis periods. We find that the bank lending channel works just the same during tranquil and crisis times, as the interaction term $Crisis * MP$ is insignificant. The discrepancy between the results may be due to one (or more) of the three reasons. First, their sample includes also Latin American and East Asian countries, which have different legal environments, banking regulations and have experienced more volatile output fluctuations than our sample of only Central and Eastern Europe economies. Second, their timeframe is shorter, namely 1996-2003 compared to our 1998-2012. Third, the combination of the first two factors results in a very different meaning of the crisis times. In their sample crises are local and primarily related to banking sector. In our sample crisis is a singular, global and economy-wide event, while local

banking crises are virtually non-existent.

Allen et al. (2015) find that foreign banks contract their lending during crisis times more than domestic. We do not test their hypothesis in the data, as the focus of our paper is different. Our results suggest, that we should attribute differences between domestic and foreign banks lending to their different reactions to monetary policy. We find that those differences are systematic and are present both in tranquil and crisis times.

3.3 Inside the Bank Lending Channel

In the previous subsections we have established that domestic and foreign banks react differently to changes in monetary policy. In particular, foreign banks response is muted compared to domestic banks. In this subsection, we ask what are the underlying drivers of this fact. We do so in the spirit of Gambacorta (2005), which is the first study that investigates the heterogeneity of the bank lending channel (in the sample of Italian banks between 1986 and 2001). We introduce interactions of the monetary policy instrument with bank-level characteristics to our regression equation, but keep the distinction between foreign and domestic banks and *FGN*MP* interaction (which is not considered in Gambacorta (2005). We estimate the following regression equation:

$$\begin{aligned} D.NetLoans_{ijt} = \beta_0 + \beta_1 FGN_{it} + \beta_2 MP_{jt} + \beta_3 MP_{jt} * FGN_{it} + \beta_4 \text{Bank}_{it} + \beta_5 \text{Economy}_{jt} + \\ + \beta_6 MP_{jt} * Bank_{it} + \beta_7 MP_{jt} * FGN_{it} * Bank_{it} + \varepsilon_{it}. \end{aligned} \tag{2}$$

This exercise enables us to determine how the bank lending channel operates when we account for the heterogeneity at the bank level. Interactions $MP_{jt} * Bank_{it}$ capture the nature of the bank lending channel of all banks in the sample. Interactions $MP_{jt} * FGN * Bank_{it}$ capture the nature of the difference between the bank lending channel in domestic and foreign banks. If flows from the parent bank mitigate the imperfect substitutability of assets that gives rise to the bank lending channel, we should see the coefficient β_3 to be positive and significant. In other words, if *internal capital market* hypothesis is true, we should observe positive and significant β_3 despite adding interaction terms. The results of this exercise are displayed in Table 6.

The results offer two new lessons. First, the driver of the bank-lending channel in our sample is operating mostly through larger and more liquid banks (columns (1)-(3)). There is nothing, however, to be learned about the difference in the bank lending channel between foreign and domestic banks, the coefficient at the interaction of foreign ownership dummy and monetary policy indicator is still positive and significant.

Second, once we incorporate within-foreign-banks heterogeneity (columns (4)-(6)), we learn that it is foreign banks profitability that differentiates their response to monetary policy. We also notice that the estimate of $FGN * MP$ interaction becomes insignificant. That is, we can explain differences in the bank

Table 6: Inside the Bank Lending Channel

	(1) OLS	(2) FE	(3) GMM	(4) OLS	(5) FE	(6) GMM
FGN	-2.834***	-1.956*	-1.438	-2.891***	-2.031*	-1.536
	(1.067)	(1.096)	(1.666)	(1.069)	(1.093)	(1.660)
MP	-1.170	-0.941	0.543	-0.0660	0.300	1.124
	(0.932)	(0.977)	(0.954)	(1.339)	(1.317)	(1.305)
FGN*MP	1.629**	1.745***	1.617**	0.320	0.150	0.771
	(0.655)	(0.632)	(0.687)	(1.523)	(1.489)	(1.488)
MP*Cap	-0.0202	-0.0108	-0.0442	-0.0424	-0.0662	-0.0581
	(0.0405)	(0.0422)	(0.0319)	(0.0978)	(0.100)	(0.108)
MP*Size	-0.0568**	-0.0502*	-0.105***	-0.0495	-0.0728	-0.0837*
	(0.0284)	(0.0276)	(0.0315)	(0.0653)	(0.0618)	(0.0468)
MP*Prof	0.131	0.0983	0.0945	-0.252	-0.240	-0.297
	(0.148)	(0.160)	(0.139)	(0.213)	(0.214)	(0.225)
MP*Liq	-0.0183	-0.0221	-0.0399**	-0.0347	-0.0251	-0.0443
	(0.0185)	(0.0187)	(0.0200)	(0.0434)	(0.0427)	(0.0513)
FGN*MP*Cap				0.0248	0.0652	0.0248
				(0.104)	(0.107)	(0.114)
FGN*MP*Size				0.0217	0.0583	0.0182
				(0.0773)	(0.0748)	(0.0633)
FGN*MP*Prof				0.527**	0.475*	0.547**
				(0.239)	(0.247)	(0.272)
FGN*MP*Liq				0.0129	0.000101	-0.00198
				(0.0468)	(0.0457)	(0.0529)
Country FE	No	Yes	Yes	No	Yes	Yes
Year FE	No	Yes	Yes	No	Yes	Yes
Observations	2019	2019	2019	2019	2019	2019
No. banks			329			329
No. instruments			327			335
R^2	0.32	0.37		0.32	0.37	
F	55.89	33.77	32.97	38.66	28.30	30.67
AB AR(1) test			0.00			0.00
AB AR(2) test			0.84			0.96
Hansen J			0.36			0.42

Notes: The dependent variable is the real rate of growth of net loans at the bank level. The sample is 440 banks in 10 CEE countries in years 1998-2012. FGN is a foreign ownership dummy and MP is a change in the average nominal interest rate (monetary policy). Details of all variables construction and data sources are described in the Appendix. Models (1)-(3) include interactions of MP with the bank characteristics. Models (4)-(6) additionally include interactions of MP with FGN and the bank characteristics. Estimates for macro and stand alone bank controls are suppressed. Robust standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

lending channel using only within-group heterogeneity. Based on this result we offer an alternative way of understanding the bank lending channel differences between domestic and foreign banks.

Foreign banks are on average more profitable than their domestic counterparts. As our results point out, these are the two characteristics that have the power in explaining the bank lending channel. Both can be related to demand heterogeneity, competitive advantage (better selection) and strategic interactions between banks but not necessarily to capital flows and transfers with a parent bank. Thus, we conclude that the tamed response of foreign banks to monetary policy may be due to market segmentation rather than an effect of intra-group capital flows. This is the third main contribution of this paper. The results of the next subsection further strengthen this point.

3.4 Outside the Bank Lending Channel

In the last subsection we zoomed in and investigated the forces operating inside the bank lending channel. In this subsection we zoom out and ask whether foreign banks react to developments in: their home country and their parent bank. An *internal capital market* hypothesis predicts that they should. We are interested whether foreign variables affect the bank lending channel in a host country, thus in this subsection we go "outside" the bank lending channel.

We have collected the data on the rate of growth of GDP per capita and monetary policy short term interest rates for the 22 countries that we identified as foreign banks' home countries[6] for the years 1998-2012. Using these data we estimate the following regression equation:

$$\begin{aligned} D.NetLoans_{ijt} = \beta_0 + \beta_1 \text{FGN}_{it} + \beta_2 \text{MP}_{jt} + \beta_3 \text{MP}_{jt} * \text{FGN}_{it} + \beta_4 \text{Bank}_{it} + \beta_5 \text{Economy}_{jt} + \\ + \beta_6 GDP_{Pit} + \beta_7 MP_{Pit} + \varepsilon_{it}. \end{aligned} \tag{3}$$

where GDP_P is the rate of growth of per capita GDP in home (parent) country of a foreign bank and MP_P is the yearly change in the average nominal interest rate in the home (parent) country of a foreign bank. For consistency GDP_P and MP_P are equal to 0 for all non-foregin banks. Observing positive and significant β_6 and negative and significant β_7 would be a strong signal that the *internal market* hypothesis is at work.

Next, we have collected the data on the bank-level characteristics for the parent banks. We have identified 124 parent banks and a total of 2151 bank-year observations. This is a reasonably high number of banks and observations, given that not every bank in our sample has a foreign owner, that many foreign banks may have the same owner and that many foreign banks have dispersed ownership and non-bank owners. We estimate the following regression equation:

$$\begin{aligned} D.NetLoans_{ijt} = \beta_0 + \beta_1 \text{FGN}_{it} + \beta_2 \text{MP}_{jt} + \beta_3 \text{MP}_{jt} * \text{FGN}_{it} + \beta_4 \text{Bank}_{it} + \beta_5 \text{Economy}_{jt} + \\ + \beta_6 Bank_{Pijt} + \varepsilon_{it}. \end{aligned} \tag{4}$$

where $Bank_P$ is a vector of bank controls for the parent bank: capitalization, profitability and liquidity $(Cap_P, Prof_P, Liq_P)$ constructed identically as the respective controls for subsidiaries. As we do not have the data on asset levels for all banks in all home countries we do not construct the respective variable for size. If the *internal market* hypothesis is at work then at least some of the estimates in β_6 will be significant.

The results of both exercises are displayed in Table 7. In columns (1)-(3) we test whether credit growth in foreign banks is affected by home country macroeconomic conditions. We find that foreign banks do not

[6] Home country is the country where the headquarters of the biggest foreign immediate owner are located. We have 19 countries in the European Union plus Norway, Russia and the US. We skipped the data collection for the countries that are home countries for less than five foreign banks in the sample. Data for the EU countries and Norway come from the Eurostat, for the other two from the IMF. The two sources have been crossed-checked for consistency.

Table 7: Outside the Bank Lending Channel

	(1) OLS	(2) FE	(3) GMM	(4) OLS	(5) FE	(6) GMM
FGN	-2.838***	-2.145*	-1.694	-3.755*	-2.022	-2.332
	(1.070)	(1.097)	(1.607)	(1.974)	(1.954)	(2.259)
MP	-1.988***	-1.752***	-1.513**	-2.034***	-1.721***	-1.453**
	(0.561)	(0.574)	(0.642)	(0.560)	(0.594)	(0.659)
FGN*MP	1.316**	1.501**	1.238*	1.768***	1.698**	1.364**
	(0.655)	(0.642)	(0.703)	(0.673)	(0.665)	(0.679)
GDP_P	0.395	0.465*	0.400			
	(0.259)	(0.256)	(0.301)			
MP_P	1.415**	0.640	0.563			
	(0.647)	(0.679)	(0.798)			
Cap_P				0.0228	0.0426	0.0485
				(0.0524)	(0.0510)	(0.0816)
$Prof_P$				0.333	0.266	0.158
				(0.221)	(0.201)	(0.322)
Liq_P				0.00978	-0.0218	-0.0108
				(0.0390)	(0.0381)	(0.0448)
Country FE	No	Yes	Yes	No	Yes	Yes
Year FE	No	Yes	Yes	No	Yes	Yes
Observations	2019	2019	2019	1493	1493	1493
No. banks			329			260
No. instruments			325			330
R^2	0.32	0.37		0.32	0.36	
F	63.51	35.68	25.90	43.22	25.35	36.04
AB AR(1) test			0.00			0.00
AB AR(2) test			0.87			0.56
Hansen J			0.34			1.00

Notes: The dependent variable is the real rate of growth of net loans at the bank level. The sample is 440 banks in 10 CEE countries and 124 parent banks in 21 countries in years 1998-2012. FGN is a foreign ownership dummy and MP is a change in the average nominal interest rate (monetary policy). Details of all variables construction and data sources are described in the Appendix. Models (1)-(3) control for economic situation in the home country of the foreign bank. Models (4)-(6) control for the financial situation of the parent bank of a foreign bank. Estimates for host country macro and bank controls are suppressed. Robust standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

react to economic variables in their home countries. We only observe a very weak reaction to the GDP growth in the fixed effects model and a reaction to monetary policy in the pooled OLS model, but neither of the two effects survive in the system-GMM estimation. If these estimates were significant, the *internal market* hypothesis would gain strong support. However, the lack of significance is not enough to disprove the hypothesis. It could well be, that parent banks are well diversified and hardly react to macroeconomic developments in their home countries. Therefore it is necessary to look directly into balance sheets of parent banks.

In columns (4)-(6) we test whether credit growth in foreign banks is affected by parent banks financial conditions. We find that foreign banks do not depend on neither capitalization, nor profitability nor liquidity of their parent bank. Foreign banks behavior does not depend on balance sheet conditions of their owner bank. We conclude that the data does not provide evidence for the existence of the *internal capital market* hypothesis[7].

[7] This result echoes the results of Allen et al. (2015), where they show that it is only parent bank's capitalization and only

The third main contribution of this paper is that the data does not provide strong support for the *internal market* hypothesis. We have shown this in three steps. First, in Table 6 we provide evidence that differences in the bank lending channel between foreign and domestic banks can be attributed to the observed differences within and between the groups. After controlling for interactions between monetary policy and bank characteristics there is no residual difference that could be attributed to the existence of the internal capital market. Second, in columns (1)-(3) of Table 7 we show that foreign banks do not react to macroeconomic variables in the country of their parent. Third, in columns (4)-(6) of Table 7 we show that foreign banks do not depend on the balance sheet conditions of their parent bank.

4 Discussion

In this section we discuss an alternative explanation of the differences between foreign and domestic banks. We propose the *market segmentation* hypothesis. Under this hypothesis bank clients are heterogeneous. Foreign banks service more reliable clients whose credit responds less to macroeconomic conditions. Firstly, a foreign bank may inherit credit relationships with clients of its parent bank. When there is selection into foreign expansion, then foreign-owned banks lend to more productive clients. De Haas and Naaborg (2006) find that an acquisition of a domestic bank by a foreign bank leads to a bias in the acquired bank's lending towards large multinational companies. Secondly, when foreign-owned banks have better know-how (e.g. screening technology or marketing) then they can grant credit to more reliable clients, who can service their liabilities even under high interest rates. Bonin et al. (2005) finds evidence that foreign banks bring know-how into the CEE economies' banking sectors and Beck and Brown (2015) show that foreign banks in the CEE economies cherry-pick financially transparent clients.

When the *internal market* hypothesis is at work, an increased presence of foreign-owned banks weakens monetary policy transmission channel. A host country becomes prone to an instability abroad, as foreign banks import foreign shocks through the internal capital market. On the other hand, foreign banks are also less prone to variations in host country GDP and a monetary policy rate. When *market segmentation* hypothesis is at work however, increased presence of foreign-owned banks has no impact on the bank lending channel in the aggregate.

Under *internal market* hypothesis, due to facilitated capital flows with a parent bank, foreign banks should be able to adjust their capital structure more easily than domestic banks and also volatility of dividends should be larger in foreign banks. Those assumption yield testable consequences: i) standard deviation of capitalization in foreign banks is higher than in domestic banks, ii) standard deviation of dividend ratio in foreign banks is higher than in domestic banks. Furthermore, the *internal market* hypothesis implies that foreign banks should iii) react to innovations abroad (namely to the changes in the interest rate and GDP in the country of the parent bank) and iv) depend on balance sheet conditions of their parent bank.

during crisis times that matters for subsidiary's lending.

Table 8: Internal Market versus Market Segmentation Hypotheses

Hypothesis	Data Test	Result	Conclusion
Internal Market	$\sigma(Cap^{fgn}) - \sigma(Cap^{dom})$	= -0.951***	NO
	$\sigma(Div^{fgn}) - \sigma(Div^{dom})$	= -4.005	NO
	Fgn. banks react to GDP and MP in home economy	Table 7	NO
	Fgn. banks depend on parent bank balance sheet	Table 7	NO
Market Segmentation	$Prof^{dom} - Prof^{fgn}$	Table 1	0
	$Size^{dom} - Size^{fgn}$	Table 1	YES

* p<0.10, ** p<0.05, *** p<0.010

The *market segmentation* hypothesis implies on the other hand, that foreign banks do not react to the innovations abroad and that their reaction to the changes in the host country GDP are the same as domestic banks. Furthermore, under *market segmentation* i) domestic banks should be on average less profitable and ii) smaller than foreign banks. We collect these testable differences and test results in Table 8.

None of the four *internal market* hypothesis implications are to be found in the data. The data point towards the *market segmentation* hypothesis. Anginer et al. (2017) study what factors can help insulate affiliates from their parent banks and show that parent-subsidiary interdependence is lower for subsidiaries that are more independently managed and when host country banking sector is better regulated. On the other hand, foreign banks are significantly bigger, they are also more profitable, but the difference is not significantly different from zero. We note however, that to conduct a direct test one would need data on the intra-group capital flows, hence the results we provide in this section should be treated with caution.

5 Conclusions

We have investigated empirically the role of foreign banks in the bank lending channel of monetary policy. We have made three contributions. First, we show that banks adjust their loans to changes in host country's monetary policy. Second, we show that foreign-owned banks are less responsive to monetary policy of a host country than domestic banks in both normal and crisis times. Third we show that the data do not support the conventional view behind this heterogeneity - the *internal market* hypothesis.

We have discussed whether foreign-owned banks presence may pose additional challenges for policy makers. This happens when the differential response to monetary policy by banks with different ownership is driven by flows between the subsidiary and the owner, an *internal capital market*. An increased presence of foreign-owned banks would decrease the strength of the bank lending channel.

We argue that *market segmentation* in the banking sector is a more likely driver of the observed difference.

An increased presence of foreign-owned banks in the economy does not weaken the bank lending channel. However, under this hypothesis an increased penetration by foreign banks may yield competition concerns for the policy makers. If the weakest, least productive banks are not taken-over by foreign banks then monetary policy may affect their profitability and sector concentration.

Therefore, we believe it is worthwhile to approach the issue of foreign banks penetration and monetary policy in a dynamic industry competition model. It would be interesting to analyze individual country data complementing the cross-country patterns. Possibly different individual experiences can be explained in greater detail by country-specific banking competition factors. This we leave for the future research.

References

Adams-Kane, J., J. A. Caballero, and J. J. Lim (2013): "Foreign bank behavior during financial crises," Policy Research Working Paper Series 6590, The World Bank.

Allen, F., K. Jackowicz, O. Kowalewski, and Ł. Kozłowski (2015): "Bank lending, crises, and changing ownership structure in Central and Eastern European countries," *Journal of Corporate Finance*.

Anginer, D., E. Cerutti, and M. S. M. Pería (2017): "Foreign bank subsidiaries' default risk during the global crisis: What factors help insulate affiliates from their parents?" *Journal of Financial Intermediation*, 29, 19 – 31.

Arellano, M. and S. Bond (1991): "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations," *Review of Economic Studies*, 58, 277–97.

Arellano, M. and O. Bover (1995): "Another look at the instrumental variable estimation of error-components models," *Journal of Econometrics*, 68, 29 – 51.

Aydin, B. (2008): "Banking Structure and Credit Growth in Central and Eastern European Countries," IMF Working Papers 08/215, International Monetary Fund.

Beck, T. and M. Brown (2015): "Foreign bank ownership and household credit," *Journal of Financial Intermediation*, 24, 466 – 486.

Bernanke, B. S. and A. S. Blinder (1992): "The Federal Funds Rate and the Channels of Monetary Transmission," *American Economic Review*, 82, 901–21.

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

Bonin, J. P., I. Hasan, and P. Wachtel (2005): "Bank performance, efficiency and ownership in transition countries," *Journal of Banking & Finance*, 29, 31–53.

Brzoza-Brzezina, M., T. Chmielewski, and J. Niedzwiedzinska (2010): "Substitution between domestic and foreign currency loans in Central Europe. Do central banks matter?" Working Paper Series 1187, European Central Bank.

Campello, M. (2002): "Internal Capital Markets in Financial Conglomerates: Evidence from Small Bank Responses to Monetary Policy," *The Journal of Finance*, 57, 2773–2805.

Claessens, S. and N. Van Horen (2013): "Impact of Foreign Banks," *Journal of Financial Perspectives*, 1, 29–42.

De Haas, R. and I. Naaborg (2006): "Foreign banks in transition countries. To whom do they lend and how are they financed?" MPRA Paper 6320, University Library of Munich, Germany.

De Haas, R. and I. van Lelyveld (2006): "Foreign banks and credit stability in Central and Eastern Europe. A panel data analysis," *Journal of Banking & Finance*, 30, 1927–1952.

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

Gambacorta, L. (2005): "Inside the bank lending channel," *European Economic Review*, 49, 1737–1759.

Kashyap, A. K. and J. C. Stein (2000): "What Do a Million Observations on Banks Say about the Transmission of Monetary Policy?" *American Economic Review*, 90, 407–428.

Mathieson, D. J. and J. Roldos (2001): "The Role of Foreign Banks in Emerging Markets," .

Micco, A. and U. Panizza (2006): "Bank ownership and lending behavior," *Economics Letters*, 93, 248–254.

Naaborg, I. and R. Lensink (2008): "Banking in transition economies: does foreign ownership enhance profitability?" *The European Journal of Finance*, 14, 545–562.

Ongena, S., J. Peydro, and N. v. Horen (2013): "Shocks Abroad, Pain at Home? Bank-firm Level Evidence on the International Transmission of Financial Shocks," Discussion Paper 2013-040, Tilburg University, Center for Economic Research.

Peek, J. and E. S. Rosengren (1997): "The International Transmission of Financial Shocks: The Case of Japan," *American Economic Review*, 87, 495–505.

Schmitz, B. (2004): "What role do banks play in monetary policy transmission in EU accession countries," in *3rd Macroeconomic Policy Research Workshop on October*, 29–30.

Wu, J., A. C. Luca, and B. N. Jeon (2011): "Foreign bank penetration and the lending channel in emerging economies: Evidence from bank-level panel data," *Journal of International Money and Finance*, 30, 1128–1156.

6 Appendix

6.1 Data construction and definitions

Table 9: Definitions of variables

Dependent Variable	
$D.NetLoans$	Growth rate of Net Loans in a given bank in a current year less inflation rate in host country multiplied by 100. To neutralize the impact of outliers this variable is winsorized at 5^{th} and 95^{th} percentile. Net Loans reported in local currency. Source of Net Loans: Bankscope. Source of Inflation: Eurostat.
Monetary Policy	
MP	Monetary policy tool; yearly average of Repo Rate of the central bank in a host country less yearly average in a previous year. To neutralize the impact of outliers this variable has been cleaned from values lower than -10 (no observations were higher than +10). Source: ECB and central bank's websites.
MP_P	Foreign monetary policy tool; defined only for observations with $FGN = 1$; yearly average of Repo Rate of the central bank in a residence country of major foreign owner in a given year minus the yearly average in a previous year. Source: ECB and central bank's websites.
$FixedXR$	Monetary Policy dummy; takes value 1 if a country is within a Eurozone or in a currency peg and 0 otherwise.
Ownership	
FGN	Foreign ownership dummy. Takes value 1 if more than 50% of the shares of a bank in a given year are owned by a party located in a different country. Source: Bankscope and individual banks' websites.
GOV	Government ownership dummy. Takes value 1 if more than 50% of the shares of a bank in a given year are owned by a government of the host country. Source: Bankscope and individual banks' websites.
Bank Controls	
$Size$	Bank's size; Total Assets in a bank in a given year divided by the sum of Total Assets in all banks in host country in the same year times 100; winsorized at 99^{th} percentile. Total Assets reported in local currency. Source: Bankscope.
Liq	Bank's liquidity; Liquid Assets divided by Total Assets times 100; winsorized at 99^{th} percentile and cleared from negative values. Total Assets and Liquid Assets reported in local currency. Source: Bankscope.
Cap	Bank's capitalization; Total Equity divided by Total Assets times 100; winsorized at 99^{th} percentile and cleared from negative values. Total Assets and Total Equity reported in local currency. Source: Bankscope.
$Prof$	Bank's profitability; Operating Profit divided by Total Assets times 100; winsorized at 1^{st} and 99^{th} percentile. Total Assets and Operating Profit reported in local currency. Source: Bankscope.
Macro Controls	
GDP	Growth rate of real GDP per capita in host country. Source: Eurostat.
Pi	Inflation in country j in year t. Source: Eurostat.
GDP_P	Growth rate of real GDP per capita in country where the parent bank is located. Source: Eurostat and IMF.
$Crisis$	Financial Crisis dummy, takes value 1 for years 2008-2012.

Table 10: Comparison of bank controls across countries and ownership

	Size DOM	Size FGN	Liquidity DOM	Liquidity FGN	Capitalization DOM	Capitalization FGN	Profitability DOM	Profitability FGN
BG	4.28	6.22	40.05	28.58	17.74	13.02	1.13	1.34
CZ	3.30	3.89	33.12	24.71	10.55	10.19	0.42	1.04
EE	2.12	8.22	35.42	26.96	16.62	15.70	0.61	0.24
HR	1.39	5.82	30.06	28.64	15.76	13.40	0.55	0.78
HU	6.73	2.89	35.05	29.35	9.90	11.68	0.91	0.91
LT	4.42	13.19	29.88	22.59	12.91	9.58	0.07	-0.07
LV	4.97	7.30	42.56	30.16	13.47	10.60	0.83	-0.13
PL	3.94	2.87	16.05	20.10	11.82	13.12	1.41	1.44
RO	4.70	4.24	34.98	30.73	18.21	13.01	0.96	0.74
SI	5.76	3.51	21.19	16.95	9.35	7.79	0.74	0.31
SK	5.31	6.42	39.55	30.13	21.12	10.15	0.39	0.85
Total	4.04	4.79	31.17	26.29	14.05	11.93	0.79	0.90

Table 11: Comparison of bank controls across years and ownership

	Size DOM	Size FGN	Liquidity DOM	Liquidity FGN	Capitalization DOM	Capitalization FGN	Profitability DOM	Profitability FGN
1998	5.89	4.78	38.09	42.69	16.88	12.05	0.14	0.93
1999	5.87	4.59	37.43	42.02	16.75	14.32	1.09	0.83
2000	5.83	4.62	41.97	40.54	17.73	13.27	1.22	1.12
2001	5.67	5.42	46.40	40.42	16.36	12.74	0.98	1.07
2002	5.18	5.75	42.12	38.20	15.45	13.05	1.48	1.65
2003	3.88	5.76	38.18	34.25	14.38	12.59	1.13	1.47
2004	3.50	5.30	33.59	31.66	13.26	12.74	1.60	1.46
2005	3.26	4.69	32.71	30.27	13.50	11.20	1.63	1.39
2006	3.09	4.82	30.27	28.23	13.03	11.48	1.41	1.20
2007	3.08	4.83	26.19	24.93	13.11	10.95	1.54	1.30
2008	2.84	4.50	21.46	19.42	13.81	11.11	0.53	0.89
2009	2.98	4.28	20.96	17.68	12.72	10.99	0.16	-0.16
2010	2.91	4.33	22.49	17.13	11.37	11.63	-0.23	0.24
2011	3.08	4.48	22.31	17.15	10.62	11.77	-0.81	0.40
2012	3.37	5.27	22.03	16.38	11.11	12.13	0.02	0.36
Total	4.16	4.88	32.35	27.87	14.21	12.02	0.79	0.92

6.2 Data coverage

Table 12: Data coverage by country

	Number of bank-years		Sample coverage (in %)	
	ownership	net loans	in # of bank-years	in volume of net loans
BG	353	288	95.83	99.31
CZ	430	381	88.19	91.00
EE	114	97	91.75	99.25
HR	527	476	98.32	99.69
HU	448	455	84.40	98.50
LT	145	130	99.23	99.31
LV	310	229	98.69	98.76
PL	683	478	92.68	98.56
RO	437	344	92.44	99.57
SI	282	256	92.58	97.66
SK	279	246	93.09	95.49
Total	4008	3380	92.75	97.25

Table 13: Data coverage by year

	Number of bank-years		Sample coverage (in %)	
	ownership	net loans	in # of bank-years	in volume of net loans
1998	242	163	93.87	88.34
1999	242	168	91.67	89.22
2000	252	183	88.52	89.78
2001	244	176	86.93	87.29
2002	251	179	90.50	90.40
2003	266	188	94.68	93.31
2004	271	223	94.62	96.95
2005	282	251	95.22	96.70
2006	268	249	95.18	96.75
2007	266	253	93.28	96.95
2008	289	267	95.13	99.73
2009	282	283	91.52	98.43
2010	284	286	91.61	99.03
2011	284	272	93.75	97.65
2012	285	239	92.05	98.43
Total	4008	3380	92.75	97.25