Global Banking Crises and Emerging Markets

Edited by
Josef C. Brada and Paul Wachtel

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1
Introduction

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The importance of finance for economic development is now well understood by both economic researchers and policy makers. Robust financial intermediaries that can efficiently allocate resources to the most productive uses are the foundation of a successful growth strategy. Interestingly, this has not always been the case. Mid-20th-century economic development discussions paid little attention to finance; its role only became clear in the last 25 years or so.

In ideal circumstances, a growing economy will have a wide range of intermediary institutions, including informal sources of financing, venture capital, banks and other depositories, institutional investors such as pension funds and capital markets including organized equity markets and stock exchanges. In practice, banks are the most important intermediary in emerging market economies, which typically do not have a venture capital industry or developed capital market institutions. The principal source of business financing and household borrowing, once informal sources such as friends and family are exhausted, is the banking system. Thus, growth and development can be stifled when banks are unable to provide financing for growing firms.

Often, domestic banks are not able to supply the necessary loans to the private sector due to low domestic savings, and what loans they do make are often directed in suboptimal ways due to the banks' inability to screen borrowers effectively or to the ties they have to their traditional borrowers. As a result, emerging market countries have been a fertile field of activity for foreign banks that are able to establish new affiliates or to acquire local banks. These foreign-owned affiliates and branches increase competition in the banking sector and bring in the technology for new financial services and products such as mortgage instruments, household finance and formal models for risk evaluation. Though often

opposed by entrenched local business interests, foreign-owned banks are now common in virtually all emerging markets and often have a dominant market share.

At the same time, foreign domination of the banking sector remains controversial for several reasons. The first is that, if the local affiliate uses its foreign owner as a source of funds, the funding can be retracted quickly and often for reasons not related to business conditions in the host country. To some extent, the recent financial crisis was transmitted to emerging markets through the contraction of this foreign funding channel. The currency mismatch between the funds provided by the foreign owner, which are denominated in foreign currency such as dollars or Euros, and the loans made by local affiliates to their clients, which are often in the local currency, are an additional source of risk. This mismatch creates additional risk for the foreign parent in case the host country's currency depreciates, and it also leads to a tendency for local affiliates to make loans to domestic clients that are denominated in the currency of the parent bank, thus passing the risk, and potential instability, on to local borrowers. Extensive mortgage lending in Euros or Swiss Francs has been a source of political frictions when the domestic currency depreciates and borrowers look to the government to protect them. A second potentially negative consequence of foreign bank entry into emerging market countries is a growing concentration in the banking sector as local banks that are not taken over by foreign investors prove unable to compete with foreign-owned rivals. Thus, in some instances, foreign bank entry results in a decline in competition among banks that reduces the efficiency of financial intermediation as opposed to just the opposite instances where foreign entry brings competitive pressures to banking systems dominated by state-owned banks or banks controlled by powerful family business interests.

Third, large spreads between deposit rates in the owners' home countries and lending rates in the host countries may make lending in emerging market economies particularly attractive, leading to the possibility that foreign parent banks will encourage their affiliates in emerging market economies to increase lending to levels that may be imprudent, resulting in dangerous credit booms and asset price bubbles. The final problem arises from the fact that banking is a regulated activity, but bank regulators in emerging markets may lack the necessary expertise or regulatory tools to effectively regulate foreign-owned banks. Moreover, any such regulation involves cooperation between regulators in the host country and those in the country where the parent bank is located. The international regulatory regime, Basel II, soon

to be replaced by Basel III, emphasizes risk management tools for large complex banking institutions and takes little account of cross-border flows to emerging markets.

While these considerations apply to various degrees to all emerging market economies, they are most intensely evident in the countries of Central and East Europe (CEE) where foreign-owned banks now have a dominant market share in virtually every country. The CEE countries began transition in 1989 with relatively high levels of income and industrial development for emerging market economies, but their banking systems were rudimentary. Under central planning, most banking activities were carried out by a state-owned monobank whose lending activities were directed by economic plans and not by the financing needs or capacity to of repay borrowers. Thus, the creation of a market economy in CEE had as one of its most pressing needs the creation of a viable banking system. Typically the state-owned monobank was broken up into a number of commercial banks, at first state owned and later privatized, but these new banks were saddled with Communist-era loans to firms whose future was in doubt, and often they continued to extend loans to these firms. Faced with banking sector insolvency, governments adopted various strategies to clean up the banks' bad loans and recapitalize the banks. From the mid-1990s on, the strategies involved the sale of banks to foreign owners. Thus, the financial sectors of most transition countries came to be dominated by foreign-owned banks. Although the banking sectors remained highly concentrated, foreign ownership was widely lauded as the best way to modernize the financial system and improve its efficiency.

In many CEE countries, lending increased rapidly, not only to the corporate sector but also to households and governments. However, with the coming of the global financial crisis in 2008, capital flows to CEE dried up, putting a crimp on bank lending and raising fears that foreign parents of banks in the CEE countries would withdraw funds from the region in order to shore up their balance sheets at home. Even though the region was hard hit by the crisis, the banking sectors of the CEE countries withstood these challenges. Nevertheless, regulators in CEE countries, as in many other emerging markets, have sought to develop ways of regulating their banks better in order to strengthen them against future crises.

The chapters in this book have been written by recognized experts on international banking and on transition economies. All the chapters were previously published in *Comparative Economic Studies*, an international journal devoted to the study of emerging and market economies. They cover, in greater depth, the issues summarized above.

Chapters 2 through 5 examine the way in which foreign banks came to dominate the financial sectors of the transition countries and the main changes in credit markets that occurred as a result. Chapter 2, by Ralph de Haas, demonstrates both the benefits reaped from the entry of foreign banks and how the presence of foreign banks altered the competitive structure of the banking sector and of lending and, as well, the potential vulnerability of these economies to international financial crises. There is no clear way of determining the optimal mix of local and foreign funding. Domestic funding may be more stable but will result in less, and more expensive, borrowing, while foreign funding exposes the economy to external shocks. It would appear that the best answer might be foreign funding and a regulatory structure that accounts for external risks. John P. Bonin, in Chapter 3, focuses on the more important transition economies where the banking systems are mostly foreign owned, with the notable exception of Russia where state-owned banks still dominate. Bonin stresses the effects on the banking sector of the ways in which foreign banks enter the market. He argues that what he calls hybrid banks, created by foreign banks' takeovers of domestic banks, tend to be countercyclical in their lending behavior while banks created through greenfield investments tend to lend procyclically. Thus, the former should be more beneficial for the host economies. He identifies the key foreign banks involved in the acquisition of CEE banks and discusses the benefits and potential risks of the resulting banking sector structure. For example, the banking sectors in Hungary and Croatia are almost totally foreign owned and in both countries, two-thirds of bank loans in 2008 were denominated in foreign currencies.

Research in the next two chapters takes a detailed look at banking in the Czech Republic to address some important questions. In Chapter 4, Anca Pruteanu-Podpiera, Laurent Weill and Franziska Schobert examine the effect on bank efficiency that resulted from changes in the intensity of competition among banks in the Czech Republic. They find that the entry of foreign banks did not increase competition in the Czech banking sector, mainly because weak local banks disappeared and entry into the Czech banking sector was largely through the acquisition of local banks. Moreover they find that an increase in competition among banks reduces bank efficiency; thus the growing domination of Czech banking by foreign banks led to increases in the efficiency of bank operations. In Chapter 5, Adam Geršl and Petr Jakubík use bank and firm data to examine the extent of relationship banking in the Czech Republic. The term relationship banking refers to the use of soft or not publicly available information about firms that banks can accumulate from their

long-term relationships with customers. Banks will be successful in their lending activities if they are able to obtain and to act on accurate information about their clients. Such knowledge is costly to obtain and thus banks and firms find it to their advantage to form long-term relationships that permit firms to build credibility and banks to acquire knowledge about the firms they lend to. Geršl and Jakubík find that most Czech firms have a more or less exclusive relationship with one bank, especially if the firms are new or in dynamic industries. Riskier firms, on the other hand, tend to maintain relationships with more than one bank, presumably to avoid the discipline of being dependent on one source of credit. They illustrate the importance of banking relationships even in a young banking system like the Czech Republic. Overall, the findings of Chapters 4 and 5 suggest that the entry of foreign banks has driven out less efficient domestic banks and provided borrowers with better access to credit and modern banking techniques.

The credit-to-GDP ratios in transition countries were low through the turmoil of the 1990s. The foregoing chapters demonstrated the expansion of credit in the region associated with the entry of foreign banks. The rapid credit expansion was greeted as a positive development because it indicated a general deepening of the financial sector and increased access to borrowing throughout the economy, and the credit-to-GDP ratios increased rapidly. A question that was only occasionally raised by regulators and policy makers was whether such credit expansion could be "too much of a good thing." Growth-enhancing deepening of financial markets can also be associated with loose lending standards and increased risk in the banking system. The correct balance between financial deepening and credit boom can be hard to strike.

The next four chapters examine the dramatic expansion of credit to firms and to households that followed the modernization of banking in the CEE countries. Although the growth rates of lending by banks were inflated by the fact that lending started from very low levels, there were concerns that excessive lending posed risks for unsophisticated borrowers and for banks who were taking greater risks in order to maintain their position in the industry. In Chapter 6, Balázs Égert, Peter Backé and Tina Zumer estimate the equilibrium levels of credit-to-GDP in CEE countries based on the parameters obtained from a sample of emerging market and small open European economies. Although credit-to-GDP ratios have risen in most CEE countries, the authors' international comparisons suggest that there is no evidence of pervasive excess lending in the region in a sample that ends several years prior to the financial crisis. Comforting as that finding may be, it is not only the volume of

lending that creates risk but also its composition. Loans to households were one of the fastest growing segments of banks' activities in nearly all CEE countries, and there was concern that households unaccustomed to borrowing might become overextended and unable to repay their loans. Moreover, credit expansion in the form of consumer lending is not likely to have the same growth-enhancing benefits as lending to business that finances the accumulation of productive capital. Foreign banks, in particular, will often concentrate on lending to consumers because they can rely on the parent bank's computer technology for credit evaluation whereas building relationships with local enterprises and accumulating soft information is much more difficult. Thus, there is a tendency to emphasize consumer lending and concern about the risks of such credit expansion. In Chapter 7 Evan Kraft uses detailed data on consumer loans made by Croatian banks, and he finds that such loans are not excessively risky either for borrowers or for lenders. He suggests that the growth of household lending in Croatia is partially due to the lagging enterprise reform that makes business lending unattractive and also notes that there were policy steps taken in Croatia to avoid excessive risks. Kraft also compares the volume of household debt in CEE countries to that in comparable Western countries and finds that there are a few cases where CEE household debt appears to be excessive in international perspective. This suggests that there has not been a consumer-credit bubble in CEE and that there exists the potential for further expansion of credit to households without creating major risks for banks. The next two chapters provide cautionary notes to these comforting conclusions. In Chapter 8, Natalia Tamirisa and Deniz O. Igan point out that relatively weak, and often domestic, banks have been expanding their lending activities quite rapidly in some CEE countries, raising the possibility that, while aggregate lending may be at appropriate levels, some particularly vulnerable banks may be becoming overexposed to risky loans. The authors recommend strong regulatory oversight of such banks. Finally, Jane Bogoev, in Chapter 9, examines the question of CEE banks' lending in both domestic and foreign currencies. Such loans shift foreign exchange risk from the banks, who often obtain a large fraction of their loanable funds from their foreign parents, to CEE borrowers who may be attracted by the lower interest rates on loans denominated in foreign currencies but who may not appreciate the risk they face if the domestic currency depreciates. Bogoev examines Macedonia, a country where Greek banks are the dominant owners of the banking industry. He documents the growing role of loans denominated in foreign currencies, mainly Euros, in

the Macedonian economy and demonstrates how such loans severely limit the central bank's ability to implement monetary policy. Thus, countries where such foreign currency lending is important face a double-edged sword: loans that carry exchange rate risks for borrowers combined with an inability to exercise monetary policy to maintain a stable value for their currency.

The global financial crisis proved to be a major test of the financial systems of the CEE countries and, indeed, of most emerging market economies. In Chapter 10, Ursula Vogel and Adalbert Winkler provide some evidence that the presence of foreign-owned banks in the CEE countries tended to stabilize cross-border flows of money between domestic and foreign banks. This result for CEE seems to be something of an anomaly in that the finding does not hold for many other emerging market economies. One reason why foreign banks chose not to drain money from their CEE affiliates is the actual or prospective EU membership of many CEE countries and the resulting desire of the parent banks to protect their long-term market positions in these new markets. Further there was a European agreement, the Vienna Initiative, to mitigate the effects of the crisis on transition economies. Although, cross-border flows remained stable during the crisis, bank lending was not countercyclical during the crisis; whether this is a supply-side or a demand-side driven phenomenon is unclear. Moreover, not only did foreign banks seem rather prudent in shielding their CEE operations from the worst of the global financial crisis, banks in CEE, whether domestic or foreign-owned, seemed to act prudently. Rainer Haselmann and Paul Wachtel, in Chapter 11, argue that there are no systematic differences in risk-taking by CEE banks of different size or ownership and that the region's banks appear to have matched their risk-mitigation strategies to the riskiness of their loan portfolios. Haselmann and Wachtel also find that banks with riskier portfolios tended to hold higher levels of capital to offset the greater risk. Of course, both banks and regulators must determine whether risk should be mitigated by holding more capital or greater reserves. In Chapter 12, Sophie Claeys, Koen Schoors and Rudi Vandervennet examine this question in the context of the Russian banking industry. They conclude that attempting to mitigate risk by making banks hold higher reserves leads to greater risk-taking on their part; higher capital requirements, on the other hand may reduce or increase risk-taking depending on the cost of capital. One consequence of the global financial crisis was a concerted international effort to prevent such a crisis from occurring again. Given the global nature of capital markets, this requires that all countries adopt more or less the same

regulatory framework for their bank sector. This regulatory framework is embodied in the so-called Basel accords. Since large developed countries have the largest banks and also the greatest regulatory expertise, it is not surprising that the most recent accord, Basel III, reflects the needs and concerns of these countries. Emerging market economies, including the CEE countries, often lack the sophisticated financial market structures including bond markets and ratings agencies that are needed for the full implementation of Basel III. In Chapter 13 Jan Frait and Vladimír Tomšík examine how Basel III will apply to small and emerging market economies. While they provide a generally positive assessment of Basel III, they do point out a number of problems that implementation will raise for emerging market economies.

2

The Dark and the Bright Side of Global Banking: A (Somewhat) Cautionary Tale from Emerging Europe

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This paper reviews the literature on the benefits and risks of global banking, with a focus on emerging Europe. It argues that while the potential destabilising impact of global banks was well understood before the recent financial crisis, the sheer magnitude of this impact in the case of systemically relevant foreign bank subsidiaries was under-appreciated. A second lesson from the crisis is that banks' funding structure, in particular the use of short-term wholesale funding, matters as much for lending stability as does their ownership structure.

Introduction

What are the costs and benefits of cross-border banking integration and how has the balance between the two shifted in the aftermath of the global financial crisis? This question is not only of academic interest but also pertinent to policy discussions in the wide range of countries that have opened up their banking sectors to foreign investors over the past three decades. The process of financial globalisation during this period has resulted in high levels of foreign ownership of banks across the world. To name but a few examples, Spanish and Portuguese banks developed a presence in Latin America on the back of the strong cultural and trade links between this region and the Iberian Peninsula. Nigerian and South African

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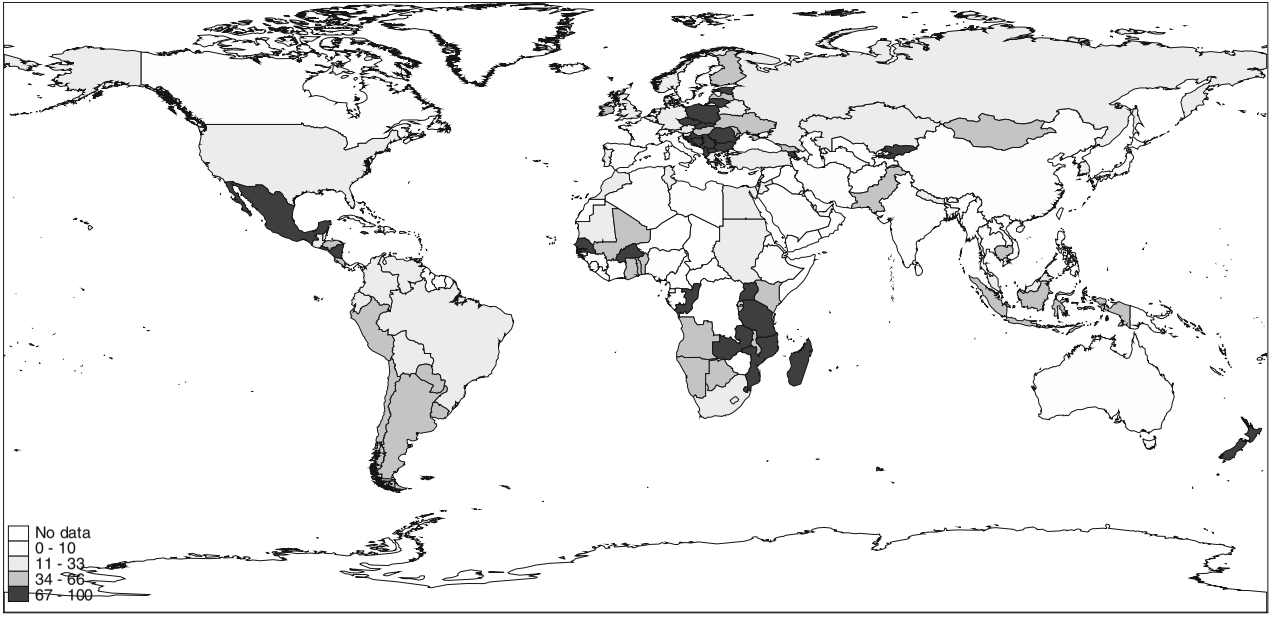

Figure 2.1 Global banking across the globe
Note: Foreign bank assets as a percentage of total banking assets.
Source: Claessens and Van Horen (2014) and EBRD (2009).

banks created pan-African networks, while many of New Zealand's banking assets are currently owned by Australian financial institutions.

Yet banking integration has perhaps advanced the most between Western and Eastern Europe. After the fall of the Berlin Wall, Western European banks bought former state banks and opened new affiliates, both branches and subsidiaries, across emerging Europe. Figure 2.1 shows that in many emerging European countries between 67% and 100% of all banking assets are nowadays in foreign hands. Banks with saturated home markets were particularly attracted to the region due to its scope for further financial deepening at high margins.

A rich literature has developed over the last two decades that evaluates the economic upsides and downsides of banking integration for countries, in particular emerging markets, that play host to multinational banks. This paper attempts to revise this literature in two steps. First, I briefly review the academic evidence on foreign bank entry in emerging markets as it stood at the time of the outbreak of the financial crisis in 2008–2009. While numerous contributions focused on the positive impact of foreign bank entry on banking efficiency, I argue that many of the negative 'surprises' of the crisis – such as global banks' role as conduits for cross-border shock transmission – were already well known before the crisis.

Second, I discuss new empirical evidence that emerged in the wake of the crisis. Here I will highlight in particular the role of bank funding structure, over and above ownership structure, as a determinant of lending stability. Throughout the paper my emphasis will be on emerging Europe, as in this region the impact of multinational banking has been most pronounced.

Pros and cons of global banking for emerging markets

Academic and policy discussions about the economic impact of global banks on emerging markets typically focus on three topics: changes in the *quantity,* the *efficiency* and the *stability* of financial intermediation. I discuss these in turn.

Global banking and the quantity of financial intermediation

Foreign bank entry in emerging markets can help unlock access to foreign savings, increase investments and speed up economic convergence. Although in general less capital tends to flow from rich to poor countries than theory would predict, emerging Europe is one of the few regions where this empirical pattern does not hold. Facilitated by the presence of foreign banks, emerging Europe has been quite successful in

accessing foreign savings, using them to fund local business opportunities, and move quicker towards Western European living standards than would otherwise have been possible.[1]

Global banking and the efficiency of financial intermediation

Foreign banks may not only expand the amount of available savings, they may also transform savings more efficiently into investments. In emerging markets, foreign banks often introduce superior lending technologies and marketing know-how, developed for domestic use, at low marginal cost (Grubel, 1977).[2] Evidence suggests that emerging Europe, where commercial banks were still largely absent at the start of the 1990s, has reaped substantial efficiency gains due to foreign bank entry (see, for instance, Bonin *et al.,* 2005; Fries and Taci, 2005; Havrylchyk and Jurzyk, 2011). Foreign banks are not only efficient themselves but also generate positive spillovers to domestic banks which may, for instance, copy the risk management methodologies of their new foreign competitors.

An important issue is whether this higher efficiency comes at the cost of a narrower client base. Foreign banks may simply be more efficient because they cherry-pick the best customers and leave the more difficult clients – such as opaque small- and medium-sized enterprises (SMEs) – to domestic banks. Domestic lenders may be better positioned to collect and use 'soft' information about opaque clients (Berger and Udell, 1995), whereas foreign banks rely more on standardised lending technologies. Some evidence consequently indicates that foreign banks are associated with a relative decline in SME lending (Detragiache *et al.*, 2008; Gormley, 2010; Beck and Martinez Peria, 2010). Yet more recent evidence suggests that foreign banks may actually find ways to effectively lend to SMEs (Beck *et al.*, 2012) either by using techniques that rely on hard information, such as credit scoring, or by using relationship lending (Beck *et al.*, 2014). As a result, foreign banks may increase SME lending in the medium term as they adopt these new lending technologies (De la Torre *et al.*, 2010). For emerging Europe, the evidence indeed suggests that foreign bank entry has not led to a reduced availability of small business lending (De Haas *et al.*, 2010; De Haas and Naaborg, 2006; Giannetti and Ongena, 2008).

Global banking and the stability of financial intermediation

Even if foreign bank entry is associated with more (and more efficiently delivered) credit, this advantage may be (partly) offset if lending by global banks is volatile and contributes to economic instability. Theory predicts that multinational banks reallocate capital to countries where bank capital is in short supply (eg, those experiencing a banking crisis) and away from

countries where investment opportunities are scarce, such as countries in a downturn (Morgan *et al.*, 2004; Kalemli-Ozcan *et al.*, 2013). Such cross-border capital movements can cause instability in countries that experience a reduction in bank capital. The empirical evidence here focuses on three separate impacts banking integration may have on local financial stability.

First, there is abundant evidence that foreign banks have a stabilising effect on aggregate lending during local bouts of financial turmoil (see Dages *et al.,* 2000; Crystal *et al.,* 2002; Peek and Rosengren, 2000a; Goldberg, 2001; Martinez Peria *et al.,* 2002; Cull and Martinez Peria, 2007). Compared with stand-alone domestic banks, foreign bank subsidiaries tend to have access to supportive parent banks that provide liquidity and capital if and when needed. De Haas and Van Lelyveld (2006) find such a stabilising role for foreign bank subsidiaries in emerging Europe and De Haas and Van Lelyveld (2010) for a broader set of countries.

Second, foreign bank entry may expose a country to foreign shocks. Parent banks reallocate capital across borders and therefore capital may be withdrawn from Country A when it is needed in Country B. Peek and Rosengren (1997, 2000b) show how the drop in Japanese stock prices starting in 1990, combined with binding capital requirements, led Japanese bank branches in the United States to reduce credit. Van Rijckeghem and Weder (2001) find that banks that are exposed to a financial shock in either their home country or another country reduce credit in their (other) host countries. Schnabl (2012) shows how the 1998 Russian crisis spilled over to Peru, as banks, including foreign-owned ones, saw their foreign funding dry up and had to cut back lending.

While foreign bank subsidiaries can transmit foreign shocks, it is important to keep in mind that lending by such local brick-and-mortar affiliates is still considerably less volatile than *cross-border* lending by foreign banks (García Herrero and Martínez Pería, 2007). Peek and Rosengren (2000a) find that cross-border lending in Latin America did in some cases diminish during economic slowdowns, whereas local lending by foreign banks was much more stable. Similarly, De Haas and Van Lelyveld (2004) find that reductions in cross-border credit to emerging Europe have generally been met by increased lending by foreign bank subsidiaries, either because new subsidiaries were established or because the lending of existing affiliates increased.[3]

Lastly, foreign bank ownership may also affect the sensitivity of the aggregate credit supply to the business cycle. Because multinational banks trade-off lending opportunities across countries, foreign bank subsidiaries tend to be more sensitive to the local business cycle than domestic banks (Barajas and Steiner, 2002; Morgan and Strahan, 2004).

However, if the population of foreign banks in a country is sufficiently diverse in terms of home countries, this diversity may make aggregate lending more stable. In line with this, Arena *et al.* (2007) argue on the basis of a data set comprising 20 emerging markets that the presence of foreign banks has contributed somewhat to overall bank lending stability in these countries.

To sum up, the empirical evidence available before the 2008–2009 crisis suggests the following:

(1) Global banking improves credit availability in emerging markets and makes the delivery of credit more efficient. Yet, at least in the short term, small firms may benefit less.
(2) Global banking may exacerbate business and credit cycles, particularly if parent banks are mostly from the same home country or region.
(3) Global banking reduces the economic impact of local financial crises.
(4) Global banking increases the vulnerability of a country to foreign shocks.

New evidence from the great recession

The Lehman Brothers bankruptcy on 15 September 2008 triggered a flurry of research into how multinational banks transmitted this unexpected shock across borders. Many of these banks were either directly exposed to the sub-prime market or indirectly affected by US dollar illiquidity. It consequently became more difficult for parent banks to support their foreign subsidiary networks with capital and liquidity. Cetorelli and Goldberg (2012) show, for instance, that US banks with high pre-crisis exposures to asset-backed commercial paper became more constrained when off-balance sheet became on-balance sheet commitments. This affected their foreign affiliates as funds were reallocated towards the parent, although this effect was mitigated for large 'core' affiliates.

Likewise, Popov and Udell (2012) and Ongena *et al.* (2014) show how Western banks propagated the crisis eastwards by reducing the credit supply to both existing and potential borrowers in emerging Europe. Opaque firms with few tangible assets were affected the most as were firms located close to branches of foreign banks that did not have easy access to parent bank funding (De Haas and Kirschenmann, 2014).

De Haas *et al.* (2014) also show that foreign bank subsidiaries in emerging Europe reduced lending earlier and faster than domestic banks.[4] Foreign banks that took part in the Vienna Initiative, a public–private

coordination mechanism to guarantee macroeconomic stability in emerging Europe, were somewhat more stable lenders.[5] This stabilising effect of the Vienna Initiative is confirmed by Cetorelli and Goldberg (2011) on the basis of aggregate data from the Bank for International Settlements. They find that multinational banks transmitted the crisis to emerging markets *via* a reduction in cross-border lending and local subsidiary lending. Importantly, stand-alone domestic banks, many of which had borrowed heavily in the international syndicated loan and bond markets before the crisis, were forced to contract credit as well.

A common finding of many recent empirical papers is the importance of banks' pre-crisis funding structure for their subsequent credit stability during the Great Recession. In particular, it has become clear that banks that relied more on short-term wholesale funding reduced domestic credit more[6], were more often financially distressed (Cihák and Poghosyan, 2009) and experienced a worse stock-price performance when Lehman Brothers collapsed (Raddatz, 2010) and during the crisis in general (Beltratti and Stulz, 2012). Relying on short-term wholesale funding made banks vulnerable to sudden liquidity shortages during which they could not roll over debt. De Haas and Van Lelyveld (2014) analyse an international sample of banks and find that during the recent crisis multinational bank subsidiaries had to curtail credit growth about twice as much compared with stand-alone domestic banks. Subsidiaries of parent banks that used more wholesale funding had to reduce credit the most.

Lessons from the great recession

When we compare the pre-crisis evidence on the impact of foreign bank entry with more recent findings, two main lessons appear to stand out:

First, the crisis underlined the importance of funding structures for banking stability. In particular, it became clear that an excessive use of wholesale funding exposes banks to the bouts of illiquidity that characterise these markets. Before the crisis, policymakers and academics had focused mainly on the potentially adverse effects of depositor runs, largely ignoring the risks in the increasingly important wholesale markets. During the crisis it became clear that, relative to 'flighty' wholesale funding, (insured) deposits actually turned out to be quite 'sticky'. A prominent example was the failed UK bank Northern Rock, which saw its wholesale lenders run before retail depositors did.

A dependence on wholesale funding may hurt lending stability particularly when a bank's assets and liabilities are denominated in different

currencies. When banks carry substantial currency mismatches on their balance sheets, they become heavily exposed to temporary breakdowns in FX swap markets. During the recent crisis, this affected both domestic and globalised banks. In pre-crisis emerging Europe, many domestic banks had borrowed in local currency wholesale markets and, after swapping these funds into euros, turned them into euro loans. During the crisis this became more and more difficult. Likewise, global banks with US branches found it increasingly problematic to swap euros into US dollars and therefore experienced difficulties in supporting these branches with funding through their internal capital markets.

The Latin American experience has shown that deep financial integration through a large-scale presence of foreign banks may go hand in hand with financial stability if sufficient local deposit and wholesale funding are available. Kamil and Rai (2010) show that crisis transmission to Latin America was less severe in countries where foreign banks were lending through subsidiaries rather than across borders. Subsidiaries that were funded locally instead of through the international wholesale markets or through their parent banks were particularly stable credit sources. Some (but not all) multinational bank subsidiaries, particularly in emerging Europe, may have to adjust their funding models in this direction. These subsidiaries will increasingly have to stand on their own financial feet by raising local customer deposits and topping these up with wholesale funding if and when required. This will be easier for and more relevant to subsidiaries that target retail rather than corporate clients.

An increased focus on local funding will also be a more realistic option in countries with more conducive macroeconomic frameworks, including flexible exchange rate regimes and inflation targeting, that facilitate the development of local currency markets and a local currency deposit base. This reduces the need for banks, both foreign and domestic, to borrow and lend in FX (Brown and De Haas, 2012; Brown *et al.,* 2013).

Second, while the Japanese experience of the 1990s had already shown (or perhaps forewarned) that global banks may pass on shocks from home to host countries, what remained under-appreciated until recently is how large these effects can be if foreign bank affiliates are of systemic importance. Nowhere has this been more evident than in emerging Europe where one or several of the top three banks are in foreign hands in many countries (Figure 2.2). It was this combination of foreign ownership and systemic importance that threatened financial stability in the region and necessitated the *ad hoc* establishment of the Vienna Initiative.

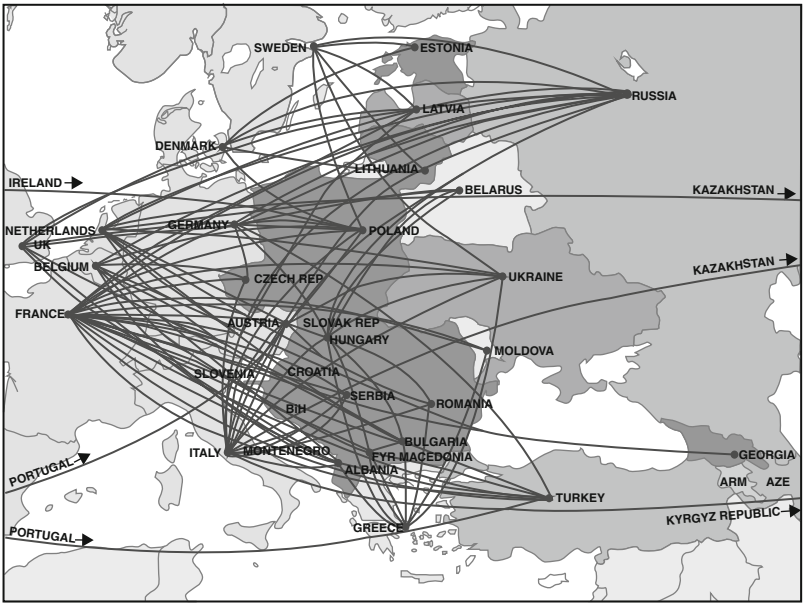

Figure 2.2 Systemic banks in emerging Europe owned by foreign parents
Note: This map shows the ownership linkages (as of 2007) between foreign strategic investors and systemic banks in emerging Europe. Systemic banks are those that are among the top three in the host country according to total assets. Each line represents one or more parent–subsidiary relationships. Branches, non-bank subsidiaries and equity holdings of less than 50% were excluded.
Source: EBRD (2009).

The recent European experience underlines the need to further reassess and possibly even adjust the role multinational banks play in many emerging markets. As this paper argues, the evidence suggests that multinational banks oftentimes play a positive role in these economies as they give households and firms access to more and more efficiently delivered financial services. A key issue that nevertheless remains high on the policy and research agenda is how to reap these benefits of banking integration while minimising 'collateral damage' in the form of an increased exposure to foreign shocks. One part of the answer lies in a gradual rebalancing of the funding structure of some of the more highly leveraged multinational bank subsidiaries towards a greater focus on local funding sources. This will reduce subsidiaries' need to borrow abroad, either from external financial markets or through their parent's internal capital market, thus limiting their role as conduits for financial shocks. The question remains what is the optimal mix of local

and foreign funding, bearing in mind that a complete reliance on local funding would entail costs to local economies in the form of less (and more expensive) borrowing opportunities for local firms.

A second part of the adjustment may have to come from the regulatory side, where further measures are needed to coordinate banking supervision and regulation across borders – for instance, in the form of supervisory colleges. For the case of emerging Europe it is important to not only improve supervisory coordination within the eurozone's Banking Union but also between the supervisors of eurozone parent banks and of the subsidiaries that are (as yet) located outside the euro area.

Notes

1. See EBRD (2009, Chapter 3) and Gill and Raiser (2012, Chapter 3) for empirical evidence.
2. In developed countries, foreign banks are generally less efficient than domestic banks as the advantages of incumbent banks tend to dominate those of new entrants (Claessens *et al*., 2001).
3. See De Haas and Van Horen (2012, 2013) for evidence on the rapid decline in cross-border lending during the 2008–2009 crisis, in particular by distant and relatively inexperienced international lenders.
4. Barba Navaretti *et al*. (2010) argue that multinational banks were a stabilising force as they displayed a stable loan-to-deposit ratio. Their analysis is limited to the years 2007–2008, while much of the credit crunch took place in 2008–2009.
5. As part of the Vienna Initiative various multinational banks signed country-specific commitment letters in which they pledged to maintain exposures and to provide subsidiaries with adequate funding.
6. See Ivashinaand Scharfstein (2010) and Cornett *et al*. (2011) for the United States; Yorulmazer and Goldsmith-Pinkham (2010) for the United Kingdom; Iyer *et al*. (2014) for Portugal; and Rocholl *et a*l. (2011) for Germany.

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3

From Reputation amidst Uncertainty to Commitment under Stress: More than a Decade of Foreign-Owned Banking in Transition Economies

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The banking landscape in the European transition economies (TEs) provides an excellent laboratory for evaluating the net benefit of foreign bank penetration in emerging market economies. The speed and depth of foreign bank entry into these countries is without historical precedent; high growth rates in retail lending, fuelled in some cases by foreign-exchange (FX)-denominated loans, preceded the global financial crisis in many TEs. The hybrid organisational form created by foreign banks acquiring controlling shares of formerly state-owned domestic banks during the bank privatisation process is a crucial ingredient to any analysis. A selective review of the empirical literature on banking in TEs indicates that parent banks treat greenfield subsidiaries as parts of an international portfolio, whereas they make a long-term commitment to their hybrids. In about half of the 10 countries considered in this article, some risk of contagion via *the banking channel is identified from a structural analysis. Nonetheless, preliminary evidence suggests that the parent foreign banks maintained their commitment to the region in the midst of the recessions brought on by the global financial crisis.*

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Introduction: what is special about foreign bank penetration in transition economies?

The experience of transition economies (TEs) with foreign bank penetration has a time dimension and an organisational dimension that are intertwined. Before 1995, virtually all foreign bank entry in TEs took the form of greenfield subsidiaries set up by a foreign bank in the host country. From 1995 onward, foreign banks participated in government programmes to privatise large state-owned banks and eventually took control of these banks. Oftentimes, a foreign bank entered a TE initially as a greenfield subsidiary and, after acquiring a former state-owned bank, merged the two entities to create a large foreign-owned bank. This takeover and consolidation activity resembles financial mergers and acquisitions in many emerging market economies. What distinguishes the TE experience from foreign bank penetration in many other countries is the hybrid corporate culture of the resulting foreign-owned bank. Having a dominant market position, the foreign-owned bank is a blend of expertise in transaction-based banking from the parent and experience in relationship-based banking from the acquired bank. Thus, I characterise the resulting bank as a hybrid that combines the hard technical information and banking skills of the parent with the soft information about clients and expertise concerning the local business environment of the acquired bank.

Tensions may arise in the parent's business strategy for this hybrid bank. Parent banks in TEs are large multinational banking groups. In allocating funding to their subsidiaries, the foreign bank may take a short-term portfolio approach and focus on the risk/return tradeoffs across several host countries. By contrast, the long-term business model of the foreign parent involves making a commitment to a TE host country so as to build up the requisite reputational capital necessary for further expansion in the region. From this perspective, the parent's long-term strategy begins with establishing trust and develops into a more mature relationship in which long-term commitment mitigates short-term portfolio concerns. Consequently, the parent bank may be held somewhat hostage when economic conditions in the host country deteriorate because it is unable to withdraw support from its subsidiary without damaging its reputation and affecting adversely its long-term business interests in the region.

As a result, the impact of hybrid foreign-owned banks on host country lending depends on a combination of three factors, namely, the parent's long-term commitment to its subsidiary, the parent's pursuit of short-term portfolio allocation, and the parent's own financial situation. Viewed from the perspective of the host country, the first factor is

countercyclical whereas the second is procyclical because deteriorating economic conditions lead to re-allocation across holdings in several host countries. Depending on the correlation between the business cycles of the home country and the host country, the third factor can be procyclical or countercyclical, as it is determined by economic conditions in the home country of the parent bank.

The countries considered in this article are the seven non-Baltic TEs that belong to the European Union (EU) and three other countries, namely, Croatia, Serbia, and Russia.[1] The Baltic countries are excluded because of their dependence on a single Swedish bank. As the literature on cross-border linkages demonstrates (Arvai *et al.,* 2009; Maechler and Ong, 2009), the three Baltic countries are ring-fenced financially so that the Baltic region can be treated as a special case. Croatia and Serbia are included because the former appears to be knocking on the door of EU accession and the latter has taken the first steps towards this objective; hence, both are likely to enter the EU in the near future. Russia rounds out the countries considered because it is too big and too important to leave out. For some large multinational foreign banking groups, Russia is the prize host country; for some TEs (in particular, the Commonwealth of Independent States (CIS) countries), Russia is the home country for the foreign banks that are beginning to penetrate their markets.

In the tables, these 10 countries are divided into two groups. The first group, denoted EU5, consists of five early accession countries, namely, Czech Republic, Hungary, Poland, Slovakia, and Slovenia. The second group is comprised of four Southeastern European countries (SEE4), namely Bulgaria, Croatia, Romania, and Serbia, plus Russia. Other designations for groupings used in the paper are EU7, which refers to the EU5 plus Bulgaria and Romania, and EU10, which includes the three Baltic countries with the EU7.

The extent of foreign ownership of banking assets in many TEs and the rapidity with which bank ownership has changed are unprecedented. Hence, these 10 countries constitute an interesting laboratory within which the special organisational characteristic of foreign bank penetration in TEs can be examined. The hybrid foreign-owned bank is the result of a takeover of a large state-owned bank by a large international bank participating in the bank privatisation process in the host country. The foreign bank's primary motive for acquiring a formerly state-owned bank may be either to gain access to an underdeveloped and somewhat protected market, that is, market power, or to use its comparative advantage to upgrade the target bank's technology and provide access to capital on better terms, that is, improve banking efficiency in the host country. As an event encompassing all three factors that influence a foreign bank's

lending response to deteriorating economic conditions, the recent global financial crisis provides an opportunity to revisit the traditional question of whether or not foreign bank entry is a net benefit to a host country based on the experiences of these ten TEs during the crisis period.

The next section is a literature review in which I draw four consensus results from empirical work on banking in TEs. The third section provides an overview of the current banking landscape in the 10 countries; I also identify the six dominant European multinational financial institutions in the region. In the fourth section, I discuss the domestic credit booms in the TEs that were precursors to the global financial crisis and investigate the role played by the international banks. In addition, to complement the literature on cross-border financial transactions, I provide a structural analysis based on parent-bank market shares to identify countries that may be prone to financial contagion through a banking transmission channel. Finally, I attempt to discern whether these six international banks are maintaining a commitment to the region during the crisis. The final section concludes with a preliminary analysis of the net benefit of foreign bank takeover in TEs and some questions to guide future evaluation.

A selective literature review of banking in transition economies

From the empirical literature on banking in TEs, I draw the following four main consensus results by focussing on the special behavioural characteristics of the hybrid organisational form that resulted from the privatisation of state-owned banks.[2] First, overall business strategies differ between hybrid banks and greenfield operations. The latter tend to adopt a short-term portfolio strategy based on an internal capital market business model, in which funding is allocated across various subsidiaries in different host countries according to risk/return calculations. By contrast, the parent bank of a hybrid is more likely to pursue a long-term commitment strategy designed to develop and maintain reputational capital in the region. Second, distinguishing between organisational types of foreign banks is critical to analyzing competition and market structure in TE banking sectors. Greenfield operations tend to focus initially on foreign clients and then move on to lend to small-medium-sized enterprises (SMEs) and to originate home mortgages. The hybrid banks lend to larger corporate clients but are also active in retail banking. The literature contains some evidence that foreign banks of either genre treat the same borrower-type equally, in which case any distinctions observed in lending activity are due solely to differences in the composition of loan portfolios. Third, institutional

development in the host country influences the acquisition motive of the foreign bank and has an important impact on the composition of loan portfolios in TE banks. Fourth, TE banking sectors are evolving and maturing so that banks therein are behaving more like their counterparts in developed economies. The following brief survey of selections from the empirical literature is intended to provide support for these four consensus results.

De Haas and van Lelyveld (2006) used data from 1993 to 2000 for 10 countries, the EU10 excluding Bulgaria but including Croatia, to investigate the three fundamental determinants of lending in host countries. The authors considered whether the foreign parent acts as a 'back-up' lender (commitment and countercyclical) or takes an internal capital market approach (portfolio and procyclical). In addition, they examined the influence of the parent bank's balance sheet on lending in the host country. The authors found that foreign banks stabilise lending during host country crises, whereas domestic banks decrease their lending but that this result is driven by the behaviour of greenfield operations not hybrids. In addition, they found foreign-bank lending to be statistically sensitive to home-country gross domestic product (GDP) growth but, once again, the result is significant only for greenfields. Finally, they found evidence that intra-group relations are less strong for takeovers than for greenfields and suggest that TE hybrids exhibit more independence from parent-bank influence in making lending decisions. As their data period ended before much of the takeover activity in the TEs was completed, the authors' comparisons between foreign-bank types are more suggestive than conclusive.

Using data from 1992 to 2004 for 45 multinational banking groups, De Haas and van Lelyveld (2010) investigated the internal capital market business model for a parent bank having several subsidiaries. The authors tested two competing hypothesis concerning foreign-bank strategy by regressing credit growth of a foreign subsidiary on the following explanatory variables: host-country conditions (independence), financial characteristics of the subsidiary, parent bank characteristics (support effects), and country characteristics of other subsidiaries within the group (substitution effects). Their objective is to differentiate between the portfolio strategy in which the foreign banking group allocates funding across subsidiaries based on relative risk/return tradeoffs, thus exacerbating host-country shocks, and the commitment strategy in which the group supports its subsidiaries long-term development, thus mitigating host-country shocks. In their data, 83% of the parent banking groups and 73% of the subsidiaries are in Europe so that TEs are included among the

host countries. From this enlarged data set, the authors found evidence that greenfields are more closely integrated with their parent bank than are takeovers, in that the former pursue a portfolio strategy whereas the latter focus more on host-country needs. Specifically, they found that credit growth from greenfields only, but not takeovers, is sensitive to host-country GDP growth and that credit from takeovers is only weakly sensitive to the quality of the parent's balance sheet. Hence, the empirical literature indicates the importance of differentiating between greenfield operations and hybrids when analyzing the impact of foreign bank penetration in TEs and, in support of the first consensus result, suggests that hybrids have a stabilising influence on credit allocation across the business cycle in host countries.

Regarding competition and market structure, Claeys and Hainz (2006) developed a model to distinguish between the behaviour of greenfields and that of acquisitions based on differences between hard (transparent) information and soft (opaque) information. Greenfields enter only if the screening benefit from using hard information outweighs their soft informational disadvantage. However, foreign acquirers of a domestic bank are assumed to be able to earn rents by combining the screening skills of the foreign parent with the soft information residing in the acquired bank. Hence, the authors concluded that competition in the host country is stronger if foreign entry occurs *via* greenfields rather than as a result of takeovers. To test their hypothesis, the authors used data from 1995 to 2003 for the EU10 excluding Romania but including Croatia. The authors found that foreign banks charge lower lending rates, on average, by about 1.5% than domestic banks. However, greenfield banks are found to charge higher rates initially, although they reduce rates significantly in the years following entry. The authors conclude that foreign bank entry of any type increases competition in TE banking sectors but with a lag for greenfield operations, perhaps because of a learning curve.

Degryse *et al*. (2008) used loan book data for Polish banks from December 1996 to December 2006 to examine which borrowers benefitted from foreign bank penetration. They found that foreign banks charge lower lending rates but they attribute some of this difference to lending in foreign exchange (FX) (mainly Swiss francs). The authors investigated three possible causes for the lower rates, namely, performance, that is, a cheaper source of funds and more efficient operations, a loan portfolio strategy, that is, targeting more transparent clients in a more competitive market with smaller margins, and a convergence hypothesis, that is, advances in information technology (hard information)

that improve banks' ability to acquire information on more opaque clients (SMEs). They found that rates charged by greenfields are lower than those charged by takeovers, which in turn are lower than those charged by private domestic banks. Their results support the hypothesis of increased competition because of foreign entry, but also suggest that greenfields will promote more competition than hybrids. However, the authors found that differences in lending rates across ownership type are solely because of differences in the composition of the loan portfolios. Foreign banks do not charge lower rates than domestic banks to the same type of borrower leading the authors to conclude that all banks in Poland, foreign or domestic, treat borrowers of a given type equally. To probe further this surprising equal-treatment result, I turn to papers that consider the composition of loan portfolios in TEs.

De Haas and Naaborg (2005) reported information from focussed interviews with foreign-bank managers in the early accession countries (EU5 plus the Baltics) regarding the composition of loan portfolios over time. They found that foreign banks initially lend to foreign companies and large corporate clients but gradually increase lending to SMEs and also begin to engage in retail lending. They concluded that heightened competition for blue-chip clients induced foreign banks to substitute toward other types of lending having better margins, that is, retail and SMEs. Giannetti and Ongena (2008) used data for 2 years, 2000 and 2005, for the EU10 plus Russia, Ukraine, and Croatia to investigate the lending behaviour of foreign banks. They found some evidence of client cream skimming in that foreign banks lend to large, foreign-owned firms. However, a foreign takeover does not result in terminating relationships with clients even for banks with a high ratio of non-performing loans lending support to the notion that the foreign acquirer is interested in relationship-based banking using soft information. These authors conclude that ownership type matters with respect to the composition of the loan portfolio finding that foreign greenfields lend to younger, high-growth firms.

For a larger group of 20 TEs, including the 10 countries considered in this article, De Haas *et al.* (2010) explored lending differences among banks having different ownership structures using European Bank for Reconstruction and Development (EBRD) survey data for 2005. First, they found that foreign banks of both types, greenfield and takeover, are more heavily involved in mortgage lending than are domestic banks, be they private or state owned. In essence, foreign banks were responsible for developing the mortgage market in TEs, perhaps due to their comparative advantage in technical knowhow. Second, foreign

greenfields provide much of the lending to subsidiaries of foreign companies, which confirms client cream skimming. Third, state-owned banks continue to lend to state-owned enterprises but foreign takeovers do not. Fourth, small banks, whether foreign or domestic, lend more to SMEs than do large banks. Hence, a consensus regarding market competition and structure is emerging indicating that greenfields charge lower interest rates because they focus on less risky clients, whereas hybrids are involved with a broader scope of clients even though foreign banks leave the least desirable clients to the domestic state-owned banks. This supports the claim that distinguishing between organisational types of foreign banks is critical to analyzing competition and market structure in TE banking sectors and focusses attention on the composition of loan portfolios by bank type.

Traditionally, two competing arguments are advanced regarding the primary acquisition motive of foreign banks. The efficiency hypothesis posits that inefficient banks are targeted so that the acquirer can use its comparative expertise to upgrade the bank in the host country. The market power hypothesis argues that the foreign bank is interested first in gaining access to an underdeveloped, protected banking sector and then in building market share to preclude competition.[3] Lanine and Vander Vennet (2007) examined data from 1995 to 2002 in the EU10 plus Croatia, Bosnia and Hercegovina, and FYR Macedonia. They found that the major international players acquired established banks of relatively average efficiency with broad franchises and large market shares in loans and deposits. They concluded that foreign banks use their technology and knowhow to earn rents in sheltered markets. Consistent with the market power hypothesis, they found no evidence that these banks promote an increase in efficiency or heightened competition in the host countries. De Haan and Poghosyan (2008) used more recent data from 1996 to 2006 for the same 13 countries plus Albania and Serbia (including Montenegro). These authors tested the two hypotheses directly using stochastic frontier measures of cost efficiency, which allowed them to differentiate across institutional quality. They found that the market power hypothesis is supported in TEs with weak institutions but, consistent with the competing hypothesis, they found evidence that foreign owners increase the efficiency of banks in TEs having strong institutions. Because the data sets in these two articles do not overlap sufficiently, a definitive result is not forthcoming. However, the data from the later period indicate that the institutional development in the host country matters to the foreign acquirer.

Institutional development in the host TE country also has a considerable impact on the behaviour of foreign banks after entry. In the early

accession countries, De Haas and Naaborg (2005) found that, as legal systems improve over time and the parent banks introduce new lending techniques, for example, credit scoring, the risk-adjusted return on lending to SMEs increases leading foreign banks to turn their attention to these companies. Hence, these authors conclude that institutional development in the host country has a significant impact on the composition of lending by foreign banks. For a larger group of 20 TEs, including the 10 countries considered in this article, Haselmann and Wachtel (2010) use EBRD survey data from 2005 to investigate the role of legal institutions on overall bank lending. They found that banks lend more to SMEs and provide more mortgages in countries with a well-functioning legal environment, whereas lending is more concentrated on large enterprises and the government when the legal environment is underdeveloped. These authors corroborate the influence of institutional development on bank lending and conclude that the ability to secure collateral is an important consideration for banks when lending to SMEs and in retail lending. Hence, as the third consensus result asserts, institutional development in the host country is an important consideration in analyzing competition, evolution and structure for TE banking sectors.

Recent studies indicate that these TE banking sectors are evolving rapidly to resemble their counterparts in mature developed economies and that foreign bank presence is promoting this convergence. For the EU10 plus Croatia, Russia, and Ukraine, Giannetti and Ongena (2008) concluded that when foreign penetration is low, foreign-bank lending has a positive impact on access to credit and on the profitability of firms. However, as the degree of foreign penetration increased and the banking sector developed, they found no discernible difference in access to credit by a client from a foreign or domestic bank. Delis *et al.* (2008) used data from 1999 to 2006 for a broader group of TEs, namely the EU10 plus Croatia, Serbia, Albania, FYR Macedonia, Bosnia and Hercegovina, Armenia, Azerbaijan, Belorus, Georgia, Kazakhstan, Moldova, and Ukraine, to compute country-specific Malmquist indices measuring the total factor productivity of banks. These indices are then used as dependent variables in regressions having measures of regulatory instruments as explanatory variables along with controls for country and bank-specific effects. The authors found that restrictions on bank activity, that is, types of products sold, have a positive impact on productivity demonstrating the importance of focussing on core activities. Market discipline, defined by adequate and timely disclosure of information, is also found to have a significant positive impact on productivity. Agoraki

et al. (2008) examined the period from 1994 to 2005 in the EU 10 plus Croatia, Serbia, and Albania to analyze the relationship between competition and bank risk-taking. They concluded that foreign penetration promotes more stable banking sectors because it results in larger and more diversified banks and that banks in TEs respond to regulation in an expected manner. By demonstrating that banks in TEs react normally to regulatory conditions and that access to credit does not depend on bank ownership type, these papers provide evidence in support of the fourth consensus result that banking sectors in TEs are converging rapidly to their more-developed counterparts in mature economies.

Banking sectors in TEs evolved rapidly with hybrid banks, defined as combinations of a foreign parent bank and a large formerly state-owned domestic subsidiary, emerging as core players. Any assessment of the net benefit of foreign penetration and the resulting structure and competitiveness of TE banking sectors requires separate consideration of two types of foreign banks, namely greenfield operations and hybrids, because each has its own distinct business strategy. The literature indicates that the foreign parent in the hybrid form is more likely to commit to supporting its subsidiary in the host country suggesting that foreign presence of this type will play a stabilising role by maintaining credit flows when host-country conditions slacken or deteriorate. However, the literature suggests that the foreign parent bank of a greenfield operation is more likely to adopt an internal capital markets business model, in which funding is allocated to its various subsidiaries according to risk/return differences across host countries. Hence, this type of foreign bank is more likely to aggravate economic cycles in a host country. Therefore, the net benefit of foreign penetration in TE banking sectors will depend on the delicate balance between a parent's commitment to preserve its reputation and long-term profitable potential in the region and its pursuit of short-term profit opportunities across its subsidiaries in various host countries. It is interesting to note that both types of foreign banks have moved aggressively into retail lending, a severely underdeveloped segment of banking in TEs, and thus fuelled rapid growth of retail credit.

The banking landscape in 10 TEs *circa* 2008

Two salient characteristics distinguish banking activity in most TEs, namely, a virtual foreign takeover of the banking sectors and an explosive growth of retail credit beginning around 2004. Regarding foreign bank penetration, acquisitions of state-owned banks by multinational banks changed the banking landscape drastically in most TEs starting

in 1995. The decade to follow witnessed the emergence of the hybrid bank, along with some rapidly growing foreign greenfield operations that expanded market share dramatically. By 2008, in 8 of the 10 TEs considered in this article, foreign financial institutions held more than 65% of all banking assets with Russia and Slovenia being the two exceptions. In addition, over the recent decade, the nature of financial intermediation changed considerably. Fewer primary deposits were available for corporate lending because they were being used increasingly as the funding base for rapidly growing retail lending. These two distinct characteristics of banking sectors in TEs elicit concerns about the vulnerability of these countries to financial crises and to contagion from abroad. The combination of dominant foreign banks and rapidly growing retail credit, especially mortgage lending, could be a Molotov cocktail for TEs depending on both the business strategy of foreign players and the nature of retail lending.

In a little more than a decade, the banking sectors of these 10 countries have been transformed from being dominated initially by state-owned domestic banks to becoming virtually foreign-owned, with two exceptions. As Table 3.1 column C indicates, Hungary was in the forefront of this dramatic sea change having about 42% of all banking assets already owned by foreign banks in 1995.[4] No Southeastern European (SEE) country or Russia had any appreciable foreign bank penetration in 1995. By 2008, the percentage of banking assets held by foreign financial institutions exceeded 80% in 6 of the 10 countries ranging from over 96% in Slovakia to more than 83% in Hungary, as column D records. Only 2 of the 10 TEs had low foreign penetration by 2008, namely, Slovenia at about 29% and Russia at just over 17%. In Russia, state-owned banks still dominated the sector holding, as a group, over 45% of banking assets and comprising the top three banks.

Financial depth, measured as the ratio of private sector loans to GDP, differs markedly across countries in 2008 as indicated in column E of Table 3.1. The countries exhibiting the highest degree of financial depth are Slovenia at 89.8%, Bulgaria at 75.2% and Croatia at 73.8%, whereas Slovakia, Poland, Russia and Serbia, in descending order, all have ratios less than 50%. The 2008 eurozone average[5] for this measure of financial depth was 127.8%, thereby indicating the still underdeveloped nature of banking sectors in TEs.

A second measure of financial depth, focussed on retail banking, specifically household loans as a ratio of GDP, illustrates the retail credit boom in TEs beginning around 2004. Table 3.1 contains the ratio of household loans to GDP for both 2004 and 2008 in columns G and H,

Table 3.1 Banking in TEs

Country	Pop. Mill.	GDPpc[a] (thous. euros) 2008	Banking Assets: percent foreign		Loans/GDP	Deposits/ GDP	Household Loans/GDP		Household	
			1995	2008	2008	2008	2004	2008	Dep/GDP 2008	L/D 2008
	A	B	C	D	E	F	G	H	I	J
EU 5										
Czech Republic (CZ)	10.3	20.2	15.9	88.5	56.0	69.3	10.1	21.8	36.3	60.1
Hungary (HU)	10.0	15.5	41.8	83.5	58.7	43.2	14.5	28.1	27.2	103.3
Poland (PL)	38.1	13.9	4.2	67.0	46.2	39.3	11.9	29.0	26.2	110.7
Slovakia (SK)	5.4	17.6	32.7[b]	96.3	47.1	60.9	8.6	17.5	31.8	55.0
Slovenia (SL)	2.0	23.3	3.8	28.7	89.8	101.7	10.4	17.8	34.7	51.3
SEE and RU										
Bulgaria (BG)	7.6	10.1	<1	86.3	75.2	62.5	9.8	26.0	33.2	78.3
Croatia (HR)	4.4	13.6	<1	90.4	73.8	71.5	26.4	36.8	39.8	92.5
Romania (RO)	21.5	11.2	<1	88.1	39.3	30.1	4.8	19.7	16.4	120.1
Serbia (RS)	7.4	9.3	<1	75.3	40.5	32.2	4.8	13.8	16.5	83.6
Russia (RU)	142.0	13.5	<1	17.3	42.0	35.5	3.6	9.7	14.2	68.3

[a] GDP per capita is measured in purchasing power parity (PPP).
[b] Number includes Czech banks whose licenses to operate in Slovakia were repealed in 1996.
Source: RZB (2009).

respectively. In four of the five EU5 (with Slovenia as the exception), this ratio virtually doubles over those 4 years. Even more remarkably, four of the five TEs in the bottom section of the table, Croatia being the exception, experience almost a tripling of this ratio over the same time period. The eurozone average for this measure of retail financial depth was 53.1% in 2008. As column H indicates, only four countries have a ratio of household loans to GDP above 25% by 2008, with Croatia exhibiting the highest measure at almost 37%. Hence, despite the recent credit explosion, retail banking remains considerably less developed in all TEs, and severely underdeveloped in some, relative to European countries.[6]

The retail credit boom had differing implications for the composition of household lending across TEs. For several EU5 countries, mortgage lending constituted a substantial percentage of total retail lending by 2008. Mortgage loans as a percent of total household lending reached 80% in Hungary, 70% in Slovakia, and 65% in Czech Republic but only 58% in Poland in that year.[7] In no one of the five TEs in bottom section of Table 3.1 is this ratio above 50% and it remains below 25% for Russia and Romania. Hence, the retail credit boom leaves banking sectors in the EU5 with considerably different loan compositions than those in other TEs even though the actual growth rates in household lending were more dramatic in the SEE4 and Russia than in the EU5.[8]

To assess the capability of banking sectors to collect deposits, column F of Table 3.1 records data on the ratio of total deposits to GDP and column I reports information on household deposits as a ratio of GDP for 2008. Primary deposit collection is an important aspect of financial sector development because it reflects the public's confidence in banks as financial depository institutions. Relative to a eurozone average of 58.4%, the ratio of household deposits to GDP is considerably lower in all TEs. Nevertheless, this measure exceeds 25% in 7 of the 10 countries with the laggards being Serbia, Romania, and Russia in descending order. Unlike on the lending side of retail banking, the ratio of household deposits to GDP does not change dramatically in any of these countries from 2004 to 2008; hence no data are reported for 2004. The largest changes over this 4-year period are an almost doubling of the household deposit ratio in Serbia and about a 50% increase in Bulgaria and Romania. The largest change in this ratio for the EU5 countries is a 35% increase in Slovakia. Therefore, growth in household lending outstripped considerably the increase in the primary deposit-funding base over this 4-year period in virtually all TEs.

To investigate the impact of the retail credit boom on financial intermediation, the ratio of household loans to household deposits is

reported in column J of Table 3.1. In three countries, Romania, Poland, and Hungary, this ratio exceeds 100% indicating that the household sector is a net borrower of loanable funds so that primary deposits are fully exhausted in funding retail lending. By contrast, in Slovenia, Slovakia, and Czech Republic, the retail intermediation ratio is 60% or less indicating that primary deposit collection more than covers household lending and, thus, provides a net source of loanable funds for corporate and government borrowing. Croatia and to a lesser extent Serbia have retail intermediation ratios that indicate a strong reliance on household deposits to fund household lending but some available loanable funds from primary deposits. By way of comparison, the average ratio of household loans to household deposits in the eurozone countries was 90.9% in 2008; surprisingly, this measure of retail-sector intermediation had become comparable with European countries for about half of the 10 TEs. In two of the EU5 countries and in two (or perhaps three) of the Balkan countries, the retail credit boom was funded fully by primary deposit collection at the expense of available loanable funds for corporate and government borrowers.

To investigate the nature of foreign bank penetration in TEs, Table 3.2 lists the 10 top investors in the region in 2008.[9] Of these, Swedbank operates almost exclusively in the Baltics. The top six foreign players are all international European banks; together they have a cumulative share of almost 65% of the total foreign banking assets in the region. By 2008, UniCredit had become the dominant multinational bank in the region with a presence in all 10 countries; it is the largest bank by asset share in both

Bulgaria and Croatia and the second largest bank in Poland.[10] UniCredit's main strategy consists of taking over domestic banks by its involvement in the privatisation processes of host countries and then merging the resulting large bank with any greenfield operations held by its European entities in that country to create large hybrid banks. The second largest player in the region, Raiffeisen International (RZB), is present in all 10 countries but its penetration strategy has been the polar opposite. With the exception of its Slovakian subsidiary, RZB's banks are all greenfield operations. In these TEs, RZB is a midsize bank, ranging from the third to the tenth largest bank by asset share in 2008. Both UniCredit and RZB have greenfield subsidiaries ranked among the top 10 banks by asset share in Russia.

The third largest multinational participant in the region is an Austrian savings bank, Erste Group, with a presence in 6 of the 10 countries. The Erste Group focused mainly on acquiring former state-owned savings

Table 3.2 Top 10 foreign players in 2008

Bank	Total assets in TEs (billions of euros)	Share of assets in TEs (%)
UniCredit group (Italy)	108.7	15.5
RZB (Austria)	85.4	12.2
Erste group (Austria)	79.2	11.3
Top three	273.3	39.0
SocGen (France)	67.1	9.6
KBC group (Belgium)	66.6	9.5
Intesa group (Italy)	42.2	6.0
Top 6	449.2	64.1
ING Netherlands	32.2	4.6
Swedbank (Sweden)	29.3	4.2
BLB (Germany)	28.8	4.1
Commerzbank (Germany)	28.1	4.0
Top 10	567.6	81.0

Notes:
1. The total assets (consolidated) of international banks in the region in 2008 equal 733.3 billion euros, of which 27.1 billion are OTP in Hungary and 16.9 billion are NLB in Slovenia. Hence, the total that we use for determining the foreign shares is 700.7 billion euros.
2. UniCredit Group includes HVB (Hypervereins: Germany) and two Austrian banks, Bank Austria (BA) and Creditanstalt (CA).
3. This list excludes OTP with a total of 43.2 billion euros of which only 16.1 billion are outside of Hungary.
Source: RZB (2009) and author's calculations.

banks and, as such, became the largest bank by asset share in both the Czech Republic and Slovakia. In addition, again through takeovers, Erste became the largest bank in Romania and the third largest bank in Croatia. The top three foreign banks have a cumulative market share of 39%; two of these banks are Austrian-based with a combined country share of 23.5% whereas the third, UniCredit, has a strong Austrian component. Although two of these three international banks secured their dominant positions mainly by participating in the privatisation processes of the host countries, one (RZB) became a dominant player through organic growth of its greenfield operations. The consensus result from the empirical literature that hybrid banks and greenfields pursue different lending strategies in host countries makes this distinction important when analyzing financial crises and possible contagion in TEs.

The remaining three of the big six international banking groups have acquired their foreign subsidiaries mainly through takeovers of existing banks during the bank privatisation programmes in the host countries. Société Générale (SocGen) has a presence in eight of the countries; it

owns the second largest bank by asset share in Romania and the third largest bank in the Czech Republic. In addition, SocGen is the largest foreign-owned bank in Russia even though its subsidiary has only a 2% market share, which nonetheless ties it with two other domestic banks for fourth place behind three large state-owned Russian banks. The Belgian bank Kredietbank ABB Insurance CERA Bank (KBC) operates in eight of the countries; it acquired the second largest bank by asset share in both the Czech Republic and Hungary and the fourth largest bank in Slovakia.[11] The Intesa Group has taken a renewed interest in the region by participating in takeovers in seven of these countries. Intesa owns the largest bank by asset share in Serbia, the second largest bank in both Slovakia and Croatia, the third largest bank in Hungary and the sixth largest bank in Slovenia. In addition, Intesa has a small greenfield subsidiary in Russia. These three international banks together hold about 25% of all foreign bank assets in the region and virtually all their subsidiaries are hybrid banks.

The major foreign banks in the European TEs are neighbours and, for the most part, have obtained their subsidiaries *via* takeovers and thus created hybrid banks. Hence, they are more likely to have made a long-term commitment to the host countries as opposed to taking a short-term perspective by viewing their operations therein as pawns in a multinational financial portfolio. Following on the heels of the recent retail credit boom, the global financial crisis became a stress test for foreign-bank commitment in TEs. Would deteriorating host-country and/or weak parent balance sheets break the resolve of these European neighbors? Would RZB begin to treat its greenfield subsidiaries as portfolio investments and re-allocate funding across host countries based on a short-term risk/return calculus? Would financial contagion from home countries be transmitted given the concentration of ownership by six multinational banking groups from five European countries? The failure of Lehman Brothers in September 2008 was followed by events that may eventually elicit complete answers to such questions.

From credit boom to financial crisis

To explore the implications of the credit boom and its accompanying increasing reliance on foreign-denominated funding, Table 3.3 provides data on lending for the 10 countries during the first 2 years of the global financial crisis. Columns A and B contain growth rates for corporate lending in 2007 and 2008. Comparisons between these 2 years suggest a credit squeeze in most countries by 2008. Presented in the two

rows at the top of each section of the table, the average growth rates in corporate lending decreased from 23.6% to 15.2% for the EU5 and from 41.5% to 22.1% for the other five countries. Examining the credit squeeze by country, the growth rate of corporate lending is less than one half of its 2007 rate in four countries, that is, Bulgaria, Poland, Slovenia, and Romania, and just over half the 2007 rate in Hungary and Russia. It is interesting to note that corporate lending growth was slightly higher in 2008 than in 2007 in Croatia; it increased dramatically in Slovakia, which reflects the latter country's anticipated adoption of the euro in 2009.

Turning to retail lending, columns C and D provide growth rates for household lending in 2007 and 2008. Household lending also felt the impact of the financial crisis; the average growth rate fell from 31.3% to 23.8% for the EU5 and, more dramatically, from 49.8% to 18.1% for the other five countries. In three countries that were beginning to develop their relatively infant retail banking sectors, namely Russia, Serbia, and Romania, household lending growth in 2008 decreased dramatically from admittedly spectacularly high rates in 2007. In particular, low growth rates in household lending of 7.4% in Russia and 11.8% in Serbia indicate considerable shifts away from developing these fledgling markets in which household loans to GDP were only 9.7% and 13.8%, respectively, in 2008 (see column H of Table 3.1). The 2008 growth rate of household lending was about half its 2007 rate in the Czech Republic and Poland and about 60% of the previous year's rate in Bulgaria and Croatia. Given that corporate-lending growth in Croatia was actually higher in 2008 than in 2007, the decline in household-lending growth indicates a considerable portfolio shift away from the retail sector in that country. Two EU5 countries, Slovakia and Slovenia, exhibited increases in the 2008 household-lending growth. However, both countries remained below the 10-country average of 22% for household loans as a percent of GDP in 2008 indicating that they had relatively underdeveloped retail banking sectors based on their level of overall economic activity at the time.

Columns E and F of Table 3.3 record the extent to which the retail credit boom beginning in 2004 affected a country's exposure to FX risk. Relative to overall economic activity (GDP), FX lending is particularly high at about 35% or more in Croatia, Bulgaria, and Hungary (column E). In these three countries, loans in FX make up more than half of total loans in 2008 with Hungary at 63.8%, Croatia at 63.8%, and Bulgaria at 57.2% (column F). Of these countries, Hungary experienced the most dramatic increase in FX lending as only 31.8% of total

loans were denominated in FX in 2004.[12] In addition to these three countries, Romania also had more than half of its loans denominated in foreign currency by 2008 although FX loans constituted only 21% of 2008 GDP. Serbia is an outlier on all counts in that it experienced a dramatic decline in the proportion of FX lending from 30.3% in 2004 to only 7.1% in 2008, which constituted a mere 2.6% of 2008 GDP. Of the remaining countries, only Russia and Poland had moderate proportions of lending denominated in foreign currency at 32% and 34.3%, respectively, by 2008 constituting 11.8% and 13.3% of that year's GDP in the respective country.[13] In terms of increasing FX exposure, the retail credit boom had its most appreciable impact on Hungary.

A coverage measure, computed as the ratio of official FX reserves to FX loans, is reported in column G of Table 3.3. According to this metric, Croatia at 41.4% and Hungary at 64.1 % face the highest uncovered exposure to FX risk. Below-average loan growth in both countries has not been sufficient to mitigate FX risk because of the high proportion of FX loans in 2008.[14] Regarding the other six relevant countries,[15] three have coverage ratios over 100%. The credit booms in Russia and Serbia, as evidenced by high growth rates of lending in 2007, have not resulted in FX exposure of any serious magnitude measured by coverage ratios. Bulgaria experienced higher-than-average growth rates in lending in both years; its ratio of FX lending to GDP is high but its coverage ratio is moderate at just over 80%.[16] Romania experienced higher-than-average growth rates in household lending in both years; its percentage of FX loans is high but its coverage ratio is moderate at just over 90%. Relatively moderate credit growth in the Czech Republic has not been accompanied by any uncovered FX exposure. All measures of FX exposure in Poland indicate that this country faced only moderate FX risk by 2008. Taking all indicators together, Hungary and Croatia were facing the most severe FX risk of any of these countries when the global financial crisis intensified.

For the purpose of analyzing the impact the global financial crisis on TEs, Banai *et al.* (2009) divide the crisis period into two pieces by taking the date on which Lehman Brothers declared bankruptcy (September 15, 2008) as the temporal break. They have data for six TEs, the EU7 excluding Slovenia, and five international banking groups, the top six in Table 3.2 excluding SocGen. In the pre-Lehman period beginning in 2007, the authors show that foreign parent banks maintained their commitment to the host countries by continuing to support rapid credit growth. However, they find that foreign banks did raise the cost of funding, decrease direct financing, and increase both maturity mismatch and swap funding. The

Table 3.3 From credit squeeze to crisis?

Country	Corporate loan growth in %		Household loan growth in %		FX loans/ GDP	FX loans/ total	FXres/ FX loans	CAdef/GDP		FiscalDef/ GDP		GDP growth
	2007	2008	2007	2008	2008	2008	2008	2008	2009	2008	2009	2009
	A	B	C	D	E	F	G	H	I	J	K	L
EU 5	23.6	15.2	31.3	23.8								
Czech Republic (CZ)	21.0	13.0	39.6	19.5	7.3	14.1	245.5	0.6	1.0	2.1	6.6	–4.2
Hungary (HU)	11.7	6.1	23.9	20.2	34.6	63.8	64.1	7.1	–0.2	3.7	3.9	–6.3
Poland (PL)	31.9	10.6	48.1	24.4	13.3	34.3	92.9	5.1	1.6	3.6	7.2	1.7
Slovakia (SK)	4.6	26.5	31.9	39.9	10.6	21.8	195.7	6.5	3.5	2.3	6.0	–4.7
Slovenia (SL)	48.6	19.8	13.0	15.3	na	na	na	6.2	1.0	1.8	5.6	–7.8
SEE & RU	41.5	22.1	49.8	18.1								
Bulgaria (BG)	75.7	31.4	58.8	33.8	43.0	57.2	81.1	24.0	9.4	–3.0	0.8	–5.0
Croatia (HR)	10.1	12.7	18.6	11.8	47.9	63.8	41.4	9.2	5.2	1.4	3.9	–5.8
Romania (RO)	37.5	17.5	70.6	25.7	21.0	57.8	91.3	12.3	4.4	4.9	7.4	–7.1
Serbia (RS)	38.7	24.9	49.6	11.8	2.6	7.1	979.9	17.3	5.7	2.0	4.2	–3.0
Russia (RU)	45.3	24.2	51.6	7.4	11.8	32.0	219.9	–6.1	–3.8	–4.8	8.4	–7.9

Notes: For Serbia the data are for total loans. Slovenia was a member of the eurozone in 2008; hence, no FX data are reported. A negative sign in the deficit olumns indicates a surplus on the respective account.
Sources: Data for GDP growth and all deficits are taken from Unicredit (2010). Other data are from RZB (2009).
na = Not applicable.

authors claim that, in the post-Lehman period, anything could happen because events were unfolding rapidly. In October 2008, UniCredit was rumoured to be insolvent; in addition, short-term swap and bond markets froze in Hungary. A large International Monetary Fund (IMF)-EU rescue package helped to stabilise the situation in Hungary. In January 2009, deliberations began between international financial institutions (IFIs) and commercial banks regarding the banking situation in the region; these continuing discussions are known as the Vienna Initiative.

To evaluate the impact of the global financial crisis on the real economies of the TEs in the post-Lehman era, aggregate economic data taken from UniCredit (2010) is reported in Table 3.3. Column L records the growth rates of GDP in 2009 for all 10 countries. In this post-Lehman year, only Poland was able to maintain positive economic growth at 1.7%. The recession was deep in six countries with GDP contracting by 5% or more in Russia, Slovenia, Romania, Hungary, Croatia, and Bulgaria. In Serbia, Czech Republic, and Slovakia, GDP declines were more moderate between 3% and 4.7%. Table 3.3 also contains information on external and internal macro-economic (im)balances in these countries for both 2008 and 2009. The impact of the global recession is evident in all TEs in the increasing fiscal (internal) deficits observed by comparing data in columns J and K. The cyclical impact of the recession on the revenue side and government stimulus policies on the expenditure side contribute to increasing fiscal deficits. The declining current account (external) deficits observed by comparing data in columns H and I require some interpretation. Reductions in imports because of the domestic recessions were greater than any decreases in exports caused by recessions in other countries. The only exception to these two trends is a slight increase in the current account deficit in Czech Republic.[17] These macro-economic data indicate clearly that the second shoe dropped for the TEs in 2009; their real sectors were impacted adversely by the global recession brought on by the impact of the first shoe, that is, the financial crisis.

The reaction of parent international banks both to the deteriorating economic situations in these host countries and to their own weakened balance sheets because of home-country recessions remains a fundamental concern in the region. The Vienna Initiative attempted to quell market concerns and to keep these banks committed to their subsidiaries. As part of a brokered agreement with the IFIs, the major international banks pledged to support lending in the host countries. In particular, they committed publicly to maintaining their level of exposures in Romania and Serbia (Sanfey, 2010, p. 17).[18] Real-sector

linkages between the TE economies and the European countries that are homes to the major parent banks make it difficult to isolate the impact of financial transmission through the foreign-bank channel during the crisis.[19] Hence, I take a structural approach to examine the potential for financial disruption caused by the response of parent banks to the global crisis.

In five of the countries, the top five banks are all foreign owned.[20] The percentages of assets held by these five foreign banks in each country in 2008 are: Croatia at 74%, Slovakia at 72%, Czech Republic at 61%, Bulgaria at 57%, and Romania at 49%. In three other countries, four of the largest five banks are foreign owned. The percentages of assets held by these four foreign banks only in each country in 2008 are: Poland at 37%, Hungary at 34%, and Serbia at 33%. In both Hungary and Poland, the largest bank is a domestically controlled bank.[21] Neither Slovenia nor Russia has significant foreign penetration in the top five banks with foreign-controlled assets of only 11 % and 3%, respectively. Hence, excluding Russia and Slovenia, these TEs have highly concentrated, foreign-controlled banking sectors making them vulnerable to contagion and financial disruption through the banking channel from the crisis in Europe.

This potential for financial contagion from home-country shocks to host countries *via* the bank-lending channel has been a major concern of skeptics regarding the benefits of foreign bank penetration. Arvai *et al.* (2009) used Bank for International Settlements (BIS) data on cross-border financial transactions from 2000 to 2007 for virtually all TEs to investigate this issue.

As a measure, they used the percentage of foreign claims from a single home country to the GDP of the recipient country. These authors showed that Swedish exposure to the Baltic region is greater than 60% in each country, which corroborates the ring fence characterisation. The only other recipient country having exposure above 60% is Croatia with such high exposure to each of two countries, namely Italy and Austria. Using BIS data on bank claims for the same countries from March 2005 to December 2007, Maechler and Ong (2009) measured host-country risk to portfolio withdrawals of credit from all foreign sources by taking the ratio of short-term foreign-bank funding to the private sector as a percentage of own GDP.[22] They found that Bulgaria, Croatia, and Romania (and the Baltic countries) have ratios above 20%. In addition, these authors confirm that foreign bank funding to the non-bank private sector was becoming increasingly denominated in foreign currency at the onset of the global financial crisis.

To continue with the structural approach, I calculated a two-home-country market share of foreign banks by finding the two countries whose banks taken together have the largest and second-largest share of banking assets in a specified host country. By this measure, Croatia has the highest risk of contagion with 66% of its banking assets held by parent banks from Italy and Austria, the largest stake of which is held by UniCredit at 24%. Slovakia is close behind at 63% from parent banks in the same two countries, the largest stake of which is held by Erste at 20%. However, the entry of Slovakia into the eurozone in 2009 mitigates these concerns and changes the nature of any contagion risk so that we drop this country from further consideration. In a second category of moderate contagion risk, these calculations place Romania at 45 % from banks in Austria and France, the largest stake of which is held by Erste at 20%, and Czech Republic at 40% from banks in Austria and Belgium, the largest stake of which is held by Erste at 18%. Finally, I discern mild contagion risk for Bulgaria at 36% from banks in Greece and Italy, the largest stake of which is held by UniCredit at 16%, and for Hungary at 30% from banks in Austria and Italy, the largest stake of which is held by Intesa at 9%. Hence, the structural approach adds two countries, Czech Republic and Hungary, to the list of three TEs identified using cross-border financial data, namely Bulgaria, Croatia, and Romania, as countries facing some degree of financial contagion risk. These five TEs experienced considerable contractions of real GDP in 2009 ranging from 7.1% in Romania to 4.2% in Czech Republic. Of the remaining five countries not identified as having any appreciable financial contagion risk, GDP growth in 2009 was positive in Poland but mildly negative in Serbia and Slovakia, whereas both Russia and Slovenia experienced serious contractions in GDP of 7.9% and 7.8%, respectively. Hence, these structural contagion measures provide no compelling evidence that the bank channel was the major determinant of the extent of real-sector contraction in 2009.

For nine of these countries (Serbia is excluded in the analysis), UniCredit (2010) concluded that private-sector lending held up relatively well during the 2009 recessions. Lending to the private sector did decline dramatically in Hungary by 10% and in Russia by 7% in 2009 (UniCredit, 2010, p. 6). However, parent banks appear to have met their commitment to much of the region; 2009 growth rates in lending range from slightly negative in Romania to positive by 3% or more in Slovakia, Bulgaria, and Poland (over 5%) with the other three countries experiencing lending growth of between 1% and 3%.[23] Combined with 2009 fourth quarter GDP growth data that indicate improvements

relative to the previous three quarters in all countries except Bulgaria, these results lead to an optimistic prediction by the UniCredit analysts that the leading banking groups are well-positioned to restart lending in the region so that banking sector should not be a brake on TE growth in the coming years (UniCredit, 2010, p. 9).[24] If this assessment is correct, the danger period is over now that the second shoe has dropped and its impact has been absorbed, to some extent, by the international parent banks.

Conclusion: waiting for *god(ill)ot*[25]

The banking landscape in the European TEs provides an excellent laboratory for evaluating the net benefit of foreign bank penetration in emerging market economies. The speed and depth of foreign bank entry is without precedent. From 2004 through the early period of the global financial crisis, credit to the private sector grew rapidly. Retail lending expanded at spectacularly high rates in many countries, fuelled in some cases by FX-denominated loans. In about half of the 10 countries considered in this article, some risk of contagion *via* the banking channel is identified. However, preliminary evidence suggests that the parent foreign banks maintained their commitment to the region in the midst of the recession brought on by the global financial crisis. Is anything lurking on the horizon that could provide a further blow to these TEs or are they now poised to resume growth of their still relatively underdeveloped and somewhat immature banking sectors, especially with respect to retail lending?

The special feature of foreign bank penetration in TEs, that is, the hybrid organisational form created by foreign banks acquiring controlling shares of formerly state-owned domestic banks during the bank privatisation process, holds the key to answering this question. Only one of the top six international banks in the region, namely RZB, gained its prominent position by growing the market shares of its greenfield operations. The empirical literature indicates that greenfield subsidiaries tend to be treated as parts of an international portfolio by their parent bank suggesting that short-term risk/return characteristics will dictate the lending strategies of RZB across host countries. In 2009, RZB was downgraded from C to D + by Moody's based on its exposure to European TEs; hence, RZB faces higher costs when raising needed capital on financial markets. Based on our structural analysis, the two countries most at risk from portfolio adjustment by RZB are Bulgaria and Croatia. The other Austrian-based bank in the top six, Erste, also saw its

credit rating downgraded in 2009. However, Erste penetrated the region mainly by acquiring former state-owned savings banks. Hence, Erste has considerable local sources of funding and, as a hybrid bank, is less likely to pursue short-term portfolio re-allocation. Therefore, Erste's dominant market shares in Czech Republic, Slovakia, and Romania and its considerable stake in Croatia pose less of a threat to these host countries.

Of the other four international players, KBC, UniCredit, and Intesa sought capital support from their home governments because of deteriorating balance sheets whereas SocGen turned to capital markets albeit at a higher cost. The hybrid nature of their subsidiaries suggests that these four banks are pursuing a long-term commitment strategy. Nonetheless, UniCredit operates in all 10 European TEs, whereas SocGen and Intesa are present in 8 and 7 of them, respectively. Hence, a commitment to the region may be different from a commitment to an individual country. Two countries, Hungary and Croatia, are identified as having considerable FX risk. The largest bank in Croatia, UniCredit, is the second largest bank in Poland, which is the only country to have maintained positive GDP growth during the crisis. UniCredit is also the largest bank in Bulgaria, where lending has been growing rapidly. Relative reallocation among its subsidiaries in favour of host countries with stronger economic fundamentals may be a sound business strategy for UniCredit. Such a strategy could have an adverse impact on lending in Croatia. In Hungary, KBC is the second largest and Intesa is the third largest bank. As a relative newcomer, Intesa may also have room to maneuver based on a risk/return calculation. Moreover, KBC also has a strong presence in both Czech Republic and Slovakia so that it has the capability to reapportion funding among its subsidiaries in three highly developed European TEs to the detriment of funding in Hungary. Finally, SocGen is the only one of these six to have any appreciable market share in Russia but it also has subsidiaries among the top five banks in Romania (second), Czech Republic (third), and Slovenia (fifth). The tension between long-term expansion and short-term re-allocation may be strongest in the business strategy of this French bank as it moves attention eastward.

What are the lessons from experiences to date in TEs with the global financial crisis? Within the EU5 group, participation in the eurozone and minimal foreign bank penetration did not protect Slovenia from the financial crisis and the resulting macro-economic imbalances although Slovakia's pending entry most likely did contribute to its high growth rate in lending in 2008. Poland with its low banking-sector concentration ratio and a highly diversified-by-country group

of international banks has weathered best the financial crisis. Poland maintained positive economic growth in 2009 and has relatively small exposure to FX risk. Czech Republic has the lowest foreign exposure in the group but it experienced a moderate decline in lending and GDP. Hungary is the most vulnerable of the group having increased substantially FX lending before the crisis and suffered considerable contractions in both GDP and lending in 2009 despite relatively strong macroeconomic balances. However, no discernible patterns have emerged among the EU5 countries that would identify the bank channel as the transmission culprit of the global recession.

Within the other group of TEs, Croatia appears to be the most vulnerable despite only modest growth rates in lending in both 2007 and 2008 because of its high exposure to FX risk and the dominance of its banking sector by Austrian and Italian banks. To a large extent, Russia is a separate case due both to its energy export base, which has a strong influence on real-sector growth, lending, and macroeconomic balances, and to the continued dominance of state-owned banks. Of the other three, Bulgaria exhibited the strongest growth in lending in 2008, over half of which was in FX loans, and placed second only to Poland in loan growth in 2009. Bulgaria's banking sector has a relatively low concentration ratio and a diversified-by-country group of foreign banks but GDP still contracted considerably in 2009. Serbia and Romania have less developed banking sectors with relatively low concentration ratios; both experienced considerable contractions of lending in 2008 and moderate changes in macroeconomic balances. With so many contributing factors at work in these countries, isolating the effect of a bank transmission channel will be difficult.

What signs might portend the descent of a new financial blow (*godillot*) on any of these TEs? Based on our analysis, Hungary and Croatia are the two countries that are most at risk. Did Hungary take the brunt of the impact in 2009 with a relatively steep recession and substantial contraction of lending so that it is now poised for recovery? A hopeful sign would be if the current account surplus and the relatively low fiscal deficit in 2009 continue into 2010. Did the Croatia National Bank reign in credit sufficiently in the early period of the crisis to escape the negative effects of the credit boom or does it remain fragile because of its high FX-rate risk? Croatia's macro-economic balances were relatively good during the crisis despite a contraction in GDP of almost 6% in 2009; hence, remaining on schedule to join the EU would be a strong positive signal. Considerable contractions in GDP in 2009 and the accompanying severe impacts on macro-economic imbalances leave

Romania, Russia, and Slovenia wounded. However, the fate of two of these countries depends considerably on external factors. Russia's economy is linked closely to conditions in international energy markets, whereas Slovenia, as a member of the eurozone, depends considerably on ECB monetary policy. Having finally privatised all of its large banks, will Romania now reap benefits from foreign bank penetration? The slight decline in lending in 2009 calls into question the public commitment to Romania made by international banks in the Vienna Initiative; any continuing contraction would be a negative sign. With respect to the other countries, impending events on the horizon are likely to provide the strongest signals. Will the Serbian government sell its dominant share in the second largest bank, currently having both EBRD and International Finance Corporation (IFC) minority-ownership participation with the government holding the control ling stake, in the near future? Will Bulgaria arrange an orderly transition from its currency board to full membership in the eurozone? If the relative stability exhibited by Poland and Czech Republic spreads to the rest of the TEs, *God(ill)ot* will remain in the wings and never make an appearance.

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Notes

1. Details on the evolution of the banking sectors and the privatisation programmes in these 10 countries are found in Bonin *et al.* (2010). Barisitz (2008) provides a comprehensive analytical history of the first decade and a half of banking sector development in a somewhat larger group of transitioning economies.

2. In the literature, different terms are used for this type of foreign-owned bank, for example, takeover or acquisition. I use the term hybrid to distinguish this foreign-bank type from foreign greenfield banking operations. Bonin, Hasan and Wachtel (2005) distinguish foreign greenfield banks and privatized banks with strategic foreign owners to investigate the impact of privatization on bank efficiency in TEs.
3. A related concern was expressed regarding the bank privatization process, namely that foreign banks would buy up only the best-performing banks in TEs leaving the weaker banks to remain as wards of the state. Although some evidence of such cherry picking by foreign acquirers is found in early acquisitions, an endogenity problem makes this result difficult to establish because governments were offering the financially better state-owned banks earlier in their privatisation programmes.
4. Although Slovakia also appears to be ahead of the field in this respect, the number reported for 1995 includes the remaining vestiges of Czech bank holdings after the Velvet Divorce, hence it is not comparable to measures in the other countries.
5. All eurozone averages reported in this section are taken from RZB (2009).
6. Comparisons between TEs and eurozone averages ignore considerable differences in levels of economic development. To make a relative comparison among TEs, a correlation between the ratio of household loans to GDP and GDP per capita in 2008 is presented in RZB (2009, p. 12). In addition to the 10 countries considered in this article, the correlation exercise includes Ukraine, Albania, Bosnia and Hercegovina, and Belarus. In all, 4 of the 10 countries in Table 3.1, namely, Bulgaria, Croatia, Hungary, and Poland, lie above the correlation line indicating high retail financial depth relative to GDP per capita with respect to other TEs. Of the remaining six that fall below the line, Russia exhibits the lowest level of relative depth. Three of the EU5, namely Czech Republic, Slovakia, and Slovenia, also lie below the line, thus indicating less retail financial depth than would be expected given their levels of overall economic development.
7. Author's computations from country tables in RZB (2009); no data on mortgage loans are provided for Slovenia.
8. In 2008, the average ratio of mortgage loans to GDP was 16.9% in the EU5 compared to a eurozone average of 37.8% (RZB, 2009, p. 13). Hence, relative to overall economic activity, the mortgage market is considerably underdeveloped in all TEs compared to European countries.
9. These data were taken from RZB (2009, pp. 46ff). Ranked by total assets held in TEs, the Hungarian Orszagos Takarekpenztar es Kereskedelmi Bank (OTP) banking group would come in sixth, slightly above the Intesa Group, but the majority of its assets are in the parent bank in Hungary so that I have adjusted its total accordingly. As the first note to the table explains, I subtracted the home-country assets for OTP (and also for those of a Slovenian bank) from the total of foreign assets in preparing the shares reported in Table 3.2. OTP's major acquisition outside Hungary is DSK, the former state-owned savings bank in Bulgaria, with assets valued at 4.4 billion euros in 2008.
10. The UniCredit Group includes two formerly independent Austrian banks, namely Bank Austria and Creditanstalt, along with a former German bank, namely Hypervereins. These three banks had been early entrants into TE

banking sectors as greenfield operations before their own acquisition by the Italian-based mother bank.

11. KBC acquired a minority ownership stake in Nova Ljubljanska Banka (NLB), the largest bank in Slovenia, in a privatisation tender. In 2008, KBC announced its intentions to sell its shares because the Slovenian government was unwilling to allow the Belgian bank to increase its stake to gain control of the bank. However, it still retains its stake in NLB, which was the only Slovenian bank to participate in recent European stress tests. According to a recent news release (Reuters, July 30, 2010), the bank passed the test narrowly but has plans to seek additional capital. The same source claims that the Slovenian government has not yet decided whether to inject the capital itself or sell some of its shares. However, based on a Slovenian newspaper citing unofficial government sources, the article reports that Goldman Sachs has an interest in acquiring NLB and that the Slovenian government would now approve a takeover by KBC. Perhaps a bidding war is in the offing.
12. The increase in Bulgaria was smaller as 48.2% of total loans were denominated in FX in 2004. In Croatia, FX lending as a proportion of total loans actually decreased somewhat in 2008; this ratio was 69.5% for 2006, which is the first year of reported data in RZB (2009).
13. Poland did experience about a 40% increase in the proportion of FX lending over the 4-year period as this measure was 24.2% in 2004. Neither exposure ratio is high in the Czech Republic. Slovakia joined the eurozone in 2009 mitigating concerns about its FX exposure.
14. During this period, the Croatian National Bank imposed restrictions on credit growth. In addition, Croatia was able to raise capital successfully in international markets twice in 2009 (Sanfey, 2010, p. 10), thus indicating that its high FX exposure may be manageable.
15. Two countries, Slovakia and Slovenia, are now members of the eurozone; as such, they are left out of this discussion.
16. The relatively high level of FX reserves in Bulgaria support its currency board monetary arrangement making any interpretation of FX risk for this country more complicated.
17. The increase in the fiscal deficit as a percent of GDP is relatively small in Hungary because of an austerity programme required by the IMF support package of 2008.
18. In early 2009, Serbia and Romania received considerable IMF support.
19. I am indebted to Paul Wachtel for calling this point to my attention.
20. Regarding the overall structure of these banking sectors, the five-bank concentration ratio, computed as the top five banks holdings of total banking assets, ranges from 45% in Russia to 74% and 72% in Croatia and Slovakia, respectively with six of the countries having a measure between roughly 50 and 60%.
21. In Hungary, the largest bank (OTP) is a widely held bank with foreign portfolio investment but no strategic (controlling) foreign owner; in Poland, the largest bank Powszechny Kasa Oszczednosci – Bank Panstwowy (PKO) remains a state-owned bank.
22. These authors also investigated both a home country's exposure to the region relative to its total foreign claims and the overall importance of such cross-border banking in TEs to the home (rather than the host) country. They found that Austria is the most important creditor country to the region

with an exposure equal to 49% of total foreign claims constituting a remarkably high 70% of own GDP. For non-Baltic TEs, the results in descending order of exposure to the region (with the percentage of home-country GDP in parentheses) are Italy 13.6% (9.1% of GDP); Germany 13.1% (6% of GDP); France 8.9% (5.3% of GDP); and Belgium 7.5% (26.3% of GDP). Their analysis confirms the Baltic ring fence with Sweden. As an additional concern, they found that home country portfolios are relatively undiversified with usually more than 50% of claims found in only three host countries. Austria, the largest creditor to the region, has the most diversified portfolio with only 46.5% in the top three host countries.

23. The UniCredit analysts present a correlation between the ratio of non-performing loans to the minimum GDP growth rate (maximum contraction) both for past financial crises with their resulting recessions and for the current recession in a group of emerging market economies and TEs. They conclude that credit quality held up reasonably well in the recent crisis (UniCredit, 2010, p. 9).
24. Popov and Udell (2010) have a more pessimistic view of the situation based on their analysis of the other side of the credit market. Using EBRD survey data for 2008 from companies in 14 TEs (EU10 plus Albania, Croatia, Macedonia, and Montenegro), these authors found evidence that SMEs, in particular, are severely credit-constrained. Moreover, their empirical analysis showed that foreign banks are more apt to transmit financial shocks to the real sector than are domestic banks. I thank Paul Wachtel for bringing this article to my attention.
25. *Godillot* is an old slang French word for a leather boot derived from the name of a military boot maker. When asked about the identity or meaning of the never-appearing title character in his famous play, Waiting for Godot, Samuel Beckett's usual response was that the name suggested itself to him by this slang word because feet play such a prominent role in the plot.

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4

Banking Competition and Efficiency: A Micro-Data Analysis on the Czech Banking Industry

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Banking competition is expected to provide welfare gains by reducing monopoly rents and cost inefficiencies, favouring a reduction of loan rates and then an increase in investment. These expected gains are a major issue for transition countries in which bank credit represents the largest source of external finance for companies. With the use of quarterly data for Czech banks, this paper aims to estimate the effects of banking competition in the Czech Republic. First, we measure the level and evolution of banking competition between 1994 and 2005. Competition is measured by the Lerner index on the loan market, using data on loan prices. We find no improvement in banking competition during the transition period. Second, we investigate the relationship and causality between competition and efficiency. We perform a Granger-causality-type analysis that supports negative causality only running from competition to efficiency. Therefore, our results reject the intuitive 'quiet life' hypothesis and indicate a negative relationship between competition and efficiency in banking.

Introduction

As banks play a fundamental role in the financing of the economy, banking competition exerts an impact on economic development. However, there are some potential negative effects of banking competition

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through excessive risk-taking by banks, which may hamper financial stability (Allen and Gale, 2004; Carletti and Hartmann, 2002). Moreover, a higher degree of competition in banking markets is expected to provide welfare gains by reducing the prices of financial services and thereby accelerating investment and growth. These gains should in fact come from two channels of transmission. On the one hand, a higher degree of banking competition should result in lower monopoly power of banks, and therefore a decrease in banking prices. On the other hand, heightened competition should encourage banks to reduce their costs, that is, their cost inefficiencies. This latter channel is particularly promising in terms of welfare gains, as the order of magnitude of the cost inefficiencies in the banking sectors of European transition countries has been shown to average between 30% and 50% (eg Hasan and Merton, 2003; Fries and Taci, 2005). The issues regarding banking competition and its effects are therefore of particular interest in transition countries, as bank credit there is by far the largest source of external finance for companies (Caviglia *et al.*, 2002). Since investment is particularly sensitive to a decrease in loan rates, a reduction of monopoly rents and cost inefficiencies would consequently impact investment and economic growth.

Furthermore, the banking sectors of transition countries underwent major changes during the 1990s. Two main tendencies distinguished the transformation of the banking sectors of these economies: a considerable number of bank failures, and a banking sector gradually acquired by foreign investors. It is therefore of utmost interest to investigate how banking competition was influenced by these changes in transition countries. The Czech banking industry offers a relevant illustration of what has happened in transition countries. The Czech Republic was considered a success story at the beginning of the transition period before facing the same troubles as the other transition countries with bank failures and before opening up its banking sector to foreign investors.

This research has two aims: the first aim is to provide evidence on the level and evolution of banking competition between 1994 and 2005. A major contribution is the measurement of competition with the Lerner index, using data on output prices. We are therefore able to measure the degree of monopoly power for each bank in the loan market.

The second aim is to investigate the relationship and causality between competition and efficiency. Indeed, in spite of the commonly accepted view favouring a positive relationship, the scarce empirical literature in banking on this issue supports rather a negative link (Berger, 1995; Goldberg and Rai, 1996; Weill, 2004). Furthermore, the theoretical literature provides arguments for both

signs of this relationship. Namely, the intuitive 'quiet life' hypothesis suggests that competition positively influences efficiency, whereas the 'efficient-structure' hypothesis, proposed by Demsetz (1973), predicts a negative impact of efficiency on competition, as the most efficient banks would benefit from lower costs and therefore higher market shares. Finally, the specificities of banking competition cause one to expect that competition negatively influences efficiency, as reduced competition allows banks to benefit from economies of scale in monitoring and from longer customer relationships.

We provide evidence on the sign of this relationship for the Czech banking industry. We then contribute to the literature on banking in transition countries by providing the first investigation of the link between competition and efficiency in banking in a transition country. Furthermore, the computation of Lerner indices, which provides measures of competition at the firm level, allows us to investigate the causality between competition and efficiency at the firm level. Namely, we perform Granger-causality-type estimations in order to obtain information on causality between competition and efficiency in banking. This is an issue of considerable interest to the Czech banking industry, and also to the empirical banking literature as a whole. Indeed, to our knowledge, ours is the first work that investigates the causality between competition and efficiency in banking. Evidence on this issue will enrich the discussion of the conflicting assumptions on this topic. Such evidence is helpful to provide the normative implications of competition policy in the banking industry. Specifically, a negative relationship between competition and efficiency would imply a trade-off between these two objectives.

The structure of this paper is as follows: The next section describes the recent evolution of the Czech banking industry and surveys the theoretical and empirical literature of the relationship between competition and efficiency in banking. The methodology is described in the third section, followed by a discussion of the data and variables in the fourth section. The penultimate section presents the empirical results. Finally, we provide some concluding remarks in the last section.

Background

The evolution of the Czech banking industry

The Czech banking industry underwent massive structural changes during the economic transition period. The final outcome is fairly similar to banking sectors in the other Central European transition countries, with foreign owners now dominating the banking sector. Under the

communist regime, the banking system was dominated by a monobank combining the functions of a central bank and commercial banks. After the collapse of the old regime, the authorities decided to separate the activities of the former monobank. The commercial activities were transferred to two banks. Owing mainly to the lack of prudential regulation, the number of banks increased in the first years of transition, reaching 52 in 1993. The liberal licensing policy was primarily motivated by a desire to quickly increase competition in the banking sector. However, progress in bank regulation did not keep the same pace. The banking sector had been formed at a time when banking supervision was defined and conceived but when appropriate supervisory activities had not yet been developed.

However, after 1993, the Czech authorities strengthened the prudential measures to avoid a mass bankruptcy of the banking system due to the high amount of non-performing loans owned by the major banks, and the poor financial situation of the newly created banks. During the period of economic boom and high credit growth (1994–1996), serious problems were already starting to emerge, especially in small banks. The Czech National Bank thus developed a comprehensive programme for consolidating small banks (Consolidation Program II) at the end of 1995, with implementation commencing at the beginning of 1996. Of the 18 small banks, 15 were included in Consolidation Program II, with radical solutions (revocation of licenses, imposition of forced administration or take-over by another bank) adopted in nine cases.

To resolve the problem of the increasing amount of non-performing loans, the Czech government decided in 1993 to transfer the main part of non-performing loans from major banks to a special institution created for this purpose, Konsolidacní Banka. This procedure cleaned the loan portfolio of the main Czech banks with the intention of facilitating privatisation.

Furthermore, the difficulties of the Czech economy, accompanied by the inefficiencies of bank management partly due to the remaining links between major state-owned banks and state-owned firms, left non-performing loans at 30% of the total of loans in 1997 (CNB, 1998). The Czech government finally adopted a programme for the privatisation of banks in 1998, leading to a banking sector gradually acquired by foreign investors as they were expected to stabilise banks financially, improve their efficiency and supply expertise in modern banking.

Consequently, the period from 1994 to 2005 saw two main trends. The first was the failure of numerous banks. Out of the 48 banks operating in 1994 and another six licensed later on, 21 banks had failed by

2003. Most of these failures occurred between 1994 and 2000.[1] Only two failures recurred after 2000, both of them in 2003. We can thus distinguish two periods regarding bank failures: the 'troubled' sub-period 1994–2000, and the 'quiet' sub-period 2001–2005. As a consequence of the bank failures, the number of banks in the Czech market decreased from 48 at the beginning of 1994 to 36 at the end of 2005.

The second trend was an increasing share of foreign investors in the banking industry. After the privatisation of one public bank, Zivnostenka Banka, sold to foreign investors in 1992, there was a steady increase in foreign branches and subsidiaries specialising in providing investment banking and services to companies and households in the Czech market. However, the biggest change occurred between 1999 and 2002 with the privatisation and the sale of the three largest banks[2] to foreign banks. Owing to the failures of Czech-owned banks and sales to foreign investors, foreign investors controlled 96.2% of assets of the banking sector by the end of 2005 (CNB, 2006).

Both these tendencies in the Czech banking sector have also been observed in most transition countries to various degrees, so that they may be considered as general characteristics of the banking sector transformation of the transition countries.

A brief survey of the link between competition and efficiency in banking

Relatively little theoretical literature has examined the link between competition and efficiency. As observed by Caves (1980, p. 88), economists have 'a vague suspicion that competition is the enemy of sloth'. This suspicion is nonetheless supported by a couple of arguments in the literature. First, Hicks (1935) considered that monopoly power allows relaxing efforts.[3] This 'quiet life' hypothesis resorts to the idea that monopoly power allows managers to grab a share of the monopoly rents through discretionary expenses or a reduction of their effort. However, the existence of a monopoly rent does not explain its appropriation by managers. Indeed, there is no obvious reason why owners of monopolistic firms would exert weaker control of managerial effort than those of competitive firms. Therefore, complementary theories have been suggested by Leibenstein (1966) and Demsetz (1973).

Leibenstein (1966) explains why inefficiencies inside firms (the 'X-in-efficiencies') exist, and why they are reduced by the degree of competition in product markets. X-inefficiencies would result from the existence of imperfections in the internal organisation of firms: these imperfections have an impact on the level of information asymmetries

between owners and managers. Indeed, the incompleteness of labour contracts makes the effort of managers at least partially discretionary. The discretionary share of the effort would not be the source of any problem if the owners had the means to control firm performance. The production function is not known entirely. Therefore, owners cannot check the level of effort exerted by managers. Leibenstein then considers that the main determinant of a reduction in inefficiencies is an increase in competitive pressures for two reasons.

First, competition provides incentives to managers to exert more effort. As they are aware of the increase in competition, managers have to improve their performance or their firm will leave the market. Thus, managers are motivated by their will to avoid the personal costs of bankruptcy. Second, a larger number of firms on the market improves the possibilities for owners to assess firm performance relative to other firms. In this way, they acquire better knowledge about the production function of their own firm. Owners are then able to carry out a better assessment of managerial performance and consequently to proceed to make changes in management if necessary. Being informed about the comparative possibilities of competition, managers are inclined to exert more effort. Following Leibenstein's work, a few studies have proposed a formalisation of his ideas (Hart, 1983; Selten, 1986; Scharfstein, 1988). Leibenstein's X-efficiency theory in fact lies within the scope of the 'Structure–Conduct–Performance' (SCP) paradigm proposed by Bain (1951). According to this paradigm, market structure should influence firm behaviour in terms of prices and quantities, and therefore firm profits.

An alternative assumption has, however, been proposed by Demsetz (1973). This predicts a reverse causality between competition and cost efficiency: the 'efficient-structure' hypothesis. He considers that the best-managed firms have the lowest costs and consequently the largest market shares, which leads to a higher level of concentration. Thus, the causality of the relationship between competition and efficiency is reversed in comparison to the SCP paradigm: efficiency determines competition. As concentration can be considered an inverse measure of the competition, there should then exist a negative link between competition and efficiency.

This survey has so far only presented some theoretical references about the link between competition and efficiency, which are not necessarily specific to the banking industry. However, banking markets have some specific characteristics as compared to other markets. First, banking markets have a structure of imperfect competition, as observed in most studies on banking competition (eg De Bandt and Davis, 2000;

Bikker and Haaf, 2002; Weill, 2004). In fact, the theoretical literature in banking suggests that imperfect competition may result from the information asymmetries between lender and borrower in credit activity. As a consequence, banks have to implement some mechanisms to resolve the resulting problems such as adverse selection and moral hazard. One way out is the implementation by the bank of a customer relationship, meaning a long-term repeated relationship, to gain some information on the borrower. Banks can then reduce the problems related to information asymmetries. Nevertheless, an increase in banking competition may reduce the length of the customer relationship. These specific characteristics of the banking industry may consequently modify the relationship between competition and efficiency in banking. Also, according to Diamond (1984), banks have a comparative advantage in the *ex post* monitoring of borrowers, in comparison to investors, because of the existence of economies of scale resulting from their role as the delegated monitor.

As a consequence, competition may increase monitoring costs because of the existence of economies of scale, and a potential reduction in the length of the customer relationship, further decreasing the cost efficiency of banks. In other words, the specificities of the banking industry provide some additional arguments in favour of a negative relationship between competition and cost efficiency. This assumption will be called the 'banking specificities' hypothesis in the following text. It can be argued that this assumption should be validated more strongly in transition countries than in developed countries. Indeed, banks are supposed to suffer more from information asymmetries in transition countries, because of uncertainties of accounting information, and the relative lack of credit risk analysis know-how of bank employees, owing to the short history of the market economy.

We now turn to the empirical studies on the relationship between competition and efficiency in banking. Only a few studies have been performed on this issue, most of them regressing cost efficiency on a set of variables for market structure: Berger (1995) and Berger and Hannan (1997) on US banks, Lang (1996) on Western German banks, and Goldberg and Rai (1996) and Punt and Van Rooij (2003) on European banks. In these papers, cost efficiency is typically measured using the stochastic frontier approach, while market structure is measured by market share or concentration indices. These papers tend to support a positive relationship between cost efficiency and concentration/market share. Therefore, they tend to be in favour of the 'efficient-structure' hypothesis. In a paper devoted to Western European banks, Weill (2004) also supports

this view but by regressing efficiency scores on the nonstructural measure obtained with the Rosse–Panzar model.

In summary, the theoretical literature provides conflicting arguments with respect to the relationship between competition and efficiency, while the empirical literature rather favours a negative relationship. It therefore seems relevant to provide new empirical evidence with respect to the relationship between competition and efficiency by measuring competition with the Lerner index and by investigating the sense of causality of this link. Furthermore, as no former empirical study has been carried out on this issue in a transition country, it is also of interest to investigate whether the specificities of such an economy influence this relationship.

Methodology

Our aim is to investigate the relationship between competition and efficiency in the Czech banking industry. We therefore explain in this section how we estimate both variables.

Measurement of competition

Empirical research on the measurement of banking competition provides several tools, which can be divided into the traditional Industrial Organization (IO) and the new empirical IO approaches. The traditional IO approach proposes tests of market structure to assess banking competition based on the SCP model suggested by Bain (1956). The SCP hypothesis argues that greater concentration causes less competitive bank conduct and leads to greater profitability (meaning lower performance in terms of social welfare). According to this, competition can be measured by concentration indices such as the market share of the five largest banks, or by the Herfindahl index, which is defined as the sum of the squares of the market shares (Herfindahl, 1950). These tools were widely applied until the 1990s. Figure 4.1 shows the trend of the Herfindahl index of the Czech banking sector calculated for total bank assets and loans, respectively, and the number of banks from 1994 to 2005 that were reported to the central bank. According to the Herfindahl index, concentration continuously decreased from 1994 to 2000 and then strongly increased from 2000 until 2003 before a slight decrease from 2003 to 2005, whereas the number of banks continuously decreased over this time period.

The new empirical IO approach provides non-structural tests to circumvent the problems of the measures of competition provided by

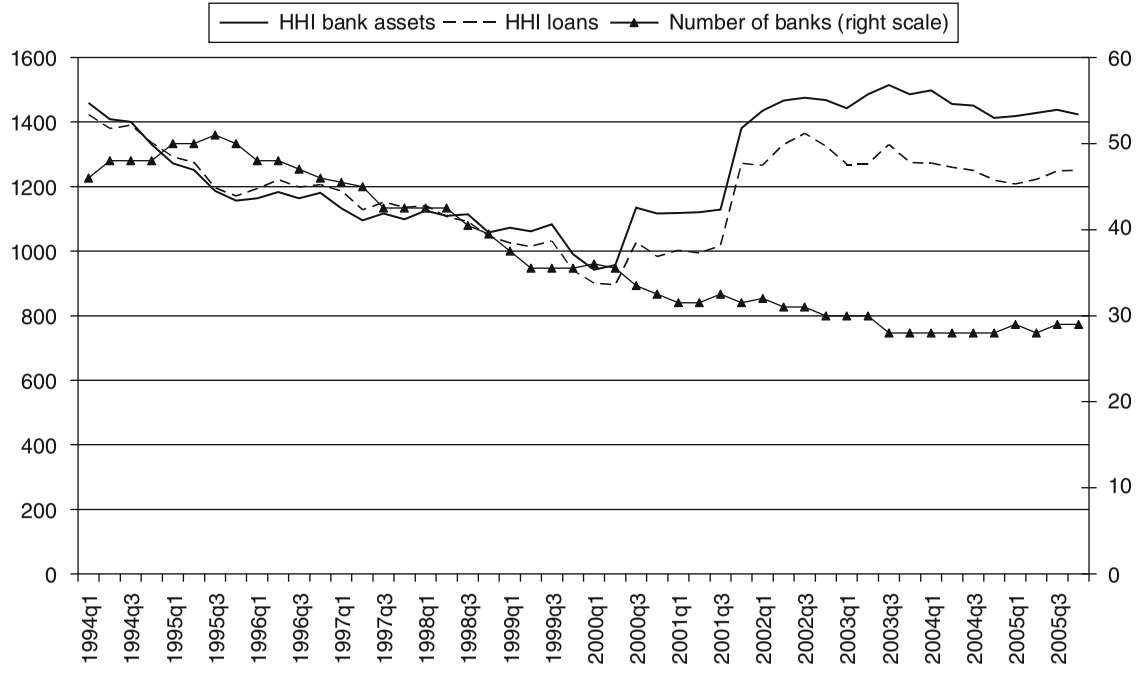

Figure 4.1 Herfindahl index and number of banks in the Czech Republic 1994–2005

the traditional IO approach. These latter measures suffer from the fact that they infer the degree of competition from indirect proxies such as market structure or market shares. In comparison, non-structural measures do not infer the competitive conduct of banks through the analysis of market structure, but rather measure banks' conduct directly. Furthermore, it allows us to consider the actual behaviour of the banks by taking into account contestability, that is, the possibility to freely enter and exit a market (Baumol *et al*., 1982). Indeed, as observed by Claessens and Laeven (2004), the actual behaviour of a bank is related not only to market structure but also to the barriers to entry, which influence the likelihood of the entry of new competitors and therefore the behaviour of incumbents.

The most commonly applied tool to assess competition with the new empirical IO approach is the Rosse–Panzar model (Rosse and Panzar, 1977; Panzar and Rosse, 1987). The Rosse–Panzar model is based on the estimation of the *H*-statistic, which aggregates the elasticities of total revenues to input prices. It has been applied to Western European countries by several authors (Bikker and Haaf, 2002; Hempell, 2002; Weill, 2004), and also by Gelos and Roldos (2004) and Mkrtchyan (2005) in transition countries. Gelos and Roldos (2004) investigate banking competition in eight emerging countries including three transition countries (the Czech Republic, Hungary and Poland). They conclude that monopolistic competition exists in these three countries, and also that there has been no significant change in banking competition between 1994 and 1999. However, Gelos and Roldos do not use exhaustive information on banks, as it obtains information from the Bankscope database from which a substantial number of banks are missing. Mkrtchyan (2005) measures competition for the whole Armenian banking sector and also points out monopolistic competition. However, the Rosse–Panzar model provides a characterisation of competition for the banking industry as a whole. Another approach is the Bresnahan–Lau test based on the estimation of a structural model with separate demand and supply equations (Bresnahan, 1982, 1989; Lau, 1982). This test therefore estimates the mark-up on aggregate data. To our knowledge, this approach has only been applied to banking sectors of Western countries (eg Shaffer, 1993).

However, our research requires individual measures of competition for each bank of our sample through the period 1994–2005 instead of aggregate measures for the full sample. Therefore, we compute the Lerner index for each bank of the sample instead of estimating the Rosse–Panzar model and the Bresnahan–Lau test.

The Lerner index has been computed in several empirical studies on banking competition (eg Maudos and Fernandez de Guevara, 2004; Fernandez de Guevara *et al.*, 2005). It is defined as the difference between the price and the marginal cost, divided by the price (Lerner, 1934). In this study, we focus on the loan market, which represents by far the greatest share of assets for Czech banks. As a consequence, we use the price of loans and we compute the marginal cost by considering loans as the output.

The price of loans is computed as interest revenues divided by net loans. Net loans are total loans minus the non-performing because revenues are not likely to come from the non-performing loans. Not subtracting the non-performing loans would understate the price for banks having significant proportions of non-performing loans.

The marginal cost is estimated on the basis of a translog cost function with one output and three input prices, which are described in the section Data and Variables. One cost function is estimated for each year by introducing fixed effects for banks. We impose the restriction of linear homogeneity in input prices by normalising total costs and input prices by one input price. The cost function is specified as follows:

$$\begin{aligned}\ln\left(\frac{TC}{w_3}\right) = {} & \alpha_0 + \alpha_1 \ln y + \frac{1}{2}\alpha_2 (\ln y)^2 + \alpha_3 \ln\left(\frac{w_1}{w_3}\right) \\ & + \alpha_4 \ln\left(\frac{w_2}{w_3}\right) + \alpha_5 \ln\left(\frac{w_1}{w_3}\right)\ln\left(\frac{w_2}{w_3}\right) \\ & + \frac{1}{2}\alpha_6 \left(\ln\left(\frac{w_1}{w_3}\right)\right)^2 + \frac{1}{2}\alpha_7 \left(\ln\left(\frac{w_2}{w_3}\right)\right)^2 \\ & + \alpha_8 \ln y \ln\left(\frac{w_1}{w_3}\right) + \alpha_9 \ln y \ln\left(\frac{w_2}{w_3}\right) + \varepsilon\end{aligned} \tag{1}$$

where TC denotes the total costs, y loans, w_1 the price of labour, w_2 the price of physical capital and w_3 the price of borrowed funds. The indices for each bank have been dropped from the presentation for the sake of simplicity. The estimated coefficients of the cost function are then used to compute the marginal cost. Because the marginal cost is the derivative of the total cost with respect to output (loans), it can be shown that the derivative of the logarithm of the total cost with respect to the logarithm of output is the ratio of the marginal cost to the total cost multiplied by output. As a consequence, the marginal cost is equal to the product of the derivative of the logarithm of the total cost with respect to output (ie the derivative of equation 1 with respect to loans y) multiplied by the ratio of total cost to output.

Measurement of efficiency

We compute cost efficiency that measures how close a bank's cost is to what a best-practice bank's cost would be for producing the same bundle of outputs. Several techniques have been proposed in the literature to measure efficiency with frontier approaches. All are based on the estimation of an efficiency frontier, but they differ in the assumptions made to decompose the distance from the frontier between an inefficiency term and a random error.

Nonparametric approaches like data envelopment analysis consider the whole distance from the frontier as inefficiency. These methods are therefore deterministic in the sense that they do not include the possibility of luck and measurement errors in the estimation of the frontier. They may therefore overestimate the inefficiencies.

Parametric approaches such as the stochastic frontier approach and the distribution-free approach do not suffer from this drawback. The stochastic frontier approach (SFA) makes some distributional assumptions to disaggregate the residual from the frontier into an inefficiency term and a random disturbance. The inefficiency term follows a one-sided distribution, which is generally the half-normal distribution, while the random disturbance is assumed to have a normal distribution. However, these distributional assumptions are arbitrary and the literature has found that when inefficiencies were unconstrained they behaved much more like symmetric normal distributions than half-normal distributions (Bauer and Hancock, 1993; Berger, 1993).

Therefore, the distribution-free approach (DFA) has been proposed to resolve the main criticism of the SFA, namely its reliance on distributional assumptions. Instead, the DFA adopts more intuitive assumptions to separate inefficiency from random disturbance. First, the efficiency of each bank is assumed to be constant over time, following the hypothesis of a firm-effect inefficiency. Second, random disturbances tend to average out over time, following the view that good and bad luck cancel out over time. As a consequence, the average residual for each bank over the period serves as an estimate of the efficiency term for that bank, given that the average random error term tends toward zero over the period.

Because of these assumptions, Berger and Mester (1997) consider the DFA as their 'preferred frontier efficiency estimation technique'. This technique is nevertheless not always applied in works on banking efficiency as it needs two major requirements. The first is the availability of panel data. The second is the assumption of constant efficiency over the studied period, which limits the number of efficiency measures obtained with this technique. However both these requirements are not

problematic for our analysis as we have panel data and we can estimate constant efficiency scores for each year since we have quarterly data.

Bauer *et al.* (1998) distinguish three different techniques by which DFA may be implemented in practice. In this study, we chose to apply DFA-P WITHIN, which is a fixed-effects model that estimates inefficiency from the value of a firm-specific dummy variable. Each firm's efficiency is then computed as the deviation from the most efficient firm's intercept term. More precisely, we estimate the translog cost function presented in equation 1 for each year (four quarters) where we assume that the random error cancels out over the four quarters and the (in) efficiency term is computed from an estimated bank-specific dummy variable.[4] The other two techniques are DFA-P GLS and DFA-P Truncated. DFA-P GLS applies generalised least squares to panel data, and assumes that inefficiency is uncorrelated with the regressors. Hence, it implies an additional assumption in comparison to the technique we chose. DFA-P Truncated estimates the cost function separately for each period. The efficiency estimates are then based on the average residuals for each bank. Since some noise might be persistent over time, this technique truncates the residuals at both the upper and the lower ends of the distribution, to limit the effects of extreme average residuals at both ends. Therefore, this technique is not appropriate for our relatively small sample. We do not have extreme cases and further truncations would reduce the sample even more.

Data and variables

We used monthly data for all Czech commercial banks[5] during the period 1994–2005 that reported to the Czech National Bank (CNB) and aggregated them into quarterly observations. We performed a careful investigation of the data to find and omit outliers. For failed banks, the observations for the year of failure were dropped as the data for the quarters preceding the failure are mostly chaotic. For each year, we only keep banks with information for all four quarters. We use an unbalanced panel. For the definition of inputs and outputs, we adopted an intermediation approach proposed by Sealey and Lindley (1977). It assumes that the bank collects deposits to transform them, using labour and capital, into loans.

One output, net loans (ie total loans minus non-performing loans), was adopted for the estimation of the cost function and the cost efficiency frontier.[6] Inputs included labour, physical capital and borrowed funds. The price of labour was measured by the ratio of personnel expenses to

Table 4.1 Descriptive statistics

	Median	Mean	s.d.
Output			
Loans (CZK billions)	14.4	53.9	92.8
Input prices			
Price of labour (CZK thousands)	85.9	116.3	93.7
Price of physical capital	0.09	0.137	0.122
Price of borrowed funds	0.012	0.015	0.011
Other characteristics			
Assets (CZK billions)	20.12	81.09	146.3
Total costs (CZK millions)	305.4	981.8	1727.8
Price of loans	0.021	0.023	0.0122

$N = 1{,}110$ observations.

the number of employees. The price of physical capital was defined as the ratio of expenses for physical capital to fixed assets. The price of borrowed funds was measured by the ratio of expenses for borrowed funds to borrowed funds. Total costs were the sum of expenses for personnel, physical capital and borrowed funds. The price of loans was computed using the ratio of interest received on loans to loans. Summary statistics for the period 1994–2005 are reported in Table 4.1.

Results

This section presents the empirical results. The first subsection discusses the trends in banking competition. In the second subsection, we investigate the relationship between competition and efficiency.

The evolution of banking competition

We present the results regarding the computation of the Lerner index. One cost function is estimated for each year so as to allow the coefficients of the cost function to change over time. The cost function is estimated by introducing fixed effects for the banks. The fit of the equation is satisfactory, based on the individual *t*-statistics of the coefficients and the value of the adjusted R^2 statistics, which range from 0.75 to 0.88 depending on the year of the estimation. All coefficient estimates are not reported due to space constraints.

Our results for each year are displayed in Table 4.2. One has to keep in mind that the Lerner index is an inverse measure of competition,

Table 4.2 Lerner indices per year

	N	Median	Mean	s.d.
1994	87	60.13	59.01	30.97
1995	110	16.94	13.6	49.48
1996	99	14.73	2.46	71.12
1997	106	–14.38	–26.88	83.67
1998	86	8.77	10.94	24.26
1999	99	32.16	30.76	31.73
2000	100	30.37	31.11	23.96
2001	92	24.4	29.12	24.79
2002	92	17.1	17.03	27.7
2003	88	50.95	43.44	30.93
2004	75	55.11	45.74	27.66
2005	76	44.8	42.09	26.67

All indices are in percentage.

that is, a greater Lerner index means lower competition. The statistics of Lerner indices per year concern all the Lerner indices of the year for all banks. We focus our comments on the median competition measures for each year, rather than mean competition measures that can be influenced by extreme values. We, however, observe that median and mean competition measures are relatively close for each year.

The most striking finding is the absence of a decreasing trend of the Lerner index, which would have meant an increase in banking competition. The Lerner index decreased in the first years between 1994 and 1996. Its evolution then became erratic between 1996 and 2001. From 2001 to 2005, the evolution became more regular with a clear increase.

Consequently, two remarks can be made to sum up the evolution of banking competition in the Czech Republic. First, the main trend is in favour of a reduced banking competition over the period. Namely, after the improvement in banking competition in the first years, banking competition declined considerably until 2005, even if this path was not smooth. Second, we do not observe any development of strong banking competition during the transition period.

The entry of foreign investors into the Czech banking industry from 1999, with the launching of the privatisation of major banks, does not seem to lead to increased banking competition. This may be a surprising result, as this entry meant a strong change in the ownership of banks. The empirical literature on banking in developed economies concludes, however, that the dominant market structure is imperfect competition. Therefore, the large share of foreign ownership in Czech banks

may have favoured a process of convergence of banking performance towards the normal market functioning, even though a high level of banking competition was not observed.

Moreover, bank failures provide at best only a limited explanation of the changes in Czech banking competition. Failures usually decrease competition – and therefore increase the Lerner index – because of the reduced number of competitors. While the period studied can clearly be decomposed between one period with many bank failures from 1994 to 2000 and another period with only a few bank failures from 2001 to 2005, we do not observe a reduction of competition between these sub-periods. This result is not surprising and in line with non-structural measures of competition from the new empirical IO approaches. Here, the number of competitors does not necessarily constitute a satisfactory measure of competition.

The link between competition and efficiency

Focusing on the link between competition and efficiency, the theoretical and empirical literature does not provide a clear-cut conclusion about a direct relationship between competition and efficiency. We propose several hypotheses about this relationship. While the 'efficient-structure' hypothesis suggests a negative influence of efficiency on competition, both the 'quiet life' and 'banking specificities' hypotheses favour a significant impact of competition on efficiency but disagree on the sign of this effect.

We analyse the link between competition and efficiency in the Czech banking industry in a Granger-causality framework, formally specified in equations (2) and (3) as follows:

$$y_{it} = \alpha_0 + \sum_{l=1}^{m} \alpha_l^y y_{it-l} + \sum_{l=1}^{m} \delta_l^y x_{it-l} + f_i^y + u_{it}^y \tag{2}$$

$$x_{it} = \beta_0 + \sum_{l=1}^{m} \alpha_l^x x_{it-l} + \sum_{l=1}^{m} \delta_l^x x_{it-l} + f_i^x + u_{it}^x \tag{3}$$

where y represents 'Efficiency' and x the 'Lerner index'. f_i represents the bank's 'individual effect'.

Efficiency and *Lerner* are the yearly averages of the cost efficiency score and the Lerner index, respectively. The indices i and t represent the bank and the year. Each dependent variable was regressed on its yearly lags and on those of the other variable. We used yearly averages in order to capture the genuine effect, if any, of competition on efficiency and

vice versa. We believe that it takes time for the effect of competition on efficiency and *vice versa* to become apparent; hence, such an effect could be revealed by analysing yearly data rather than quarterly data, which are obviously more volatile. Following Berger and DeYoung (1997) and Williams (2004), who also pursue a Granger-causality analysis, we adopt four yearly lags.

Because we have panel data available, we do not use a standard Granger-causality analysis but instead we use panel-specific methods to estimate the dynamic equations (2) and (3). Holtz-Eakin *et al.* (1989) mention the main pitfall of not accounting for panel structure, and instead estimate a standard Granger-causality model by stacking all the time series cross-section observations together. They claim that this procedure ignores the possibility of accounting for 'individual effects' that would summarise the influence of unobserved variables with a persistent effect on the dependent variable.

To estimate the dynamic equations represented in (2) and (3) we used the Generalized Method of Moments as designed by Arellano and Bond (1991). Attanasio *et al.* (2000) mentioned that most studies of Granger-causality-type estimates with fixed effects used estimators similar to those proposed by Holtz-Eakin *et al.* (1989) and Arellano and Bond (1991) (hereinafter 'AB'). AB's methodology applied first differences to the autoregressive model in order to eliminate individual effects and 'optimally exploits' the moment conditions using the lagged values dated *t*-2 and earlier of the dependent variable. This ensured efficiency and consistency under the asymptotic hypothesis of $N/T \rightarrow \infty$, and provided that the model was not subject to serial correlation in ε_{it} (ie there will be evidence of a significant negative first-order serial correlation and no evidence of a second-order serial correlation in the differenced residuals) and that the set of instrument variables used is valid (which is tested with the Sargan test). Our panel dimension fulfilled the asymptotic conditions of large *N* and small *T*, as we have 25 banks over a 12-year period.

Our results are displayed in Table 4.3. The Sargan test and the first- and second-order serial correlations in the differenced residuals are reported at the bottom of the table (AR1 and AR2). The statistics favour a valid set of instrument variables and a significant negative first-order serial correlation and no evidence of second-order serial correlation in the differenced residuals. The table reports the coefficients of the lags of the dependent variable as well as the coefficients of lags of the independent variable. Of primary interest are the coefficients of the lagged independent variable. For both equations (2) and (3), we test the joint

Table 4.3 Granger-causality test

	Dependent variable: efficiency$_t$		**Dependent variable: lerner$_t$**	
	Coefficient	**Std err.**	**Coefficient**	**Std err.**
Intercept	–0.06***	0.011	0.06***	0.02
Efficiency$_{t-1}$	–0.6***	0.12	0.11	0.15
Efficiency$_{t-2}$	0.05	0.12	0.28*	0.17
Efficiency$_{t-3}$	–0.18**	0.09	–0.11	0.14
Efficiency$_{t-4}$	0.05	0.09	–0.05	0.14
Efficiency$_{t-1}$ = Efficiency$_{t-2}$	$\chi^2(4) = 32.94$		$\chi^2(4) = 4.33$	
= Efficiency$_{t-3}$ = Efficiency$_{t-4}$ = 0	Prob > $\chi^2 = 0.0000$		Prob > $\chi^2 = 0.3629$	
Σ *AR* Efficiency coefficients	–0.69***	0.24	0.24	0.32
Lerner$_{t-1}$	0.2***	0.07	–0.33***	0.11
Lerner$_{t-2}$	0.29***	0.08	–0.17	0.12
Lerner$_{t-3}$	0.29***	0.08	–0.15	0.11
Lerner$_{t-4}$	0.12**	0.06	–0.12	0.10
Lerner$_{t-1}$ = Lerner$_{t-2}$ = Lerner$_{t-3}$ =	$\chi^2(4) = 32.69$		$\chi^2(4) = 11.99$	
Lerner$_{t-4}$ = 0	Prob > $\chi^2 = 0.0000$		Prob > $\chi^2 = 0.0175$	
Σ *AR* Lerner coefficients	0.898***	0.16	–0.77***	0.24
P-value AR1/AR2	0.05/0.13		0.000/0.24	
P-value Sargan	0.003		0.04	
Number of observations	1085		1085	

*, **, *** denote an estimate significantly different form zero at the 10%, 5% or 1% level.

hypothesis that $\delta_1 = \delta_2 = ...\delta_m$ are equal to zero, which signals whether this variable Granger-causes the dependent variable. The sum of these coefficients, which gives an overall measure of the effect on the dependent variable, is also computed.

The results show that the Lerner index positively Granger-causes efficiency – hence, competition negatively Granger-causes efficiency – but efficiency does not Granger-cause competition. In the equation explaining *Efficiency*, the coefficients of the lags of the Lerner index are jointly different from zero (Prob > $\chi^2 = 0.0000$) and they sum up to 0.9, significant at 1%. In the equation explaining the *Lerner index*, the lags of efficiency are not jointly different from zero (Prob > $\chi^2 = 0.3629$) and their sum is not significant at 10%.

These results are consistent with the 'banking specificities' hypothesis, that greater competition reduces the cost efficiency of banks. In summary, our findings support only negative causality running from competition to efficiency in the Czech banking sector during its transition period from 1994 to 2005, meaning that heightened competition

can lead to an increase in monitoring costs through the reduction in the length of the customer relationship and due to the presence of economies of scale in the banking sector.

The negative link between banking competition and banking efficiency suggests that policies favouring banking competition should consider possible effects on financial stability. The finding of this trade-off between banking competition and financial stability contributes to the literature regarding this topic (Allen and Gale, 2004). Several papers have underlined the possible negative effects of banking competition on financial stability, notably through increased risk-taking by banks. Our results provide another channel of transmission for the negative effects of banking competition, which could hamper the cost efficiency of banks.

The finding of a negative relationship between competition and efficiency in the Czech banking industry is in accordance with most studies providing results on the link between competition and efficiency in banking (Berger, 1995; Goldberg and Rai, 1996; Weill, 2004). However, our study differs from previous papers on this issue in two major respects. On the one hand, all the previous papers used concentration or market share indices, except Weill (2004) who used the Rosse–Panzar model. On the other hand, unlike other papers concentrating on Western countries, we have provided evidence on the link between banking competition and efficiency in a transition economy. Consequently, this result adds some robustness to the counterintuitive inverse relationship between competition and efficiency generally observed in empirical studies of banks.

Conclusion

This research provided new evidence on the link between competition and efficiency in the banking sector, by focusing on the economic transition period of the Czech Republic. Our first results showed an absence of increased competition in the Czech banking market between 1994 and 2005. This appeared at first glance to be a negative trend. However, analysing the relationship and causality between our proposed measure of competition and estimated efficiency provided evidence in favour of negative causality, running only from competition to efficiency. This finding may appear counterintuitive. It is, however, in accordance with the previous literature in banking, which supports the existence of a negative link between competition and efficiency in banking. Therefore, the zero increase in competition observed in the Czech

banking industry does not necessarily reflect a bad trend. Furthermore, it can be explained by the fact that increased competition leads to greater monitoring costs for banks owing to economies of scale and a reduction of the length of the customer relationship between the bank and the borrower.

Our results cast doubt on the view of promoting bank competition to reduce the price of financial services. Indeed, greater banking competition may hamper the cost efficiency of banks, which could result in higher loan rates. Our analysis can be extended in a number of ways. Because our research only studies one transition country, additional case studies would provide further validation of the causal links. Furthermore, the inverse impact of competition on efficiency suggests that we could investigate the optimal level of competition in a banking market, opening new avenues for further research.

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Notes

1. The precise number of bank failures for each year from 1994 to 2000 was: 1, 3, 2, 5, 3, 3, 2, respectively.
2. ČSOB, Česka Spořitelna, Komerční Banka.
3. This argument is summarised in the famous sentence from Hicks: 'The best of all monopoly profits is a quiet life'.
4. We do not consider that cost efficiency and managerial performance are equivalent, as cost efficiency can be affected by exogenous elements that are influenced by managerial performance such as environment. These elements could then be included by including environmental variables in the estimation of cost frontier, following for instance Dietsch and Lozano-Vivas (2000). However, such inclusion is useless in our investigation because our estimations on the sample of banks are from a small country, meaning that we can reasonably consider that environment is similar for all banks and consequently that cost efficiency measures managerial performance.
5. We do not include mortgage banks since a mortgage bank has a different production function than a commercial bank, because of different activities.
6. As several authors, for example, Weill (2003), include investment assets as an additional output, we estimated efficiency scores both including and excluding investment assets, but found only negligible differences.

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5

Relationship Lending in Emerging Markets: Evidence from the Czech Republic

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This paper focuses on how firms obtain financing from domestic banks, using a unique loan-level data set for the Czech Republic. The results show that the vast majority of firms use the services of just one relationship lender. Small and young firms in technology- and knowledge- intensive industries tend to concentrate their credit needs in a single bank, whereas less creditworthy firms and firms in cyclical industries tend to borrow from more than one bank. The analysis also reveals different behaviour of firms towards financing banks in case of multiple lenders. Finally, the paper shows that the level of credit risk at the bank level decreases in line with the extent to which firms applying a relationship lending strategy occur in the bank's portfolio.

Introduction

A firm that relies on bank credit can choose whether to borrow from just one bank or whether to obtain financing from multiple banks. The use of one lender is often termed relationship lending and is most often cited as a characteristic of the German banking system.[1] Available anecdotal evidence suggests that this model is also present in other economies, including emerging markets. This article sets out to determine which bank financing model predominates in the Czech Republic, what its main characteristics are, and what factors the choice of bank financing model

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depends on at firm level. We also analyse whether the model chosen has a significant effect on the credit risk in the portfolios of relationship lenders.

The value added of our research is twofold. First, it analyses the phenomenon of relationship lending using a new data set with essentially full coverage of an emerging market. We use internal data from the database of the Czech National Bank's Central Credit Register (CRC), which, since 2002, has been recording all credit relationships between companies and banks in the Czech Republic. These data have not previously been used for analytical purposes, so this paper represents the first research study drawing on this original source of data.[2] Compared with the only other existing paper on relationship lending in the Czech Republic (Ongena and Smith, 2000) which analysed a sample of 59 observations from the year 1996, we offer much more reliable and robust evidence. The full coverage of all loans is not typical even in studies on developed markets (Degryse *et al*., 2009, pp. 82–84). Second, we analyse the effect of the presence of relationship lending on the level of credit risk in financing banks' portfolios. To our knowledge, this effect has not been extensively studied to date. In their extensive discussion of research questions and available literature on relationship banking, Degryse *et al*. (2009) show that most studies focus on effects of relationship lending on firms' performance but almost none discuss the effect of the selected financing strategy of a bank on its own portfolio.

By relationship lending we mean a long-term close bank-customer relationship. For emerging markets that have undergone a major transition to a free-market economy, one of the sources of 'close and long-term' bank- customer relationship especially in the 1990s was the fact that lending decisions were driven by the incentive to help certain companies, for example due to common joint ownership of both banks and firms, often by the state. These features also existed in the Czech Republic during 1990s and were analysed under the terms 'soft-budget constraints' or 'banking socialism' (Kreuzbergová, 2006). As this paper covers the period 2002–2009, a period where all formerly state-owned banks and most firms were fully privatized and the bad assets that had emerged as a result of this crony lending were transferred outside the banking sector (Bárta and Singer, 2006), the direct role of this phenomenon is limited in our analysis. However, indirectly, the structure of bank financing models prevailing in the 2000s has been, of course, influenced by developments during the 1990s.

The next section provides a short review of the literature, while the subsequent section presents the data used. The latter section contains descriptive statistics regarding the model of bank financing of firms in the Czech Republic followed by an analysis of the determinants of the choice of the number of lending relationships at firm level. The

penultimate section tests the effect of the application of relationship lending on the credit risk of banks. The last section concludes.

Review of the literature

Relationship lending may be the optimal financial strategy for many companies, as a relationship lender has a good knowledge of the firm's credit history and performance and can react optimally to its evolving financing needs. From the bank's perspective, relationship lending may be an attractive business strategy because it reduces the costs of monitoring the borrower, by addressing the main problem of the banking business, the information asymmetry between borrower and lender. 'Service packages' for businesses and 'customized financing' are manifestations of a business model that focuses on a single bank winning a client and financing all its needs.

Petersen and Rajan (1994) define relationship lending as a situation where there are close ties between the firm and the lender. The usual indicator of this model is the number of lenders, with the existence of just one bank corresponding to relationship lending (Degryse *et al*., 2009). However, for large firms, which often use the services of multiple banks, this indicator is too restrictive. Even if it uses multiple banks, the firm may have a truly close, tight and long-term relationship with just one lender. The existing literature offers three main indicators of close ties: (a) the number of lending relationships, (b) the share of the most significant bank in the company's total debt, and (c) the duration of the main lending relationship (Ongena and Smith, 2001; Memmel *et al*., 2007). The share of the most important bank turns out to be the indicator with the highest information value for close ties between a company and a bank (Elsas, 2005) and will be used in our econometric analysis.

An extensive survey of literature on relationship lending can be found in Degryse *et al*. (2009). They review all relevant theories, methodologies of analysis and empirical studies covering both developed and emerging markets. According to the conclusions of existing studies, company characteristics and competition are important determinants of the bank-customer relationship (Petersen and Rajan, 1994; Nam, 2004; Elsas, 2005). These studies also reveal that companies with a relationship lender have easier access to loan financing (Elsas and Krahnen, 1998; Harhoff and Körting, 1998), although an effect on interest rate terms has not been established unambiguously (Stein, 2011; Elsas and Krahnen, 1998; Harhoff and Körting, 1998; Gorton and Schmid, 1996). Given the structure of our data set and the available variables described in the next section, we are not able to analyse the effects on loan conditions. Thus, we concentrate

on the determinants of relationship lending. Here, we hypothesize that similar variables as those discussed in other studies will play a role in the Czech Republic as well, that is mainly company characteristics.

Few studies have addressed the link between the model of bank financing and credit risk in banks' portfolios. Theoretical approaches to this research question support the argument that banks that apply a business model focusing on relationship lending tend to experience lower credit risk in their portfolios. According to von Thadden (2004), this is consequence of a dynamic process where creditworthy clients stay with their main relationship lender while uncreditworthy clients switch to multiple lenders. Over time, banks engaging in relationship lending with such creditworthy lenders should experience a lower default rate on corporate loans. However, large firms, which are generally less risky but due to their size are often financed by syndicated loans from several banks, may contribute to the opposite effect. Some literature emphasizes that relationship lending allows creditors to take a longer view on investments and reduce financial constraints for firms in temporary difficulties (Rajan, 1992, Hoshi *et al*., 1991), which should also decrease a probability of non-repayment of loans and thus the level of credit risk. For this reason, a single bank relationship is proposed as an optimal model for transition economies, where external non-banking sources of financing are limited (Aoki and Patrick, 1994).

An area of research that relates bank financing and credit risk is the soft budget constraint literature, which argues that, especially in emerging market economies where alternative external corporate financing is not available, weak state-owned banks have incentives to fund projects with negative net present value, leading to an increase in credit risk (Dewatripont and Maskin, 1995).[3] Empirical studies that at least indirectly relate the bank financing model and bad loans accumulation include Diaz-Alejandro (1985) and Corsetti *et al*. (1999).

The hypotheses we want to test are as follows: (1) The main determinants of the presence of relationship lending, measured as the share of the main lender in the company's total debt, are company characteristics such as the size of the firm, industry and riskiness. (2) The level of credit risk in the corporate loan portfolios is lower in those banks where firms engaged in relationship lending prevail.

Data

The CNB's CRC contains data on all balance sheet, and some off-balance sheet, exposures of domestic banks, including branches of foreign banks,

to resident and non-resident legal entities and to sole traders. Each record in the database is a loan-specific record containing bank, firm, month and year, and additional firm-, bank- and loan-specific information. The data are reported with a monthly frequency. The register was established at the end of 2002 and contains not only all new loans provided since that date, but also all bank loans in existence at the end of 2002. For example, the oldest loan that was registered in the Credit Register in December 2002 had been made to a Czech company in 1990. The database is thus not truncated, with the exception of loans provided and repaid before 2002. The reporting of loan data is not subject to any reporting limit.[4]

Anonymized data on the bank loans (balance-sheet exposure) to non-financial corporations were used for the analysis. Loans to non-residents, sole traders, the public sector and financial institutions were not taken into account. In all, the sample contained almost 8 million records describing the individual loans to around 120,000 companies in the period from December 2002 to December 2008 in monthly frequency. This period can be considered as relatively homogenous as most of the transition-related structural reforms, including privatization of banks and cleaning-up of the banks' balance sheet from bad assets, had been finished by 2002 (Bárta and Singer, 2006).

For each firm, there is information on size as measured by total turnover and number of employees, industry, legal form and ownership (public, private-domestic, private-foreign). The banks do not report data on companies' balance sheet or performance to the register; thus basic data on companies are uploaded to the register from a firms' register (Register of Economic Subjects, RES) maintained by the Czech Statistical Office. This has three main shortcomings: first, the data on companies from the RES are uploaded every month and the characteristics of firms are always overwritten with the newest record.[5] Second, the data on total turnover and number of employees are given only by range with 16 categories of turnover and 20 categories of number of employees. For the analysis, we assumed that all firms in a given size category thus had turnover or employees equal to the mean value of that category. Finally, the data on size are available for only about half of the firms (60 thousand companies).

Using the information on each firm's loans, we constructed variables describing the number of lending relationships, debits/overdrafts as a percentage of total debt, FX loans as a percentage of total bank loans, the year of the oldest granted loan, the firm's 'age', computed as the difference between the year of the observation and the year of the oldest granted loan, and client creditworthiness based on information on its

default rate in previous years. For each firm, we also created variables related to their three most important lenders in terms of the banks' share in the firm's total borrowings from domestic banks, namely the size of the share, selected data on the bank and selected data on the credit relationship with that bank, that is the above-mentioned characteristics of the relationship: debt and foreign currency ratios, year of oldest loan and information on default.

Finally, we created variables at the individual bank level, that is the 12-month (12M) default rate in the corporate loan portfolio, the bank's market share in total loans to non-financial corporations, and the shares of various types of debtors and selected sectors and loans in the total corporate loan portfolio (foreign currencies, foreign-controlled corporations, small and medium-sized enterprises, etc).[6] Owing to the fact that the data are anonymized, we did not have the identities of individual banks. The only information we have for the banks is the bank type: large banks, medium-sized banks, small banks and foreign bank branches.

Table 5.1 shows the descriptive statistics for the main firm and bank variables. The average turnover of firms in the data set is around 90 CZK million (around 3.5 EUR million) and the average number of employees is around 50. This is caused by a large number of rather small and medium- sized companies. Given its relatively short free-market history and the way the age of a firm is proxied, most of the firms are relatively young, 9 years old. As to the structure of bank loans, the table reveals that average bank debt is around 125 CZK million (5 EUR million), with relatively small average share of FX loans (5%), a large share of overdrafts (50%) and on average slightly more than one financing bank. The 'relationship lending' and some other variables including their developments over time are discussed in more detail in the next section.

As regards the banks, the average 12M default rate was at a low level of 2%, which clearly reflects the period of strong economic growth in the Czech Republic covered by our analysis. On average, small firms make up about 40% of banks' portfolios, and about one-third of the loan portfolio is to foreign-owned companies. The Czech banking system is not euroized; on the asset side, less than 20% of loans is denominated in currency other than the Czech koruna.[7]

To estimate our regressions, the data set was further adjusted in two ways. First, the size of the data set had to be reduced. Thus, the original monthly frequency was changed to quarterly. Given that the data are stock data, this change did not lead to any need for recalculations.

Table 5.1 Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
Firm's variables				
Turnover in CZK million	88.46	261.55	0.10	2000
No. of employees	51.13	264.02	0.00	12000
Age of the firm in years	8.90	4.99	1	19
Cyclicality of the industry (correlation with the GDP)	0.77	0.22	−0.31	0.95
Risk of firm (past default rate)	0.09	0.26	0.00	1.00
Year of the oldest loan	2000	5	1990	2008
Total debt in CZK mil	124	990	0	134000
Share of FX loans in the firm's debt (in %)	5.2%	21.0%	0.0%	100.0%
Share of overdrafts in the firm's debt	50.2%	47.8%	0.0%	100.0%
No of financing banks	1.18	0.50	1	11
Share of main relationship lender	96.6%	10.6%	14.0%	100.0%
Bank's variables				
Bank's 12M default rate	2.0%	4.8%	0.0%	40.7%
Share of clients applying dominant relationship banking	61.2%	24.6%	5.5%	100.0%
Share of small corporations in total portfolio	40.6%	30.6%	0.0%	100.0%
Share of foreign-controlled corporations in portfolio	27.4%	25.5%	0.0%	100.0%
Share of forex loans in portfolio	18.4%	21.9%	0.0%	99.5%

Source: CNB (CRC), authors' calculations.

Second, the data set was split to a 'firms data set' and a 'banks data set' to be able to run panel data models, as in Memmel *et al*. (2007, p. 10).

Model of bank financing of firms in the Czech Republic

For the purposes of this paper we use two indicators of relationship lending, namely the number of lending relationships and the share of the most significant bank. In the text that follows, 'single relationship lending' refers to the situation where a firm borrows from a single bank. The situation where one bank has a dominant share in a company's borrowings (defined as more than 80%) we term 'dominant relationship lending'.[8]

The analysed data on the number of lending relationships reveal that relationship lending predominates in the Czech Republic. At the end of 2008, 85% of all non-financial corporations had just one lender, 12% had two and only around 3% had three or more (see Figure 5.1). Over

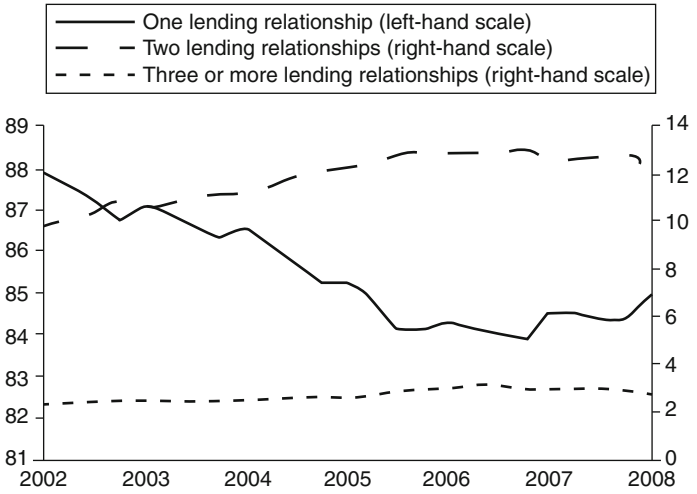

Figure 5.1 Proportion of companies by number of lending relationships (% of total number of companies in given period)
Source: CNB (CRC), authors' calculations.

the past 6 years, however, single relationship banking has been declining in significance, as almost 90% of companies were applying this model in 2002.

The presence of relationship banking in the Czech Republic can be compared with Germany, which is considered to be the classic example of single relationship lending, the Hausbank model, and for which indicators of relationship banking are available. In a study based on the Deutsche Bundesbank credit register, Memmel *et al*. (2007) find that only 43.5% of companies in 2002 utilized single relationship lending (see Table 5.2).[9] A comparison of the distribution of the number of lending relationships between the Czech Republic and Germany reveals that German firms use the services of multiple banks to a far greater extent.[10] This difference may be partly due to the different relative size of corporations and banks. Germany has far more large enterprises and small regional banks than does the Czech Republic, so consortium financing is the only option for many large German companies.[11]

For the other indicator of relationship lending, that is the share of the most important bank in a company's total bank debt, the proportion of companies using dominant relationship lending is of course even higher (see Figure 5.2). But this indicator, which covers all firms with single relationship lender and those firms with multiple lenders where the

Table 5.2 The distribution of lending relationships in the Czech Republic and Germany

No. of lending relationships	% of all companies		
	CZ (2008)	CZ (2002)	Germany (2002)
1	85.0	88.0	43.5
2	12.2	9.8	23.2
3	2.2	1.7	11.4
4	0.4	0.4	5.8
5	0.1	0.1	3.8
6	0.0	0.0	3.3
7	0.0	0.0	2.1
8	0.0	0.0	1.4
9	0.0	0.0	1.1
10+	0.0	0.0	4.3

Source: CNB (CRC), authors' calculations; Memmel *et al*. (2007).

main lender has more than 80% of firm's debt, is declining over time as well. In Germany, the figure is somewhere between 50% and 60% (Stein, 2011). For the Czech Republic, the mean share of the most important bank for the whole sample of all companies regardless of number of financing banks is almost 97%, which is, of course, due to the high proportion of firms with a single relationship lender, with a range of 14% to 100%. Stein (2011) reports an average for this indicator for Germany of around 60% with a minimum of 9% and a maximum of 100%.

Given that single relationship lending prevails among Czech firms, it is not surprising that large banks dominate as single relationship lenders (see Figure 3).[12] Roughly 70% of companies with single relationship lenders choose a large bank as their only bank, while around 20% choose a medium- sized bank. The role of branches of foreign banks and small banks is limited in this regard.[13] This is somewhat surprising as the evidence from Germany shows that smaller and middle-sized banks usually act as relationship lenders. The reasons might include factors related to competition among the smaller banks, a preference to limit concentration, institutional factors and legislative environment.[14]

The data offer more interesting information on which first and second- most important banks are chosen by firms using multiple banks. The role of foreign bank branches, for instance, could be greater here, since these banks offer companies certain specialized services.[15] The average share of the first most important bank for firms that have more than one relationship lender in the total debt of the firm is 77% and

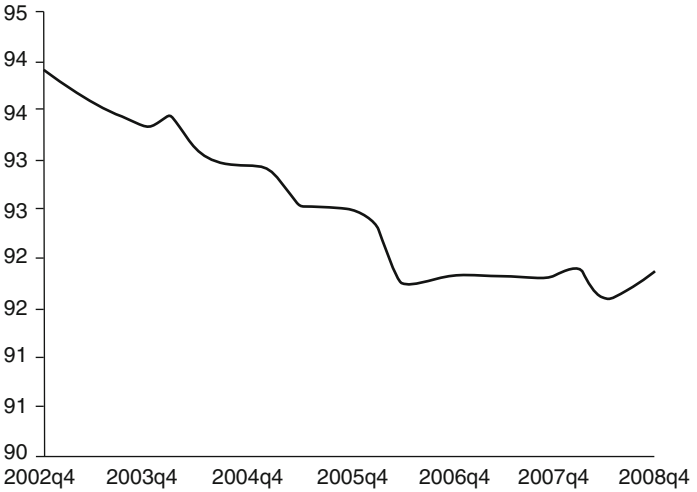

Figure 5.2 Proportion of companies applying dominant relationship banking (% of total number of companies in given period)
Source: CNB (CRC), authors' calculations.

the share of the second relationship lender is 20%. Table 5.3 shows the distribution of firms with two relationship lenders by the group of the first and second relationship lender. It turns out that large banks also have the largest share in the role of second bank, including for firms that already have a large bank as their first lender.

As the lending services offered to firms by all the large banks are broadly similar, firms may opt for the 'large–large' combination as a strategy for avoiding the problem of being 'captured' by one relationship lender (Stein, 2011). Memmel *et al*. (2010) show with German data that firms applying single or dominant relationship lending reduce their share with the largest bank in favour of another bank over time as they grow. The firm's bargaining position as regards lending conditions thus improves over time, as its credit history is known to more than one bank. This has been theoretically described as a 'hold-up' problem, for example in Bannier (2009).

Table 5.3 also shows that the second most common combination of relationship lenders is large–medium-sized or medium-sized–large, with a very similar number of firms, followed by foreign bank branch–large or large– branch. In these cases, a greater role is probably played by the firm's specific requirements, geographical location, accessibility of the bank, efforts made by banks to target specific clients and, for

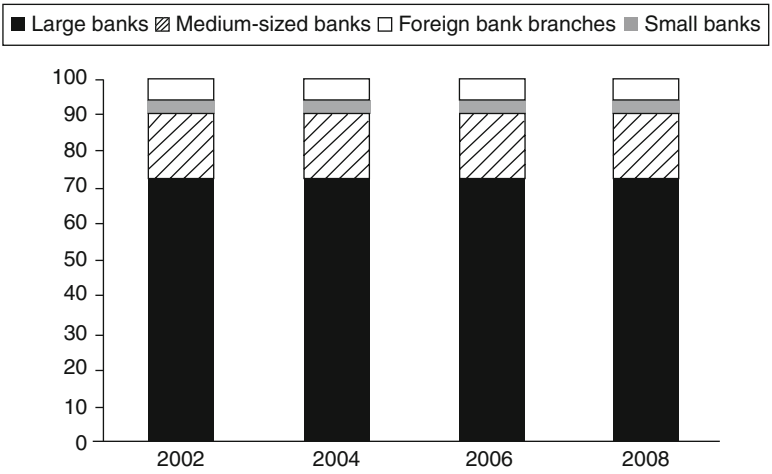

Figure 5.3 Single relationship lenders by bank category (percentage of companies with single relationship lender from given category)
Note: The chart does not contain building societies, whose role as single relationship lenders is minimal.
Source: CNB (CRC), authors' calculations.

Table 5.3 Distribution of relationship lenders by bank group for firms with two relationship lenders (% of total number of firms for all periods)

	Second relationship lender			
	Large banks	**Medium-sized banks**	**Small banks**	**Foreign bank branches**
First relationship lender				
Large banks	35.2	19.1	2.3	5.4
Medium-sized banks	19.1	3.3	0.7	1.7
Small banks	2.2	0.7	0.1	0.3
Foreign bank branches	6.8	1.9	0.4	0.5

Source: CNB (CRC), authors' calculations.

foreign-controlled corporations, existing ties between the firm's owners and the bank.

For the sake of completeness, we should mention that for firms using the services of three or more banks, large banks again play the most important role, followed by medium-sized banks and foreign bank branches. The most common bank combination for these firms is thus

large–large–large. The factors here may include the firm's size and the need for syndicated financing in large firms and the strategy of avoiding capture and cutting financing costs, although historical ties may also play a role. The largest banks were all to some extent specialized in the past decade, so companies used the services of large banks for different purposes such as payments, investment *versus* operating *versus* export financing, etc. These ties apparently still survive, even though these banks now operate essentially as universal banks offering practically every banking service.

The CRC contains information on whether a company borrows in the form of an overdraft or debit balance. This is an indirect indicator that the firm also has a current account with a particular bank and that it therefore uses the bank for routine payments with other trading partners. The data reveal that firms applying dominant relationship lending have a higher share of overdrafts and debit balances in their total bank debt than companies that do not apply this model, 50% *versus* 36% of total bank debt. This may be linked with company size, since dominant relationship lending is applied more by small firms (see below). They usually have more volatile revenues, as they have a smaller number of clients, and so they are forced to use overdraft or debit facilities more often for their day-to-day operations.

For firms using multiple banks, detailed data on their lending relationships allow us to analyse whether firms behave differently towards different banks. In the case of overdrafts and debit balances, it turns out that firms obtain overdrafts from their main bank to a lesser extent than from other banks in the sequence (Table 5.4).

One of the reasons may be that second and subsequent relationship lenders finance companies' other needs in particular operations in which overdrafts naturally have a greater weight. Moreover, firms may behave more cautiously towards their main bank in the overdraft area and probably do not make full use of overdraft or debit facilities. This behaviour has not changed significantly over time, even though the rate of overdraft use has changed.

Similar behaviour can be observed for the share of FX loans (Table 5.4). The average share of FX loans in firms' total bank debt has steadily decreased from around 9% in 2002 to 3.5% in 2008.[16] This share differs little between firms applying dominant relationship lending and other firms, but firms with three or more banks have a higher share of FX loans than do firms with two relationship lenders. These tend to be larger firms with a strong export orientation. It also turns out that in the case of multiple bank financing the share of FX loans is usually higher

Table 5.4 Differences in behaviour towards various relationship lenders (average in %)

	One relationship lender	Two relationship lenders			Three or more relationship lenders			
		Total	1st bank	2nd bank	Total	1st bank	2nd bank	3rd bank
Share of overdrafts and debit balances in bank debt								
2002	44.6	27.9	27.9	41.2	13.1	11.8	20.3	28.4
2005	57.9	42.7	41.6	56.0	30.2	27.8	35.3	44.5
2008	46.5	37.3	35.7	53.4	32.3	30.8	38.0	49.0
Share of foreign currency loans in bank debt								
2002	8.8	8.0	7.8	8.8	11.4	11.9	11.0	15.4
2005	5.4	3.3	3.2	4.6	6.0	6.1	5.9	6.3
2008	3.5	2.7	2.8	3.2	4.3	4.4	4.3	6.0

Source: CNB (CRC), authors' calculations.

for more distant banks. This is to some extent consistent with the finding that foreign bank branches, which specialize in providing FX loans or financing international trading, tend to occupy second or third place in the order of financing importance.

The final issue in the area of firms' different behaviour towards different banks is their strategy in the event of repayment difficulties. An analysis of the data reveals that firms with two relationship lenders tend to default with their main bank, on average almost 50% of firms with repayment difficulties, and keep up their repayments to the second bank. A further 30% of firms stop repaying both banks simultaneously.[17] At first glance, this situation contrasts with the conclusions of the analysis of behaviour in the area of debit balances and overdrafts, where firms try to maintain a good credit history with their main bank. A more detailed analysis reveals, however, that firms defaulting primarily with their main bank likewise use overdraft and debit facilities with them to a greater extent. In the case of three or more relationship lenders, the situation is heterogeneous and no dominant model of behaviour can be identified. In percentage terms, the most frequently observed phenomenon is default with all three relationship lenders, around 22% of cases, followed by default with the first two banks, 20% of cases, and default with the first bank, 16% of cases.[18]

Analysis of the determinants of the choice of relationship lending

Empirical studies analysing the determinants of the choice of bank financing model by individual firms (Memmel *et al.*, 2007) find a particularly important role for the size, age and creditworthiness of the firm, the technology and knowledge intensity and cyclicality of the industry, and the type and size of the lender/lenders. The industry- and firm-level characteristics indicate a positive correlation between a firm's size and age and its number of lending relationships, that is negative correlation between size/age and the degree of concentration of firm's loans, as large firms often have to finance large projects with syndicated loans. Less creditworthy firms are expected to have more lenders, that is less concentrated loans, as banks often do not want to bear all the default risk (Degryse *et al.*, 2009, p. 86). Using a similar argument, firms in cyclical industries are expected to have higher number of lending relationships and thus less concentrated bank loans. On the other hand, firms in sectors with higher technology and knowledge are expected to concentrate financing in one bank only, as research and development contains proprietary information that the firm does not want to share with more than one bank. Additional factors that may contribute to the decision of the firm to seek more lenders include the geographical location of the firm because firms from smaller communities away from financial centres may tend to borrow from the one bank that is most accessible to them. For foreign firms, ties between parent companies and foreign banks may also play a role. It is reasonable to assume, therefore, that Austrian firms, for instance, will borrow mainly from banks owned by Austrian banking groups.[19]

We analyse the determinants of the choice of bank financing model using both the between (BE) and within (FE) fixed-effects panel estimators. Test for pooling of the data and the Hausman test suggest that the fixed-effects model is the appropriate model. However, we show the results of the BE estimator in order to show the potential effects of variables that do not vary over time.[20] The share of the main relationship lender in the firm's total bank debt, that is the loan concentration, was used as the dependent variable. Alternatively, we also used the number of banks the firm borrows from. Given the nature of this variable, which takes discrete values between 1 and 11, in this case we used a Poisson regression, which takes the categorical nature of the dependent variable into account. The results, available upon request, however, are in line with the findings discussed below.

Equation 1 shows the basic structure of the model (*i* stands for a firm and *t* for a quarter).

$$share\_main\_lender_{it} = cons + \sum_{j=1}^{N} \beta_j X_{ijt} + \varepsilon_{it} \quad (1)$$

The explanatory variables used were firm characteristics; turnover, age of firm, risk of firm; selected industry-level variables, namely the cyclicality of the industry measured by the correlation between the industry's gross added value and overall GDP, and a dummy variable for high and medium-high technology and knowledge-intensive industries.[21] As the effect of firm size on bank loan concentration may be non-linear, a dummy variable was used for medium-sized and large firms.[22] Finally, a dummy variable for those firms where the main relationship lender is a large bank is included in order to test whether such firms tend to concentrate their lending more. Some of the explanatory variables, for example risk of firm and cyclicality might be correlated. Thus, we present the regression results through the gradual inclusion of variables.

The evidence from the between regression results confirms that larger and older enterprises have less concentrated loans and hence a greater number of relationship lenders (Table 5.5).[23] Some non-linearity of the effect of firm size on the share of the largest relationship lender was also confirmed as can be seen from the estimated coefficient for the dummy for medium-sized and large firms of around 0.02. This would thus add up about 2 percentage points to the share of the main relationship lender. Firms in technology – and knowledge-intensive industries tend to concentrate their borrowing needs in one bank, whereas firms with lower creditworthiness as measured by the default rate in the past two years borrow from more than one bank. The results are consistent with evidence from Degryse *et al*. (2009), Memmel *et al*. (2007), Stein (2011). Given the low number of time-variant variables, the goodness of fit of the FE models is very low.

As regards the industry's cyclicality effect, Stein (2011) does not find a significant effect of this variable for German firms. The BE models without industry dummies indicate a positive effect of cyclicality on the level of concentration of borrowing, while economic intuition would suggest that firms in procyclical industries should use multiple relationship lenders and have less concentrated loans. It might be that some of the firms or industries are responsible for this result, so we run the BE model with industry dummies. In this case, the results are in line with our expectation that firms in procyclical industries have less concentrated loans.

Table 5.5 Regression results for bank financing model (between-effects (BE) and fixed-effects (FE) models)

Estimator	1 BE	2 BE	3 BE	4 BE	5 BE	6 BE	7 FE
Turnover (in CZK billion)	−0.0639*** [0.0013]	−0.0602*** [0.0013]	−0.0636*** [0.0015]	−0.0632*** [0.0015]	−0.0610*** [0.0015]	−0.0637*** [0.0015]	
Cyclicality of industry	0.0325*** [0.0012]	0.0259*** [0.0012]	0.0281*** [0.0014]	0.0249*** [0.0015]	0.0220*** [0.0015]	−0.0437*** [0.0050]	−0.0309*** [0.00088]
Dummy for medium-sized and large firms	− 0.0237*** [0.00089]	−0.0199*** [0.00089]	−0.0206*** [0.0010]	−0.0207*** [0.0010]	−0.0208*** [0.0010]	−0.0174*** [0.0010]	
Age of firm		−0.00188*** [0.000051]	−0.00187*** [0.000061]	−0.00185*** [0.000061]	−0.00212*** [0.000061]	−0.00212*** [0.000062]	
Risk of firm (past default rate)			−0.0107*** [0.0017]	−0.0105*** [0.0017]	−0.00425** [0.0017]	−0.00509*** [0.0017]	−0.00272*** [0.00060]
Constant	0.959*** [0.0010]	0.979*** [0.0011]	0.974*** [0.0013]	0.975*** [0.0013]	0.963*** [0.0014]	0.945*** [0.0017]	0.987*** [0.00068]
Dummy for technology – and knowledge-intensive industries				0.00419*** [0.00065]	0.00554*** [0.00065]	0.00496 [0.0032]	
Dummy for firms with large bank as main bank					0.0216*** [0.00070]	0.0203*** [0.00070]	
Industry dummies	No	No	No	No	No	Yes	No
No. of observations	795,179	795,179	717,346	717,346	717,346	717,346	973,609
No. of firms	72,819	72,819	63,088	63,088	63,088	63,088	102,017
R^2	0.09	0.11	0.10	0.10	0.11	0.12	0.00

Standard errors in brackets.
***$P<0.01$, **$P<0.05$, *$P<0.1$.

Effect of application of relationship lending on banking portfolio risk

Next we consider whether a bank's orientation towards clients in a dominant lending relationship has an effect on its portfolio risk, and whether that effect is positive or negative. The above analysis of the determinants of the choice of relationship lending model showed that firms with higher creditworthiness and thus lower default risk tend to concentrate their borrowing with a single dominant relationship lender. We estimate a panel regression in which the dependent variable was the default rate in banks' corporate loan portfolios. The explanatory variables used were portfolio characteristics, macroeconomic indicators and, in particular, an indicator for the bank's orientation towards their main clients as measured by the ratio of loans to clients applying dominant relationship lending to the bank's total loan portfolio (Table 5.6).

Equation 2 shows the basic structure of the model (*i* stands for a bank and *t* for a quarter).

$$default\_rate_{it} = cons + \sum_{j=1}^{N} \beta_j X_{ijt} + \varepsilon_{it} \quad (2)$$

Similarly to the estimation of Equation 1, we performed tests of poolability of the data and the Hausman test and they confirmed that the fixed effects model is appropriate. Given that here we have only 17 banks and a large part of the variability in the data comes from time dimension, we report only the results of the within (FE) estimator.

The results, reported in Table 5.6, reveal that an orientation towards clients applying dominant relationship lending has a positive effect on the bank's loan portfolio quality. This result can be explained by a better knowledge of such clients by the bank and more effective risk management in this segment and is largely in line with the theoretical literature (Rajan, 1992; von Thadden, 2004). Behr *et al*. (2007) discuss the benefits of specialization *versus* diversification of banks. However, concentrating on relationship borrowers cannot be interpreted as pure specialization strategy, as the relationship borrowers can come from different industries and have different characteristics. Thus, by focusing on relationship borrowers, the banks can reap benefits of diversification as well.

The panel regressions including all the banks did not show any dependence of their credit risk on the economic cycle as measured by GDP growth.[24] This is largely due to the inclusion of numerous small and medium-sized banks, whose share in the credit risk of the banking sector's total loans is relatively negligible. However, these banks, given their

Table 5.6 Panel regression results for credit risk (fixed-effects model; all banks excluding banks with zero default rate)

Dependent variable: 12M default rate	**All banks**	**Large banks**
Share of clients applying dominant relationship banking	−0.125*** [0.038]	−0.105** [0.049]
Share of small corporations in total portfolio	0.109** [0.049]	0.129*** [0.045]
Share of foreign-controlled corporations in portfolio	−0.0986** [0.043]	0.00899 [0.049]
Share of forex loans in portfolio	0.0987*** [0.038]	−0.0296 [0.062]
GDP growth (y-o-y)	0.00181 [0.0018]	−0.00394*** [0.00099]
Constant	0.0706** [0.028]	0.0754** [0.037]
No. of observations	412	100
No. of banks	17	4
R^2	0.06	0.25

Standard error in parentheses, ***P<0.01, **P<0.05, *P<0.1.

relatively small loan portfolios, different strategies and specializations in selected segments of the economy, can show relatively sizeable changes in portfolio structure and performance that are not primarily correlated with the economic cycle.[25] If we estimate this regression for large banks only, dependence on the economic cycle is confirmed.

An orientation towards small firms fosters a higher default rate, although this factor is reflected in higher client interest rates. Moreover, single or dominant relationship lending, where the main bank knows the company well and is better able to manage the risks, predominates in small companies. A lower default rate is fostered by the greater orientation of banks towards foreign-controlled corporations and a lower proportion of FX loans. The last two factors, however, are insignificant in large banks.

Conclusions

This paper provided the first evidence on relationship lending in the Czech Republic using data on individual bank loans of non-financial

corporations in the Czech Republic taken from the CNB's CRC. These data have not previously been used for analytical purposes, so this paper represents the first research study drawing on this original source of data.

The results of the analysis of the model of bank financing of firms in the Czech Republic revealed a high relevance of single (sole) relationship lending. As the econometric analysis suggests, this model is applied primarily by small and young firms in technology – and knowledge-intensive industries. By contrast, less creditworthy firms and firms in cyclical industries tend to borrow from more than one bank.

The data also revealed that firms applying relationship lending have a higher share of overdrafts and debit balances in their total bank debt than companies that do not apply this model. This may be linked with company size, since relationship lending is applied more by small firms which usually have more volatile revenues are forced to use overdraft or debit facilities more often.

The analysis showed that for firms with more than one lending relationship, the most common combination is to have two large banks as main lenders. Medium-sized banks and foreign banks branches occupy more distant places in the order of financing importance. As the lending services offered to firms by all the large banks are broadly similar, this might indicate that firms opt for the 'large–large' combination as a strategy for avoiding the 'hold-up' problem of being captured by a single relationship lender. The firm's bargaining position as regards lending conditions improves if its credit history is known to more than one bank.

For firms using multiple banks, it was shown that firms behave differently towards different banks in terms of the extent to which banks use overdrafts or FX loans. Interestingly, as regards the firms' behaviour towards different banks in the event of repayment difficulties, the data indicate that a half of firms with two relationship lenders tend to default with their main bank and keep up their repayments with the second bank.

The paper also analyses whether the financing model chosen has a significant effect on the credit risk of relationship lenders. While the results of this analysis have to be taken as preliminary, given the lack of suitable control variable for the economic cycle the level of credit risk at the bank level decreases in line with the extent to which firms applying relationship lending are to be found in the bank's portfolio. This result can be explained by a better knowledge of such clients by the bank and more effective risk management in this segment and is largely in line with the theoretical literature.

The global financial crisis that started in summer 2007 hit the Czech Republic only indirectly, that is *via* a drop in foreign demand that caused a large economic decline in 2009, causing a decline in bank lending to non-financial corporations and an increase in credit risk. An interesting research question from the point of view of relationship lending would be whether both firms and banks applying a relationship lending model fared differently from other firms and banks over the period 2009–2010. While some studies on the role of relationship lending in times of crisis exist (Giovanni *et al.*, 2001), the effects of the 2007–2010 global financial crisis in this area are left for further research.[26]

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Notes

1. Some papers use the term 'relationship banking' (eg. Giovanni *et al.*, 2001); we decided to use the term 'relationship lending' as we focus only on the lending side of a possible much richer relationship between firms and banks that could include also deposit accounts and investment banking services.
2. A first version of this analysis was published as a special feature in the Czech National Bank's Financial Stability Report 2008/2009 (Geršl and Jakubík, 2009). An extended working paper version has been published as Geršl and Jakubík (2010).
3. For a recent discussion of soft budget constraint literature, see Janda (2009).
4. The only exceptions are overdrafts at current accounts to an amount of 70 euro which are not reported.
5. Thus, these firms' characteristics are time-invariant. For example, if a firm changed ownership from private-domestic to private-foreign, the credit register would overwrite the older records (domestic ownership) with the newer one (foreign ownership) in all months over the whole life of the loan.
6. The 12M default rate was computed as the proportion of the bank's claims that will fall into the category 'past due for more than 90 days' within 12 months.
7. For more information about the structure and development of the Czech banking system, see CNB (2010).

8. Another suitable indicator to measure relationship lending could be the Herfindahl index of concentration of creditors. However, in this study, we do not use this measure of lender's concentration, leaving it for follow-up research.
9. Memmel *et al*. (2007) analysed bank loans from the Deutsche Bundesbank credit register for a period 1993–2004, but the frequency was only yearly.
10. Memmel *et al*. (2007) report a maximum value for the variable 'number of lending relationships' of 197. In the Czech Republic the maximum number is 11.
11. This reason is supported by the fact that the data used for the analysis of Germany in Memmel *et al*. (2007) come from the Deutsche Bundesbank credit register, which only contains loans that exceed EUR 1.5 million, that is loans primarily to large corporations.
12. The group 'large banks' consists of the four largest banks in the Czech Republic according to total assets. Their joint market share in the relevant loan market segment (loans to non-financial corporations) was around 66% and surprisingly stable over all 7 years of data availability.
13. The role of medium-sized banks was not significantly reduced by the change of form of Citibank from a medium-sized bank to a branch of a foreign bank in 2008.
14. Some of the factors could be tested by including more variables for banks, such as the assets or equity of banks; unfortunately, as the data set was anonymized and these data were not available in the credit register, this has to be left for follow-up research.
15. Foreign bank branches differ from foreign bank subsidiaries, which are incorporated in the Czech Republic and thus included in the other groups of banks – large, medium-sized or small, as they are not subject to capital regulation in the host country and are in a larger extent managed from abroad, having very often a more specialized focus and strategy in the host market.
16. This is the unweighted average. The decline is due to a decrease in this share in individual firms and partly also to the appreciation of the Czech koruna against other currencies, as well to a change in the set of firms towards a higher proportion of (for example smaller) firms using mostly koruna loans. The relatively small average amount of this share (as compared to the often cited share of FX loans in total loans provided by domestic banks of around 30%) is due to the high proportion of smaller firms with mostly koruna loans.
17. At the end of 2008, this situation switched towards equal default *vis-à-vis* both relationship lenders (50% of all firms in default in 2008:Q4).
18. Unfortunately, the credit register does not include variables on bank size, ownership, performance and the structure of balance sheets, so a number of potentially important research questions related to different behaviour *vis-à-vis* different lenders cannot be analysed.
19. Variables capturing corporations' geographical ties and countries of origin were not available, so the influence of these factors was not tested in the analysis.
20. The firm size information does not vary over time as it is taken from the turnover categories in the RES database and is always overwritten in the CRC historical data by the latest information.
21. See CZSO, *Klasifikace zpracovatelského průmyslu podle technologické náročnosti* [Classification of manufacturing by technology intensity] and *Klasifikace*

odvětví služeb podle znalostní náročnosti [Classification of services by knowledge intensity].

22. Other variables proved to be insignificant. Descriptive statistics of relevant variables used in the regressions can be found in Table 1.
23. Information on turnover is not available for all 123,040 firms analysed in the fourth section, so the regressions using this variable were performed only on a subsample containing 63,088 firms, that is roughly half the number of all firms. Given the 'categorical' nature of this variable, the variance of turnover is much smaller than would otherwise be the case, so we do not use robust standard errors.
24. Ideally, one would measure the economic cycle by the output gap. However, there is no internationally accepted time series of this measure (such as the OECD output gap database which exists for developed countries and doe not yet include the Czech Republic due to the short time series of the GDP development). Other possible macroeconomic variables such as inflation interest rates or exchange rate were either insignificant or had a sign inconsistent with economic intuition.
25. Some small and medium-sized banks, for example, used an aggressive strategy to win market share, leading to growth in the credit risk of their portfolios at times when the economy was growing strongly.
26. OECD (2010) made a reference to an early version of this article (Geršl and Jakubík, 2009) when explaining the good situation in the Czech banking system during global financial crisis.

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6

Private-Sector Credit in Central and Eastern Europe: New (Over) Shooting Stars?[1]

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This paper analyses the equilibrium level of private credit to GDP in 11 Central and Eastern European countries in order to see whether the high credit growth recently observed in some of these countries led to above equilibrium private credit-to-GDP levels. We use estimation results obtained for a panel of small open OECD economies (out-of-sample sample) to derive the equilibrium credit level for a panel of transition economies (in-sample panel). We opt for this (out-of-sample) approach because the coefficient estimates for transition economies are fairly unstable. We show that there is a large amount of uncertainty to determine the equilibrium level of private credit. Yet our results indicate that a number of countries are very close or even above the estimated equilibrium levels, whereas others are still well below the equilibrium level.

Introduction

The emerging literature on credit growth in transition economies has documented that lending to the private sector has recently grown dynamically in a number of transition economies.[2] This can be attributed to a number of factors, including macroeconomic stabilization, comprehensive reforms and privatization in the financial sector, the introduction of market institutions and legal reforms. However, given the size of

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the recent boom in bank lending in Central and Eastern Europe (CEE) some commentators have questioned whether the growth rates recorded in these countries can be viewed as sustainable in the medium to long run.

In order to answer this question, this paper investigates the determinants of domestic credit to the private sector as a percentage of GDP in 11 CEE countries[3] as well as the equilibrium level of private credit-to-GDP ratio. We have tested our empirical specifications for a variety of panels composed of (1) transition economies, (2) developed small and large OECD countries and (3) emerging market economies from Asia and the Americas.

The use of these panels provides some interesting perspectives. First, in-sample panels give useful insights regarding the major determinants of credit-to-GDP levels in CEE. Second, as financial depth in most transition economies remains comparatively low, it might well be that private credit-to-GDP ratios have still remained below their equilibrium levels for most of the last decade. This would give rise to a bias in the econometric estimates, as credit-to-GDP ratios tend to converge toward their equilibrium levels.[4] To overcome this problem, we could use estimates obtained from panels composed of small open OECD and emerging market economies from Asia and the Americas to obtain the equilibrium credit-to-GDP ratios for 11 CEE countries.

The paper is structured as follows: the next section reviews some stylized facts regarding credit growth in the transition economies. The subsequent section briefly overviews the relevant literature, sketches the issue of initial undershooting and overshooting of the credit-to-GDP ratio, and examines their consequences for econometric testing. The following section presents the economic specification used for the estimations and describes the data set and the estimation techniques. The penultimate section then presents and discusses the estimation results. Finally, the last section draws some concluding remarks.

Some stylized facts

To place credit developments in transition economies into context, it is useful to recall that financial systems in these countries are bank-based – about 85% of financial sector assets are bank assets – and that capital markets (in particular, corporate bond and stock market segments) are generally not very developed. This implies that bank credit is the main source of external financing in these countries, although also foreign direct investment (FDI) has been important in some countries. Banking sectors in transition economies in CEE have undergone a comprehensive transformation in the

past one-and-a-half decades, including wide-ranging reforms of regulatory frameworks and supervisory arrangements, bank consolidation schemes and – in almost all countries – sweeping privatization, mainly to foreign strategic owners (mostly financial institutions based in 'old' EU Member States). Consequently, the governance of banks has greatly improved, and the performance and health of banking sectors have advanced substantially, as standard prudential indicators show.[5]

In 2005, the banking systems' capital adequacy ratio in the 11 countries ranged from 10.6 (Slovenia) to 20.3% (Romania), with an unweighted average of about 13%, well above the statutory minimum of 8% prescribed by the Basle rules. Profitability has risen considerably, as return on equity data show, and is now above the EU average (about 13%) in most countries covered in this study (see Figure 6.1). Asset quality has improved, as non-performing loan ratios have fallen (see Figure 6.1). Reserves and provisions now cover a considerable part of substandard assets in most of the countries under review her, as coverage ratios ranged from 60 to 100% in 2005 in most cases, with an unweighted average of about 85%.[6]

Figure 6.2 gives an overview of the development of credit to the private sector in percent of GDP[7] from the early 1990s to 2004. Several observations can be made on the basis of Figure 6.1. Some countries, namely Estonia, Latvia, Lithuania, Poland, Romania and Slovenia, started transition with low credit-to-GDP ratios of around 20%. Estonia and Latvia then recorded a marked increase in the ratio, and the credit-to-GDP ratio also rose steadily in Slovenia from the early 1990s to 2004 although the overall increase was less pronounced than in the two aforementioned Baltic countries. Credit growth has picked up only recently in Lithuania and Romania, and for Poland, only a moderate increase can be observed during the second half of the period studied.

By contrast, the second group of countries, notably Croatia and Hungary, started transition with higher credit-to-GDP ratios than the Baltic countries. After dropping considerably to close to 20%, the ratio started to increase, reaching pretransition levels in Hungary and growing to levels well exceeding 40% in Croatia by 2004.

The third group of countries, comprising Bulgaria, the Czech Republic and Slovakia, had the highest credit-to-GDP ratio at the beginning of the period (between 60 and 80%). For Bulgaria, this ratio came down to 10% in 1997, while expanding to close to 40% by 2004.[8] The Czech Republic and Slovakia also recorded a substantial contraction (to nearly 30% for both countries), while the ratios seem to have stabilized during the last couple of years.

The differences in initial credit-to-GDP levels can be traced largely to different approaches with respect to the financing of (credit to)

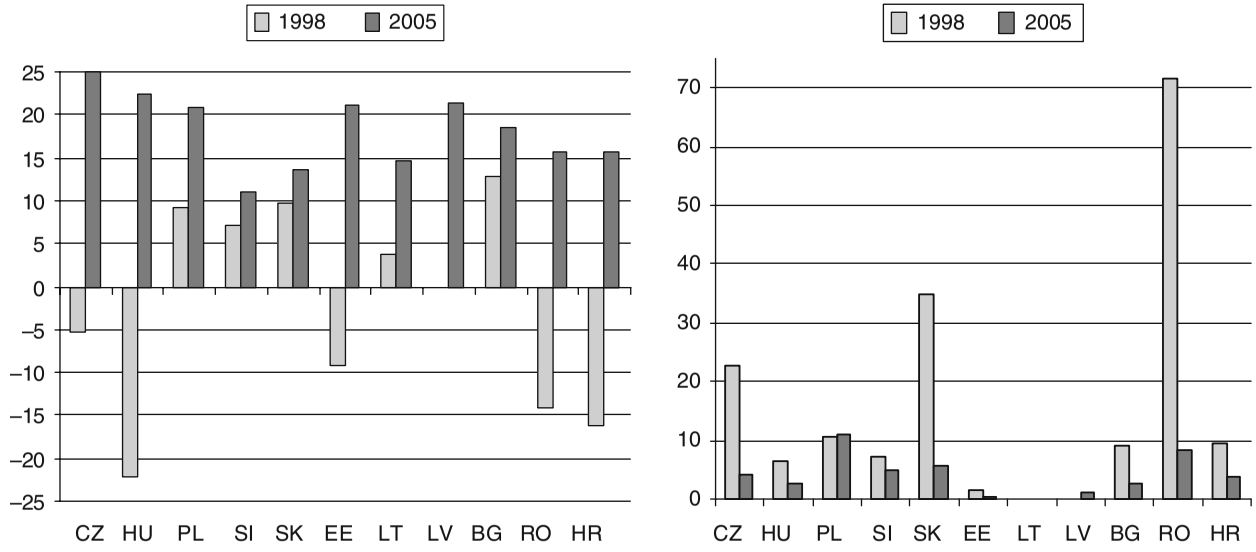

Figure 6.1 Return on equity (left-hand side, %) and non-performing loans (right-hand side, %)
Source: National central banks.
Note: Return on equity: Slovakia: value 2000 (instead of 1998); Romania: value 1999 (instead of 1998); Latvia: value 2004 (instead of 2005). Non-performing loans: Latvia: value 2004 (instead of 2005); no data available for Lithuania.

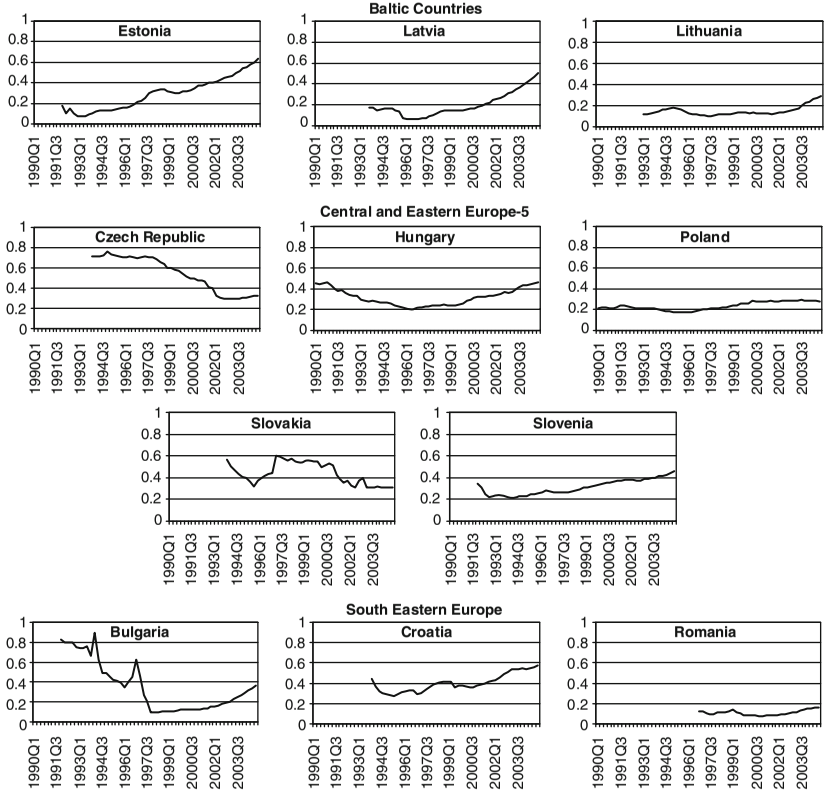

Figure 6.2 Bank credit to the private sector as a percentage of GDP, 1990 to 2004
Source: Authors' calculations based on data drawn from the IFS/IMF. For exact data definitions, see the data appendix.

enterprises under central planning across countries as well as strongly diverging inflation (price level adjustment) patterns across countries at the initial stage of transition. In turn, major temporary contractions in credit-to-GDP ratios during the transition process have mainly been due to banking consolidation measures, by which non-performing assets were removed from banks' balance sheets.[9] Such non-performing assets (mostly loans) had either been inherited from the previous era of central planning or were built up in the early transition years, when banking systems were still immature, flawed by inadequate regulation, connected lending and simple lack of experience.

The equilibrium level of private credit

Literature overview

Several theoretical and empirical studies have dealt with credit growth, financial deepening and lending booms. One body of literature on credit growth reviews the determinants of credit demand and credit supply. In the models on credit demand, real GDP, prices and interest rates are commonly the explanatory variables, although there is no 'standard' model that would be widely used. On the supply side, a variety of credit channel models consider how changes in the financial positions of banks (bank lending channel) and borrowers (balance sheet channel) affect the availability of credit in an economy (see Hall, 2001, for a succinct overview). However, modelling and estimation techniques in this area are complicated due to difficulties with separating demand side effects from supply side effects (see eg Rajan, 1994).

There are strong empirical indications of a positive interaction between finance and growth, usually with elasticity higher than one in the long run. This implies that credit to GDP levels rise as per-capita GDP increases, a process which is denoted as financial deepening (see Terrones and Mendoza, 2004 for a concise overview). In addition, empirical studies have examined the direction of causality; with most results suggesting that it is financial deepening which spurs economic development (see eg Beck *et al.,* 2000, and Rajan and Zingales, 2001 for an overview). While the results of this literature are appealing, it goes without saying that establishing genuine causality is intricate, while non-linearities in the relationship between financial development and growth as well as country heterogeneity add to the problems of empirical analysis in this area (see discussion in Favara, 2003).

On lending booms, leading theories highlight several triggers, in particular (i) real business cycles caused by technological or terms-of-trade shocks (with highly pro-cyclical output-elasticity of credit demand), (ii) financial liberalization of an initially repressed financial system,

(iii) capital inflows triggered by external factors and (iv) wealth shocks originating for example from comprehensive structural reforms (see Gourinchas *et al.* (2001) for a survey). In addition, less-than fully credible policies (in particular exchange-rate-based stabilizations) can also play a role in spurring credit booms, by setting off an unsustainable consumption boom (see Calvo and Vegh (1999) for a review). Moreover, the financial acceleration literature, including the more recent literature on credit cycles, gives some theoretical insights in the mechanisms that drive or amplify credit expansions, that turns out to be non-sustainable and thus ultimately require a correction (Terrones and Mendoza, 2004). From the empirical literature on the topic one cannot conclude that lending booms typically lead to financial crises. As Gourinchas *et al.* (2001) point out, while the conditional probability of a lending boom occurring before a financial crisis may be quite high, this does not tell much about the converse, that is the conditional probability that a financial crisis will follow a lending boom.[10]

Initial under- and overshooting in transition economies

The question of whether or not credit growth in transition economies is excessive is closely related to the issue of what the equilibrium level of the stock of bank credit to the private sector as a share of GDP in those countries is. In this study, we define the equilibrium level of private credit as the level of private credit, which would be justified by economic fundamentals. Deviations from the equilibrium level occur if changes in the private credit-to-GDP ratio cannot be explained by changes in economic fundamentals. Hence, our notion of equilibrium is very close to the one used for instance in the literature on equilibrium exchange rates (Behavioral Equilibrium Exchange Rate – BEER) and in other fields of the economic profession.[11]

Figure 6.3 demonstrates when moving from point A through B to C that the level of private credit increases as a function of the underlying fundamentals. The depicted trajectory of the increase in the credit-to-GDP ratio (credit growth) can be thought of as an equilibrium phenomenon insofar as it is in line with economic fundamentals.

Nevertheless, we may also think of a situation when the observed credit-to-GDP ratio is out of tune with economic fundamentals. Point A' depicts the situation when the initial credit-to-GDP ratio is higher than what the level of economic development would justify (initial overshooting). By contrast, point A'' shows a credit-to-GDP ratio which is lower than what the level of economic development of the given country

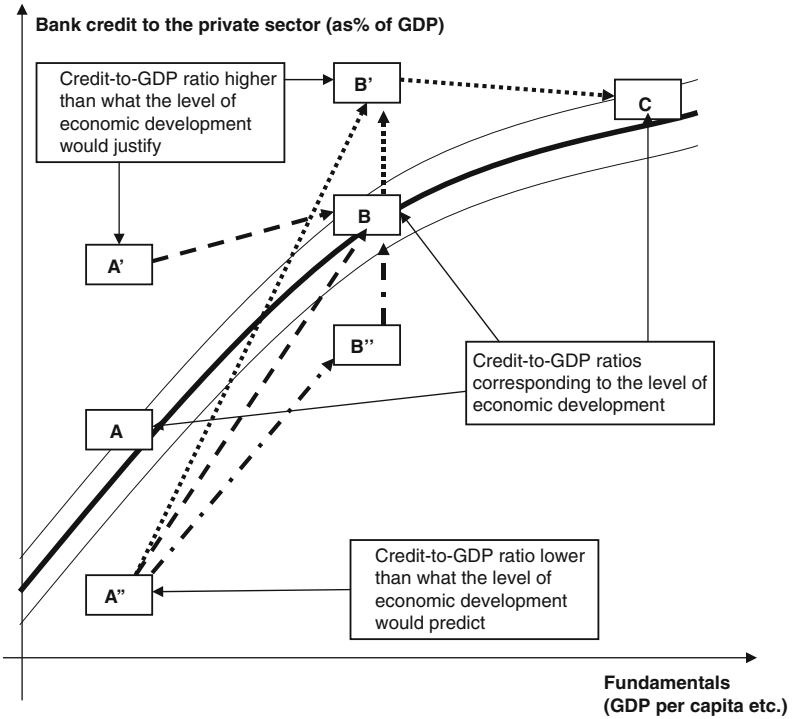

Figure 6.3 The evolution of the credit-to-GDP ratio

would predict (initial undershooting). In those cases, credit growth should differ from the equilibrium rate of growth, and this would secure the return to the equilibrium level of the credit-to-GDP ratio.[12]

Initial undershooting may be important for transition economies, most of which started economic transformation with lower levels of credit to GDP than other countries at the same level of development would have in other parts of the world. This is a heritage of central planning because of the underdevelopment of the financial sector under the communist regime. Hence, once economic transformation from central planning to market is completed, higher credit growth in the transition economies may partly reflect the correction from this initial undershooting to the equilibrium level of the credit-to-GDP ratio. This is shown in Figure 6.3, where the move from A'' to B can be decomposed into (a) equilibrium credit growth, given by A'' to B'', and (b) the adjustment from initial undershooting to equilibrium (from B'' to B). However, in cases of high

credit growth rates, the increase in credit to GDP may be even higher than the equilibrium change and the correction from initial undershooting would justify. The move from A'' to B' on Figure 2 indicates such an overshooting where the excessive increase in credit to GDP is given by the distance between B and B'.

The consequences of an initial under- or overshooting

If there is initial under- or overshooting at the beginning of the transition process and if the adjustment toward equilibrium occurs gradually, implying persistent initial under- or overshooting, the use of panels including only transition economies may lead to severely biased constant terms and coefficient estimates, as put forward in the context of equilibrium exchange rates by Maeso-Fernandez *et al.* (2005). When regressing the observed credit-to-GDP ratio moving from A'' to B (instead of the equilibrium change from A to B) on a set of fundamentals, the slope coefficient would suffer from an obvious upward bias. By the same token, the constant term will be lower than it would be in the absence of an initial undershooting.

This is the reason why one would be well advised to use panels including countries which do not exhibit an initial under- or overshooting in the credit-to-GDP ratio or to use out-of-sample panels for the analysis of the equilibrium level of the credit-to-GDP ratio of transition economies.

Empirical literature on transition economies

Cottarelli *et al.* (2005) were the first to estimate a model of the long-term relationship between the private sector credit/GDP ratio and a set of variables (see Table 6.1) for a panel of non-transition economies. Subsequently, they produce out-of-sample estimates for private sector credit/GDP ratios of 15 CEE countries. As actual private sector credit-to-GDP levels were considerably lower in 2002 than the authors' estimates of the expected long-term credit/ GDP ratios they conclude that private-sector bank credit levels in that year were not inconsistent with the structural characteristics of the economies under examination.

We are aware of two other recent studies, which also investigate the equilibrium level of private credit and the possible 'excessiveness' of credit growth in transition economies. Boissay *et al.* (2006) first estimate time series models including GDP-per-capita and real interest rates for a number of established market economies for periods with stable credit-to-GDP ratios. They then compare the average of the credit growth rates for transition economies obtained using the error correction specifications estimated for the developed countries with the observed credit

Table 6.1 Overview of papers analyzing the determinations of credit growth

Author(s)	Dependent variable	Explanatory variables
Calza *et al.* (2001)	Real loans	GDP per capita in PPS, short- and long-term real interest rates
Calza *et al.* (2003)	Real loans	Real GDP growth, nominal lending rate, inflation rate
Brzoza-Brzezina (2005)	Real loans	Real GDP growth, real interest rate
Hofmann (2001)	Real loans	Real GDP, real interest rate, housing prices
Cottarelli *et al.* (2005)	Credit to the private sector (% GDP)	GDP per capita in PPS, inflation rate, financial liberalisation index, accounting standards, entry restrictions to the banking sector, German origin of the legal system, public debt
Boissay *et al.* (2006)	Credit to the private sector (% GDP)	GDP per capita, real interest rate (Euribor), quadratic trend
Kiss *et al.* (2006)	Credit to the private sector (% GDP)	GDP per capita, real interest rate, inflation rate

Note: GDP per capita in PPS (purchasing power standards) is obtained by converting GDP per capita figures using the nominal exchange rate given by the domestic and foreign price levels (P/P*).

growth in the transition economies. They also estimate time series models for transition economies, which include the real interest rate, a quadratic trend and a dummy aimed at capturing changes in credit growth after 2001. Their results indicate excessive credit growth in the three Baltic States and in Bulgaria and to a lesser extent also in Hungary and Croatia. At the same time, credit growth in Romania and Slovenia seems to be non-excessive.[13]

The study by Kiss *et al.* (2006) estimates a dynamic panel (Pooled Mean Group Estimator) model including GDP-per-capita, real interest rate and inflation of 11 euro area countries (excluding Luxembourg) to generate out-of-sample estimates for private sector credit-to-GDP ratios of the three Baltic countries and of the CEE-5 (Czech Republic, Hungary, Poland, Slovakia and Slovenia). They find that only Estonia and Latvia may have come close recently to equilibrium while the other countries have credit-to-GDP ratios below the estimated equilibrium levels. Besides being above the estimated equilibrium credit level, they define two other criteria which may indicate a credit boom: (a) if the observed credit growth exceeds the one implied by the long-run equilibrium relationship and (b) if the observed growth rate is higher than the speed of adjustment to

equilibrium in the error-correction model. Overall, they find that the risk of a credit boom is high in both Estonia and Latvia according to these criteria, whereas Hungary, Lithuania and Slovenia might be in the danger zone because the observed growth rates are higher than the one derived from the long-run equilibrium relationship. In addition, they argue that possible credit booms are mainly due to credit expansion to households and not to the non-financial corporate sector.[14]

We contribute to this literature by expanding the list of countries (11 transition, OECD and emerging market economies), the list of explanatory variables, by constructing carefully several possible benchmark country groups, which share common characteristics with the transition economies (emerging markets, small emerging markets, small and open OECD countries) and by performing extensive sensitivity analysis of the estimation results.

Economic and econometric specifications

The empirical model

Most studies investigating credit growth employ a simple set of explanatory variables (see Table 6.1), which usually includes GDP per capita or real GDP, some kind of (real or nominal) interest rate and the inflation rate (Calza *et al.,* 2001, 2003: Brzoza-Brzezina, 2005; Boissay *et al.,* 2006 and Kiss *et al.,* 2006). Hofmann (2001) extends this list by housing prices, a very important variable, because a rise in housing prices is usually accompanied by an increase in credit to the private sector.

Cottarelli *et al.* (2005) use indicators capturing factors driving the private credit to GDP ratio. These variables describe the degree of financial liberalization, the quality and implementation of accounting standards, entry restrictions to the banking sector and the origin of the legal system. Finally, they use a measure of public debt aimed at analysing possible crowding-out (or crowding-in) effects.

The economic specification, which we estimate for the private credit-to-GDP ratio relies on explanatory variables used in previous studies but also extends on them. We consider the following variables:

GDP per capita in terms of purchasing power standards (PPS) (*CAPITA*). An increase in per capita GDP is expected to result in an increase in credit to the private sector. Alternatively, we also use real GDP (*gdpr*) and industrial production (*ip*) to check for the robustness of the GDP per capita variable and to see to what extent these variables, which are used interchangeably in the literature, are substitutes.

Bank credit to the public sector (including central and local government and public enterprises) in percent of GDP (C^G). As this variable captures

possible crowding-out effects, any increase (decrease) in bank credit to the government sector is thought to give rise to a decrease (increase) in bank credit to the private sector. It should be noted that bank credit to the government measures crowding out better than public debt as employed in Cottarelli *et al.* (2005) because public debt also includes loans taken out abroad and because public entities may well finance themselves on security markets. Moreover, public debt is subject to valuation and stock-flow adjustments.

Short-term and long-term nominal lending interest rates (i). Lower interest rates should promote credit to the private sector, implying a negative sign for this variable. Calza *et al.* (2001) use both short-term and long-term interest rates, arguing that whether short-term or long-term interest rates play a more important role depends on the respective share of loans with fixed interest rates and variable interest rates. As the nominal lending interest rates used in the paper show a high correlation with short-term interest rates (3-month treasury bills and money market rates), short-term interest rates are used as a robustness check rather than as an additional variable.

Inflation (p). High inflation is thought to be associated with a drop in bank credit to the private sector. Inflation is measured both in terms of the producer price index (PPI) and the consumer price index (CPI).

Housing prices (p^{housing}). There are a number of reasons why changes in housing prices might lead to changes in credit demand. First, increases in housing prices result in a rise in the total amount that has to be spent to purchase a given residential or commercial property. This is subsequently reflected in an increase in demand for credit through which the higher purchasing price can be fully or partly financed. This means that an increase in housing prices may generate more credit to the private sector. Second, rising housing prices may generate a rise in credit demand of homeowners as higher housing prices increase lifetime wealth according to Modigliani's lifecycle theory, which in turn leads to consumption smoothing by means of more borrowing. By contrast, higher housing prices are usually connected to higher rents, which decrease borrowing of renters (Hofmann, 2001). Third, credit demand may be affected by housing prices because Tobin's q theory is also applicable to the housing market. For example, a higher-than-unity q implies market value above replacement cost, and this promotes construction production, which is reflected in higher demand for loans. Changes in commercial and residential property prices also have an influence on credit supply. According to the broad lending channel, net wealth, serving as collateral for credit, determine the capacity of firms and household to borrow externally. Put

differently, higher housing prices resulting in rising net wealth increase the amount of credit provided by banks. Overall, both credit supply and demand bear a positive relationship to housing prices from a theoretical viewpoint.

However, a fundamental problem arising here is whether price increases in the real estate market are driven by fundamental factors or whether they reflect a bubble. If price developments in the real estate market mirror changes in fundamentals, such as the quality of housing or adjustments to the underlying fundamentals, the ensuing rise in the stock of credit can be viewed as an equilibrium phenomenon. In contrast, in the event that high credit growth is due to the development of a housing price bubble due to speculation, the accompanying credit growth is a disequilibrium phenomenon from the point of view of long-term credit stock.

The degree of liberalization of the financial sector, in particular that of the banking sector. A higher degree of financial liberalization makes it easier for banks to fund credit supply. As the financial liberalization indices (*finlib*) used in Abiad and Mody (2005) and Cottarelli *et al*. (2005) only partially match our country and time coverage, we use in addition the spread between lending and deposit rates to capture financial liberalization. A decrease in the spread can be an indication of financial liberalization in particular if it reflects more intensive competition among banks and also between banks and other financial intermediaries. It should be noted that the spread variables could also capture other factors than financial liberalization. With this caveat and limitation in mind, spread variables still are the most appropriate variables to capture financial liberalization that are available for all the countries in the different panels covered in this study.[15]

Public and private credit registries (*reg*). The existence of credit registries diminishes problems related to asymmetric information and the probability of credit fraud. This in turn leads to an increase in the supply of bank credit, all things being equal.[16,17]

Our baseline specification includes per capita GDP, bank credit to the public sector, nominal lending rates, inflation rates and financial liberalization based on the spread:[18]

$$C^P = f(\overset{+}{CAPITA}, \overset{-}{C^G}, i^{\overset{-}{\text{lending}}}, \overset{-}{p^{\text{PPI}}}, \overset{-}{spread}) \quad (1)$$

where C^P is bank credit to the private sector expressed as a share of GDP. In addition, it is worthwhile checking whether the robustness of the variables included in Eq. (1) is affected by the use of alternative measures often used in the literature (eg replacing GDP per capita by real GDP

growth and real industrial production, or long-term lending rates by short-term lending rates, and the PPI by the CPI). These alternative variables are subsequently introduced one by one in the baseline specification, which yields six additional equations.

$$C^P = f(\bar{ip}, \bar{C^G}, \bar{i^{\text{lending}}}, \bar{p^{\text{PPI}}}, \bar{spread}) \tag{2}$$

$$C^P = f(\overset{+}{gdpr}, \bar{C^G}, \bar{i^{\text{lending}}}, \bar{p^{\text{PPI}}}, \bar{spread}) \tag{3}$$

$$C^P = f(\overset{+}{CAPITA}, \bar{C^G}, \bar{i^{\text{short-term}}}, \bar{p^{\text{PPI}}}, \bar{spread}) \tag{4}$$

$$C^P = f(\overset{+}{CAPITA}, \bar{C^G}, \bar{i^{lending}}, \bar{p^{CPI}}, \bar{spread}) \tag{5}$$

$$C^P = f(\overset{+}{CAPITA}, \bar{C^G}, \bar{i^{\text{lending}}}, \bar{p^{\text{PPI}}}, \overset{+}{finlib}) \tag{6}$$

The sensitivity check to the alternative specification is then followed by the use of the registry variable and by the inclusion of housing prices:

$$C^P = f(\overset{+}{CAPITA}, \bar{C^G}, \bar{i^{\text{lending}}}, \bar{p^{\text{PPI}}}, \bar{spread}, \overset{+}{reg}) \tag{7}$$

$$C^P = f(\overset{+}{CAPITA}, \bar{C^G}, \bar{i^{\text{lending}}}, \bar{p^{\text{PPI}}}, \bar{spread}, \overset{+}{p^{\text{housing}}}) \tag{8}$$

Estimation methods

The first step is to check whether our series are stationary in levels. Four panel unit root tests are applied: the Levin *et al.* (2002), the Breitung (2000), the Hadri (2000) and the Im *et al.* (2003) tests. The first three tests assume common unit roots across panel members while the Im-Pesaran-Shin test allows for cross-country heterogeneity. A further difference is that the Hadri test tests the null of no unit root against the alternative of a unit root whereas the remaining tests take the null of a unit root against the alternative of no unit root.

If the series turn out to be non-stationary in levels but stationary in first differences, the coefficients of the long-term relationships for the relationships shown in equations (1)–(9) are derived using three

alternative estimation techniques: (a) fixed-effect ordinary least squares (FE_OLS); (b) panel dynamic OLS estimates (DOLS) and (c) the mean group estimator (MGE) proposed by Pesaran *et al*. (1999).

The panel dynamic OLS, which is the mean group of individual DOLS estimates, accounts for the endogeneity of the regressors and serial correlation in the residuals in the simple OLS setting by incorporating leads and lags of the regressors in first differences. The panel DOLS can be written for panel member *i* as follows:

$$Y_{i,t} = a_i + \sum_{h=1}^{n} \beta_{i,h} X_{i,t} + \sum_{h=1}^{n} \sum_{j=-k_{i,1}}^{k_{i,2}} \gamma_{i,j} \Delta X_{i,t-j} + \varepsilon_{i,t} \tag{9}$$

where $k_{i,1}$ and $k_{i,2}$ denote, respectively, leads and lags and the cointegrating vector β' contains the long-term coefficients of the explanatory variables (with $h = 1,\ldots, n$) for each panel member *i*.

The MGE is based on the error correction form of the ARDL model, which is given for panel member *i* as shown in equation (10) where the dependent variable in first differences is regressed on the lagged values of the dependent and independent variables in levels and first differences:

$$\begin{aligned} \Delta Y_{i,t} = a_i + \rho_i (Y_{i,y-1} + \sum_{h=1}^{n} \delta_{i,h} X_{i,t-1}) + \sum_{j=1}^{l_1} \eta_{i,j} \Delta Y_{i,t-j} \\ + \sum_{h=1}^{n} \sum_{j=0}^{l_2} \gamma_{i,j} \Delta X_{i,t-j} + \varepsilon_{i,t} \end{aligned} \tag{10}$$

where *l*1 and *l*2 are the maximum lags. The long-term coefficients (β') are obtained by normalizing vector δ' on ρ.

Finally, we use the error correction term (ρ) obtained from the error-correction specification of the mean group estimator as tests for cointegration. A negative and statistically significant error correction term is taken as evidence for the presence of cointegration.

Results

Estimation results

The estimations are carried out for quarterly data, covering 43 countries, which are grouped in three main panels: (a) developed OECD countries, (b) emerging markets from Asia and the Americas,[19] and (c) transition economies from CEE. The OECD panel is further split into two subpanels: (a) small OECD countries (excluding transition economies that have joined the OECD),[20] and (b) large OECD countries.[21] The CEE panel

consists of 11 transition economies and is also subdivided into three presumably more homogeneous groups: (a) the Baltic 3 (B-3): Estonia (EE), Latvia (LV) and Lithuania (LT), (b) the CEE-5: the Czech Republic (CZ), Hungary (HU), Poland (PL), Slovakia (SK) and Slovenia (SI), and (c) the Southeastern Europe 3 (SEE-3): Bulgaria (BG), Croatia (HR) and Romania (RO). The sample begins between 1975 and 1980 for the OECD countries, between 1980 and 1993 for the emerging market economies, and between 1990 and 1996 for the transition economies; it ends in 2004.[22]

Panel unit root tests are employed for level data and for first-differenced data. While the test results show that most of the series are I(1) processes, in a few cases, the tests yield conflicting results for level data. However, since the tests do not indicate unambiguously in any case that the series are stationary in level, we conclude that they are I(1).[23]

When analysing possible long-term relationships between the private credit-to-GDP ratio on the one hand and the explanatory variables on the other, one has to make sure that the variables are cointegrated. As explained earlier, the error correction terms (ρ) issued from the estimated error correction form of the MGE are used for this purpose. The variables are connected via a cointegrating vector in the event that the error correction term is statistically significant and has a negative sign. According to results shown in Table 6.2 below, most of the error correction terms fulfil this double criterion. A notable exception is the panel composed of the three Baltic states, as there seems to be only one cointegration relationship out of the eight tested equations.

We can now turn to the coefficient estimates obtained using equation (1), which are displayed in Table 6.3.[24] GDP per capita enters the long-run relationship with the expected positive sign for the OECD and the emerging markets panels. This result is particularly robust for small OECD and

Table 6.2 Error correction terms (r) from the mean group estimator estimations, equations 1–7

	Large OECD	**Small OECD**	**Emerging**	**CEE-11**	**CEE-5**	**B-3**	**SEE-3**
Equation 1	–0.094***	–0.063***	–0.132***	–0.281***	–0.225***	–0.103	–0.551***
Equation 2	–0.088***	–0.052***	–0.135***	–0.174***	–0.188***	–0.052	–0.273***
Equation 3	–0.092***	–0.055***	–0.202***	–0.188***	–0.183***	–0.135**	–0.248***
Equation 4	–0.097***	–0.069***	–0.189***	–0.226***	–0.136***	–0.049	–0.553***
Equation 5	–0.097***	–0.057***	–0.215***	–0.198***	–0.207***	–0.066	–0.315***
Equation 6	–0.160***	–0.049**	–0.211***	–0.233***	–0.269***	–0.120	–0.285**
Equation 7	–0.980***	–0.003**	–0.134***	–0.227***	–0.231***	–0.033	–0.414**

Note: *, ** and *** indicate statistical significance at the 10, 5 and 1% significance levels, respectively.

Table 6.3 Estimation results – baseline specification vector $=X\beta'$ $X=(CAPITA, C^G, i^{lending}, p^{PPI}, \text{spread})$; $\beta'=[1, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5]$ expected signs: [1, +, –, –, –, –]

	β_1	β_2	β_3	β_4	β_5
Large OECD					
FE_OLS	0.422***	–0.198***	–0.028	–0.394*	–0.050***
DOLS	0.391***	–0.034***	0.120***	0.241	0.171***
MGE	0.040	0.118	–0.016	–2.611**	0.207*
Small OECD					
FE_OLS	0.480***	–0.170***	–0.068***	–0.178	–0.037***
DOLS	0.540***	–0.065***	–0.082	0.678***	–0.143***
MGE	0.643***	0.057	–0.171	–1.272	0.281
Emerging					
FE_OLS	0.492***	–0.120***	0.136***	–0.263***	0.069**
DOLS	0.715***	–0.064***	0.187***	–0.436***	–0.001
MGE	0.583***	–0.386***	0.454	–0.492***	–1.172
CEE11					
FE_OLS	1.648***	0.053**	0.297***	–0.046	–0.640***
DOLS	0.981***	–0.169***	0.125	–0.105	–0.382***
MGE	2.043	–0.114	–0.027***	–0.263	–0.907**
CEE5					
FE_OLS	0.169	–0.276***	–0.031	–1.179***	–0.407***
DOLS	0.375***	–0.308***	–0.046	1.062***	–0.109*
MGE	–1.076	–0.222***	–0.057***	1.501	–0.985**
B3					
FE_OLS	2.554***	0.024	0.369***	0.396*	–0.458***
DOLS	2.227***	–0.121	0.083**	–1.676***	–0.481***
MGE	4.045	0.313	–0.124***	–2.852	–1.466
SEE					
FE_OLS	2.049***	0.455***	0.218***	–0.102**	–0.366***
DOLS	0.745***	0.013	–0.298	–0.479	–0.737***
MGE	1.654***	0.264	0.120	–0.616**	0.217

Note: *, ** and *** indicate statistical significance at the 10, 5 and 1% significance levels, respectively.

emerging market economies, with the size of the coefficient usually lying somewhere between 0.4 and 1.0 for most of the alternative specifications. However, less robustness is found for the transition countries. This holds especially true for the CEE-5, for which GDP per capita turns out to be insignificant both in the baseline and in alternative specifications. Although cointegration could not be firmly established for the Baltic countries, it is worth mentioning that GDP per capita is usually statistically significant for this group as well as for the SEE-3. The fact that the

coefficients' size largely exceeds unity reflects the upward bias due to quick adjustment toward equilibrium. The results furthermore indicate that the bias is substantially larger for the Baltic countries than for the SEE-3.

With regard to credit to the public sector, the estimations provide us with some interesting insights, as an increase (decrease) in credit to the public sector is found to cause a decline (rise) in private credit. This result is very robust for emerging market economies and for the CEE-5, as the coefficient estimates are almost always negative and statistically significant across different specifications. This lends support to the crowding-out/crowding-in hypothesis in these countries. Some empirical support for this hypothesis can be also established for the advanced OECD and for emerging market economies. By contrast, the estimated coefficients are either not significant or have a positive sign for the Baltic countries and for the SEE-3. This finding might mirror in particular the very low public indebtedness of the three Baltic countries.

Let us now take a closer look at the nominal interest rate and at the inflation rate. In accordance with the results shown in Table 6.1 and in the appendix, there is reasonably robust empirical support for nominal lending rates being negatively linked to private credit in the CEE-5 as well as in emerging markets and small OECD countries. In contrast, the finding for the Baltic states and the SEE-3 is that interest rates mostly have a positive sign, if they turn out to be statistically significant. Note that these results are not really affected by the use of lending rates or short-term interest rates.

For emerging economies from Asia and the Americas, particularly strong negative relationships are detected between the rate of inflation and private credit. Although less stable across different specifications and estimation methods, this negative relationship between inflation and credit is also supported by the data for the CEE-5 and for small OECD economies. By contrast, no systematic pattern could be revealed for the Baltic and Southeastern European countries.

An increase in financial liberalization, measured by (a decline in) spread, has the expected positive impact on private credit in small OECD economies and in the CEE-5, and also to some extent in the other transition economies. By contrast, the results for the financial liberalization index are less robust. Although the financial liberalization index is positively associated with private credit in OECD and emerging economies, it has an unexpected negative sign for all transition economies. An explanation for this may be the delay with which financial liberalization measured by this index is transmitted to private credit, whereas the spread variable captures the effective result of financial liberalization. The same mismatch between

OECD and transition economies can be seen for private and public credit registries. While changes in credit registries produce the expected effect on private credit in OECD countries, the estimation results show the opposite happening in the transition economies.

As data on housing prices are available only for developed OECD countries and for four transition economies (the Czech Republic, Estonia, Hungary and Lithuania), the estimations are performed only for large and small OECD and transition economies. In addition, we constructed a panel including countries exhibiting large and persistent increases in housing prices over the late 1990s, possibly indicating the build-up of a real estate bubble (Canada, Spain, France, the UK and the USA). The results are not particularly robust for the small and large OECD economies, as the coefficient on housing prices changes sign across different estimation methods. For transition economies, even though the results are somewhat more encouraging, as the coefficient is always positively signed if it is found to be statistically significant, the estimated equations seem to be rather fragile in general.

Now, if we look at the group of countries with large increases in housing prices, it turns out that housing prices are positively correlated in a robust fashion with private credit, and that the other coefficient estimates are also in line with our earlier findings. However, the fact that the inclusion of housing prices yields robust results only if large increases have taken place on the property markets might suggest that housing prices mostly matter for private credit in the event of possible housing market bubbles.

Deviations from the estimated equilibrium levels

We can now proceed with the comparison of the fitted values from the panel estimations for the transition economies to the observed values for the transition economies. This exercise makes it possible to see how far away the observed private credit-to-GDP ratio is from the estimated long-term value. As both the estimated long-run coefficients and the constant terms might be biased because of the possibility of a large initial undershooting followed by a steady adjustment toward equilibrium in transition economies, partly confirmed in Table 6.3, we are cautious about the use of in-sample panel estimates, that is about using the coefficient estimates obtained for the transition panels. But more importantly, it is the lack of robustness of the coefficient estimates for the transition economies that prevents us from relying on the in-sample panel estimations. As Table 6.3 and 6.4 and in the appendix show, there is no single equation for transition economies,

Table 6.4 Estimation results – equation 8, housing prices vector $=X\beta'$ $X=(CAPITA, C^G, i^{lending}, p^{PPI}$, spread, $p^{housing})$; $\beta'=[1, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5]$ expected signs: [1, +, –, –, –, –, +]

	ρ	β_1	β_2	β_3	β_4	β_5	β_6
Small OECD countries							
FE_OLS		0.611***	–0.166***	–0.098***	–0.125	–0.010	–0.062**
DOLS		0.286***	–0.064	–0.043	0.086	–0.081	0.399***
MGE	–0.207***	0.033	0.203***	–0.277**	–0.548	–0.080	0.587***
Large OECD countries							
FE_OLS		0.078*	–0.209***	–0.022	–0.855***	0.007	0.290***
DOLS		0.395***	–0.079***	–0.041*	–0.345	–0.040	–0.161**
MGE	–0.181***	–0.360	–0.049	–0.097*	–2.397***	0.139	0.544**
OECD countries with high growth rates in housing prices							
FE_OLS		0.111*	–0.160***	–0.066**	–0.787***	–0.025	0.336***
DOLS		0.334***	–0.171***	–0.043**	–0.412	0.022	0.040*
MGE	–0.176***	–0.838	–0.146***	–0.235**	–2.404**	0.432*	0.745**
CEE-4							
FE_OLS		0.316	–0.429***	0.032	–0.603***	–0.096	0.541***
DOLS		0.010***	–0.042***	0.050	–0.563**	0.002	–0.018
MGE	–0.125***	–0.651	–0.136***	–0.599***	0.080	–0.359	0.561**

Note: ρ is the error correction term. *, ** and *** indicate statistical significance at the 10, 5 and 1% significance levels, respectively.

in which all coefficients are statistically significant and have the expected sign.[25]

One may argue that emerging market economies provide with a natural benchmark for CEE economies. However, the fact that some of the coefficient estimates for the emerging market economies are not significant or, importantly, have the wrong sign disqualifies the emerging markets as a benchmark. Small emerging market economies could also constitute a meaningful benchmark, given that these countries are broadly comparably to CEE countries both sizewise and in terms of per-capita GDP levels. Therefore, we have experimented with a smaller panel including only small emerging markets (Chile, Israel, Peru and South Africa) in order to adjust for possible size effects. Yet the coefficient estimates (not reported here) do not improve as the coefficients on credit to the government, the interest rate and the spread variable are either insignificant or have the wrong sign.

As a result, we are left with the OECD panels. The baseline specification estimated by means of fixed effect OLS for small open OECD economies[26] appears to be best suited, as this is the only equation whereall

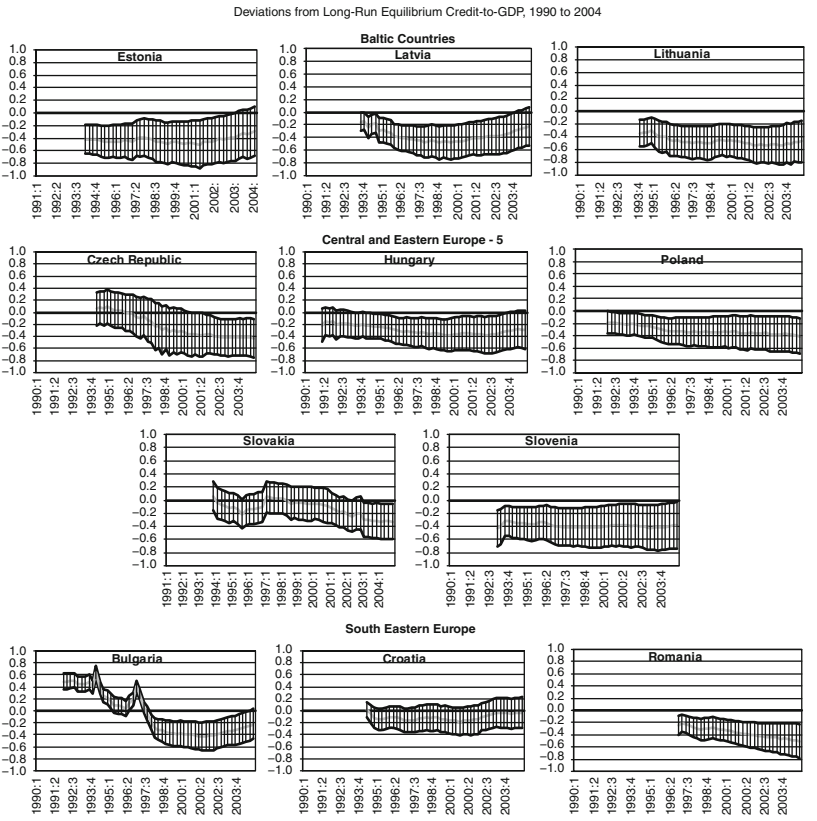

Figure 6.4 Deviations from long-run equilibrium credit-to-GDP, 1990–2004
Note: negative values indicate that the observed private credit to GDP ratio is lower than what a particular country's GDP per capita would predict ('undervaluation'). Conversely, positive figures show an 'overvaluation' of the private credit to GDP ratio.

coefficients bear the right sign and all but one are statistically significant (shaded in Table 6.3).[27,28]

When engaging in an out-of-sample exercise, that is using the coefficient estimates obtained for the small open OECD panel to derive the fitted value for transition economies, the underlying assumption is that in the long run there is parameter homogeneity between the small developed OECD panel and the transition countries. One might reasonably assume that in the long run (after adjustment toward equilibrium is completed) the behaviour of transition economies will be similar to the

present behavior of small OECD countries. Even though this homogeneity is fulfilled between the two samples, the estimated long-run values of the private credit-to-GDP ratio and the underlying deviation from equilibrium should be interpreted from a long-run perspective.

Given that no country-specific constant terms are available for the transition economies, the next intricate issue is how constant terms should be applied to derive the fitted values.[29] Our safest bet is to use the largest and the smallest constant terms (as well as the median constant term) obtained on the basis of the small OECD panel, which gives us the whole spectrum of possible estimated values for private credit.[30]

The derived range of deviation is plotted on Figure 6.4. The error margin is rather large. Consequently, if one considers midpoints, Croatia is now the only country which might have reached equilibrium by 2004. When looking at whole ranges, other countries, namely Bulgaria, Estonia, Hungary, Latvia and Slovenia, might have already reached equilibrium as well, while the mass of the estimated deviation is still located mostly on the undershooting side in 2004. At the same time, the upper edges of the estimated band come close to equilibrium for Hungary, Bulgaria, Poland and Slovenia. Moreover, it turns out that the initial overshooting might not have been that large for the Czech Republic and Slovakia, after all. Finally, it is interesting to see that the initial undershooting remains

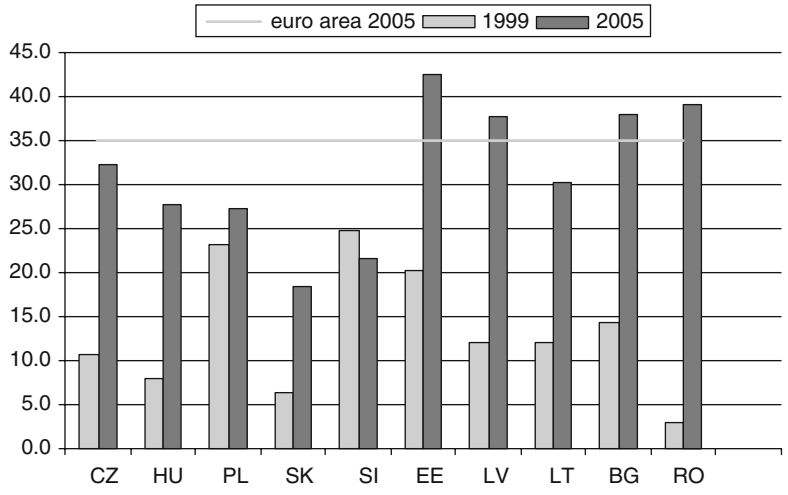

Figure 6.5 Share of credit to households in total domestic credit
Source: National central banks.

relatively stable for Lithuania and Romania, and also perhaps for Poland throughout the period.

One explanation for the initial undershooting observed for the countries under study is the low share of credit to households in total domestic credit. Figure 6.5 hereafter shows the importance of credit to households was substantially lower in transition economies than in the euro area in 1999. Nevertheless, a relative increase in credit to households can be observed over the last 7 years or so, in particular in countries where an adjustment towards equilibrium is shown on Figure 6.4.

Conclusion

In this paper, we have analysed the equilibrium level of private credit to GDP in 11 transition economies from CEE on the basis of a number of dynamic panels containing quarterly data for transition economies, developed OECD economies and emerging markets, and relying on a framework including both factors that capture the demand for and the supply of private credit.

Credit to the public sector (crowding out/crowding in), nominal interest rates, the inflation rate and the spread between lending and deposit rates aimed at capturing financial liberalization and competition in the banking sector turn out to be the major determinants of credit growth in the CEE-5, while GDP per capita is the only variable that enters the estimated equations in a robust manner for the Baltic and Southeastern European countries. Furthermore, we find the estimated coefficients for transition economies are much higher than those obtained for OECD and emerging market economies, which testifies to the bias caused by the initial undershooting of private credit to GDP in most countries. Another interesting result is that house prices are found to lead to an increase in private credit only in countries with high house price inflation. This finding disqualifies the house price variable from being included in the long-run equation to be used for the derivation of the equilibrium level of private credit.

We have emphasized that relying on in-sample panel estimates of the equilibrium level of private credit for transition economies is problematic not only because of the possible bias which shows up in the estimated coefficients due to the initial undershooting, but also because the equations estimated for transition economies are not sufficiently stable. To overcome these problems, we used small open OECD countries as a benchmark to derive the equilibrium level of private credit for transition economies as our intention to use the emerging markets

panel as the benchmark was thwarted by the lack of robustness of the empirical results. Another reason for using the small OECD panel as a benchmark is the following. Transition economies are expected to converge in behaviour to this panel in the longer run. Hence, such a panel provides us with coefficient estimates that can be used to infer equilibrium credit-to-GDP ratios, which apply in the long run for transition economies.

We can draw some general conclusions with regard to undershooting and overshooting for transition economies, even though the application of the out-of-sample small open OECD panel to transition economies yields a wide corridor of deviations from the equilibrium. Considering the midpoint of the estimated interval, Croatia is the only country which might have reached the equilibrium by 2004. When looking at whole ranges, the upper edges of the estimated band reached equilibrium in Bulgaria, Estonia, Hungary, Latvia and Slovenia, although the mass of the estimated deviation was still located mostly on the undershooting side in 2004. Moreover, it turns out that the initial overshooting might not have been that large for the Czech Republic and Slovakia, after all. Finally, it is interesting to see that the initial undershooting remains relatively stable for Lithuania, Poland and Romania throughout the period. Overall, our results suggest that the CEE countries cannot be generally regarded as (over)shooting stars in terms of their credit-to-GDP ratios despite robust credit growth observed in most of the countries. However, Croatia seems to outcompete the other countries in the pursuit of the title of an (over)shooting star, albeit Bulgaria, Estonia, Hungary, Latvia and Slovenia are still trying hard to fight back.

The prospects for the future are that credit growth will very likely remain rapid in CEE or to accelerate further in those countries where it is still comparatively moderate, given that the underlying factors that support private sector credit dynamics will remain at work for some time to come. As experience shows, the rapid pace of credit expansion and its persistence in a number of countries does by itself pose the risk of a deterioration of asset quality. Moreover, it exposes lenders and borrowers to risks because of an increase in unhedged foreign currency lending. Furthermore, the rapid adjustment process toward equilibrium levels may trigger demand booms, causing current account deficits to move above levels that can be sustained over a longer period of time. However, we leave it to future research to determine empirically the optimal speed of adjustment toward equilibrium that does not jeopardize macroeconomic and financial stability.

Appendix

Data appendix

Data sources and definitions

Quarterly data for bank credit to the private sector, credit to the government sector, short-term and long-term interest rate series, the consumer and producer price indices (CPI and PPI), real and nominal GDP, and industrial production are obtained from the International Financial Statistics of the IMF accessed via the database of the Austrian Institute for Economic Research (WIFO).[31] For some emerging markets, industrial production data is not available from this source, and hence are obtained from national data sources. Inflation is computed as a year-on-year rate (p_t / p_{t-4}). Lending rates are based on bank lending rates, and wherever not available, long-term government bond yields are used instead. Three-month treasury bill rates, and wherever not available, money market rates, are employed for short-term interest rates. The spread is calculated using lending (or, wherever not available, long-term government bond yields) and deposit rates.

GDP per capita expressed in PPS against the euro and the U.S. dollar is drawn from the AMECO database of the European Commission and the World Economic Indicators of the World Bank, respectively. The data start in 1975 for OECD countries and the emerging markets and in the 1990s for transition economies. The data are linearly interpolated from annual to quarterly frequencies.

The financial liberalization index (from 0 to 20) reported in Abiad and Mody (2005) and used in Cottarelli *et al.* (2005) is used for OECD and emerging market economies. This financial liberalization index is obtained from the aggregation of six subindices covering: (1) credit controls, (2) interest rate controls, (3) entry barriers to the banking sector, (4) banking sector regulations, (5) banking sector privatization, and (6) capital account transactions. The data cover the period from 1975 to 1996 and are available for all emerging countries and for nine OECD economies, namely the large OECD countries plus Canada, Australia and New Zealand. For the transition economies, the average of the liberalization index of the banking sector and that of the financial sector provided by the EBRD from 1990 to 2004 are used (rescaled from the range 1 to 4 + to the range 0 to 20, which corresponds to the scaling used in Abiad and Mody, 2005). The data are linearly interpolated from annual to quarterly frequencies. Data for the existence of public and private credit registries are taken from Djankov *et al.* (2005), who provide data for 1999 and 2003. The series we use can take three values: 0 in the absence of both public and private registries; 1 if either public or private credit registries are in operation and 2 if both exist. This variable basically captures whether a change between 1999 and 2003 alters the supply of credit during this period. GDP per capita, the financial liberalization index and the registry variable are transformed to a quarterly frequency by means of linear interpolation.

Housing prices are not available for emerging countries and for Italy. For transition economies, data could be obtained only for the Czech Republic, Estonia, Hungary and Lithuania. Quarterly data for the OECD economies are obtained from the Macroeconomic Database of the Bank for International Settlements (BIS) and Datastream. The source of the data is the respective central banks for the Czech Republic, France, Hungary (Kiss and Vadas, 2005) and Lithuania and the national statistical office for Estonia.

The span of the data

Starting dates (the series end in 2004:Q4 unless indicated otherwise)

Private credit (the same applies to public credit unless indicated otherwise in parentheses):
OECD: 1975:Q1 to 2004:Q4.
Emerging markets: 1975:Q1 to 2004:Q4 except for AR: 1982:Q3 (1983:Q3); BR: 1988:Q3 (1989:Q3); ID: 1980:Q3; PE: 1984:Q1 (1985:Q1).
Transition economies: HU, PL: 1990:Q4; BG, EE, SI: 1991:Q4; LT: 1993:Q1; LV: 1993:Q3; CZ, SK: 1993:Q4; HR: 1993:Q4 (1994:Q2); EE: 1991; RO: 1996:Q4.

Spread:
OECD: 1975:Q1 except for DE: 1977:Q3; NO: 1979:Q1; IE: 1979:Q3; FI, NL: 1981:Q1; NZ: 1981:Q4; ES: 1982:Q1; IT: 1982:Q3.
Emerging markets: ID, KR, PH: 1975:Q1; CL, TH: 1977:Q1; ZA: 1977:Q4; IN, MX: 1978:Q1; IL: 1983:Q1; PE: 1988:Q1; AR: 1993:Q2; BR: 1997:Q1.
Transition economies: HU, PL: 1990:Q1; BG: 1991:Q1; SI: 1991:Q4; HR: 1992:Q1; CZ, LT, SK: 1993:Q1; EE: 1993:Q2; LV: 1993:Q3; RO: 1995:Q4.

PPI (in parentheses CPI and industrial production (IP) if time span different):
OECD: 1975:Q1 except for PPI in NO, NZ: 1977:Q1; BE: 1980:Q1; IT: 1981:Q1.
Emerging markets: 1975:Q1 except for AR: 1987:Q1 (1994:Q1; not available); BR: 1992:Q1 (1992:Q1, 1991:Q1); CL: 1976:Q1 (1976:Q1, 1975:Q1); ID: IP:1976:Q1; IL: IP not available; KR IP: 1980:Q1; PE: 1980:Q1 (1980:Q1, 1979:Q1); PH: 1993:Q1 (1975:Q1, 1981:Q1).
Transition economies: BG: 1991:Q1; CZ: 1993:Q1; HR: 1993:Q1; EE: 1993:Q1 (1992:Q1, 1993:Q1); HU: 1990:Q1; LV: 1994: Q1 (1992:Q1, 1993:Q1); LT: 1993:Q1; PL: 1991:Q1; RO: 1992:Q1; SK: 1991:Q1 (1993:Q1, 1990:Q1); SI: 1992:Q1.

Real GDP:
OECD: 1975:Q1 except for BE: 1980:Q1; DK, PT: 1977:Q1; NZ: 1982: Q2.
Emerging markets: IN, IL, KR: 1975:Q1; CL, MX: 1980:Q1; PE: 1979:Q1; PH: 1981:Q1; BR: 1990:Q1; AR, ID, TH: 1993:Q1.
Transition economies: SI: 1992:Q1; HR, EE, LV, LT, RO, SK: 1993:Q1; CZ: 1994:Q1, HU, PL: 1995:Q1; data for IN and RO are linearly interpolated from annual to quarterly frequency.
All series stop in 2004:Q4.
GDP per capita in PPS:
Data based on the euro for *transition economies:* CZ, PL, RO: 1990; BG, HU, SI: 1991; LV, LT: 1992; EE, SK: 1993; HR: 1995.
Data based on the U.S. dollar for *transition economies:* HR, HU, PL, RO: 1990; BG, EE, LV, LT, SK, SI: 1991; CZ: 1992.

Housing prices:
OECD: The starting date of the series is as follows: DK, DE, NL, UK, US: 1975:Q1; JP: 1977:Q1; ZA: 1980:Q1; FR: 1980:Q4; CA: 1981:Q1; FI: 1983:Q1; SE: 1986:Q1; AU: 1986:Q2; ES: 1987:Q1, AT: 1987:Q2; PT: 1988:Q1; NZ: 1989:Q4; IE: 1990:Q1; BE, NO: 1991:Q4; GR: 1994:Q1. The series stop in 2004:Q4.
Transition economies: CZ: 1999:Q1 to 2004:Q4; EE: 1994:Q2 to 2004:Q4; HU: 1991:Q1 to 2004:Q4; LT: 2000:Q1 to 2004:Q4.

Notes

1. The paper benefited from discussion at seminars held at the Oesterreichische Nationalbank, the Banco de Espana and at DG ECFIN (European Commission). We are especially indebted to Ronald Albers, Kalin Hristov, Dubravko Mihaljek, Max Watson and four anonymous referees for stimulating and useful comments. We are also indebted to Caralee McLiesh for sharing with us the dataset used in the paper 'Private credit in 129 countries' (NBER Working Paper No. 11078), to Ivanna Vladkova-Hollar for providing us with the financial liberalization indicator, to Gergő Kiss for sharing data on housing prices in Hungary, and to Rafal Kierzenkowski, Luboš Komárek, Mindaugas Leika and Peeter Luikmel for help in obtaining housing prices for France, the Czech Republic, Lithuania and Estonia, respectively. We also thank Steven Fries and Tatiana Lysenko for the EBRD transition indicators going back to the early 1990s and Rena Mühldorf for language advice. The opinions expressed in this paper do not necessarily represent the views of the European Central Bank, the Oesterreichische Nationalbank or the European System of Central Banks (ESCB).
2. See for example Cottarelli *et al.* (2005), Schadler (2005), Backé and Zumer (2005), Duenwald *et al.* (2005), Pazarbaşyoğlu *et al.* (2005), Coricelli *et al.* (2006) and Hilbers *et al.* (2006).
3. Countries included are Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.
4. An analogous line of reasoning is applied in the literature on equilibrium exchange rates of CEE countries (Maeso-Fernandez *et al.,* 2005).
5. On recent assessments of banking sector performance and strength in CEE countries see for exmple ECB (2005a, b, 2006), EBRD (2005), IMF (2005a, b, 2006), IMF Financial System Stability Assessments (http://www.imf.org/external/NP/fsap/fsap.asp).
6. Romania (15%) and Hungary (44%) are outliers in this respect. It should be noted, however, that a low coverage ratio is not necessarily problematic, as it can be to some extent a reflection of the classification and the composition of non-performing assets. Moreover, a high capitalization may provide alternative cushion, if the coverage ratio of reserves and provisions is low.
7. The private sector is defined here as the non-government non-bank sector, that is households, non-financial corporations and non-bank financial institutions. Wherever disaggregated data are available, public non-financial corporations are separated from private non-financial corporations and are added to the public sector.
8. Note that the peculiar and rather fuzzy pattern of the credit-to-GDP ratio in Bulgaria shown in Figure 4 is not due to data problems but, to a considerable extent, driven by exchange rate movements. The ratio rose sharply in 1994, 1996 and 1997 because of the depreciation of the domestic currency vis-à-vis the US dollar, considering that a significant share of credit was denominated in foreign currency (mainly US dollars). Correction of the credit ratio occurred in the post-crisis period because of the appreciation of the domestic currency and because of the write-off of non-performing loans.
9. Note that the displayed series include credit to private non-financial corporations in Croatia and Romania and in the three Baltic states, while they

include credit both to private and public non-financial enterprises in the other countries (see data appendix on this issue). Hence, the high initial values observed for Bulgaria, the Czech Republic and to a lesser extent for Hungary and Slovakia might be also due to a large initial credit stock to state-owned firms. However, credit to public firms declined and reached low levels, as privatization and bank rehabilitation proceeded.

10. The financial accelerator literature, including the more recent literature on credit cycles, gives some theoretical insights in the mechanisms that drive or amplify credit expansions, which later on turn out to be non-sustainable and thus ultimately require a correction. Overshooting, to give just one example, may occur if bank managers follow overly loose credit policies in order to boost current bank earnings at the expense of future earnings to enhance their own reputation in the market. Moreover, as information externalities make banks' credit policies interdependent, banks coordinate to tighten credit policy in the event of an adverse shock to borrowers (Rajan, 1994).
11. Note that our definition of equilibrium is not suitable for analysing the connection between credit growth and external sustainability, financial stability aspects of credit growth or the optimal currency (foreign currency *versus* domestic currency) or sectoral (households *versus* corporate sector) composition of the credit-to-GDP ratio.
12. In both cases, credit growth is expressed in terms of GDP. For example, credit growth ($[C(t)–C(t–1)]/C(t–1)$ is higher for countries with lower credit-to-GDP levels than for countries with higher credit-to-GDP levels if both countries have similar credit-to-GDP flows. Hence, it is more appropriate to relate changes in credit to the GDP to avoid this distortion (Arpa *et al.,* 2005), like we do in this study.
13. Two observations come to mind with regard to this paper. First, the quadratic trend may capture missing variables from their model (which indeed only contains real interest rates) and explosive trends due to credit boom or to adjustment from initial undershooting of credit levels. It is in fact surprising to see that a sizeable number of countries have excessive credit growth given that the quadratic trend has a very good fit thus leaving very little unexplained variation in the credit series. Second, the authors use Euribor for their only macroeconomic variable, the real interest rate. This may be problematic because some foreign currency denominated loans are linked to other currencies than the euro for instance in Hungary but also because Euribor neglects the country risk and default risk at the micro level.
14. It may be noted that the two additional criteria used by the authors have some drawbacks. First, the observed growth rates may be in excess of the one derived from the long-run equilibrium relationship because of the adjustment from initial undershooting. Second, the speed of adjustment to equilibrium differs if the actual observations are below or above the estimated equilibrium.
15. Note for example that the recent decline in the absolute level of spreads may be partly due to record low global interest rates.
16. In contrast to Cottarelli *et al.* (2005), for econometric reasons, we do not include a variable that captures the tradition of legal systems of countries, which can affect financial development. The mean group estimator (MGE) estimation methods in the result section do not allow the use of dummy variables that take a value of zero throughout the entire period.

17. We are aware of the fact that the registry variable may not capture how credit contracts are enforced in courts. However, even though an easier seizure of collateral by banks may spark credit to households and small firms, such growth will probably be reflected in a one-off spike in growth rates.
18. For some of the variables, it is notoriously difficult to separate whether they influence the demand for or the supply of credit. For instance, GDP per capita and the interest rate variables could affect both credit demand and supply. These problems were tackled in the literature on the credit channel by the use of bank- and firm-level data (for an overview, see eg Kierzenkowski, 2004). However, given that we are interested in aggregated macroeconomic variables, these identification issues are beyond the scope of this paper. Another important issue is that our approach is based on the assumption that credit markets are in continuous equilibrium. However, this is not necessarily the case as shown for instance in Hurlin and Kierzenkowski (2003) and Kierzenkowski (2005) for the case of Poland. Nevertheless, we leave this unexplored avenue for future research because of the complexity of the issue.
19. Argentina (AR), Brazil (BR), Chile (CL), India (IN), Indonesia (ID), Israel (IL), Mexico (MX), Peru (PE), Philippines (PH), South Africa (ZA), South Korea (KR), Thailand (TH). Although South Korea and Mexico are OECD countries, they can be viewed as catching-up emerging market economies for most of the period investigated in this paper.
20. Austria (AT), Australia (AU), Belgium (BE), Canada (CA), Denmark (DK), Finland (FI), Greece (GR), Ireland (IE), the Netherlands (NL), New Zealand (NZ), Norway (NO), Portugal (PT), Spain (ES) and Sweden (SE).
21. Germany (DE), France (FR), Italy (IT), Japan (JP), United Kingdom (UK) and the United States (US).
22. The data set is unbalanced, as the length of the individual data series depends largely on data availability. All data are transformed into logs. See Appendix A for a detailed description of the source and the time span for variables.
23. These results are not reported here but are available from the authors upon request.
24. The estimations carried out for equations (1)–(7) are not reported here because they do not differ quantitatively from the results of the baseline equations. Nevertheless, they are available from the authors upon request.
25. Note that the analogy with the literature on equilibrium exchange rates in transition economies ends here, given that it is possible to establish robust relationships between the real exchange rate and its most important fundamentals, such as for instance productivity (see eg Egert *et al.,* 2006).
26. Small OECD countries appear to be a reasonably useful benchmark, at least with respect to longer-term equilibrium levels. It should be noted that CEE countries have undergone a substantial convergence to small OECD countries in structural and institutional terms. As a consequence, four of these countries – the Czech Republic, Hungary, Poland and Slovakia – joined the OECD in the second half of the 1990s. Likewise, the EBRD transition indicators (see EBRD 2005), the standard reference point for gauging progress structural and institutional change in CEE countries, show that the countries under review in this study, in particular, the Central European and Baltic countries but also Croatia had made substantial progress towards fully

fledged market economies already in the second half of the 1990s, while gradually advancing further in more recent years.

27. Note that we also carried out estimations for a panel composed of catching-up EU countries (Greece, Portugal and Spain). However, the results (not reported here) appear to be not very robust.
28. Given that this relationship may have undergone some changes over time, we carried out estimations for the following subperiods: 1980–2004, 1985–2004 and 1990–2004. The coefficients do not change much both in terms of size and significance with the exception of the spread variable that becomes insignificant for 1985–2004 and for 1990–2004. Therefore, the estimation obtained for the whole period seems reasonably stable and thus suitable for proceeding further with it in the analysis.
29. Note that Cottarelli *et al.* (2005), the only paper that derives the equilibrium level of private credit for transition economies, does not address the issue of the constant terms.
30. Another reason for selecting the baseline specification is that the variables included are all expressed in levels, which ensures that the constant terms derived on this basis have a cross-sectional meaning. For instance, the constants would not have any cross-sectional meaning if indices with a base year were used (such as for industrial production or housing prices).
31. IFS codes: Bank credit to the private sector: lines 22d (claims on private sector) and 22g (claims on non-bank financial institutions); credit to the public sector: lines 22a (claims on central government), 22b (claims on local government) and 22c (public non-financial enterprises). Note that data disaggregation for 22c (public non-financial enterprises) and 22d (claims on private sector) is available for Estonia, Latvia, Lithuania, Croatia and Romania, furthermore for Australia, Japan, Norway, Brazil, Chile, Indonesia, Mexico, Philippines and Thailand. For the remaining countries, the IFS database provides only series combining claims on private sector, public non-financial enterprises and non-bank financial institutions (claims on other resident sectors (22d),). Interest rates: lines 60b, 60c, 60l, 60p and 61; CPI and PPI: lines 64 and 63; nominal GDP: lines 99b and 99b.c; real GDP: lines 99bvp and 99bvr; industrial production in industry: lines 66, 66.c and 66ey (in manufacturing).

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7

The Boom in Household Lending in Transition Countries: A Croatian Case Study and a Cross-Country Analysis of Determinants

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Bank lending, and particularly lending to households, grew rapidly after the restructuring of transition countries' banking systems. While lending booms raise concerns about credit quality and the current account, a Croatian case study suggests that the credit quality issue may not be so severe in transition countries. Cross-country regressions show that transition countries displayed lower levels of household lending than non-transition countries with similar characteristics before 2005. Indicators of good policies, including recent low inflation and successful banking reform, are significant in explaining the ratio of household lending to GDP in transition countries. However, weak enterprise reform also leads to higher levels of household lending, pointing to a danger of unbalanced reforms resulting in unsustainable consumption and problems with external balances.

Introduction

Since the mid-1990s, the transition countries of Central and South East Europe have made major strides in restructuring their banking systems.[1] A wave of foreign investment in banking has occurred, resulting in foreign bank ownership of a majority of bank assets in almost all of the countries. This has also been accompanied by strengthening of

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banking supervision, and improvements in the legal environment. A much more competitive environment has resulted, and the quality of the banking system seems vastly improved.[2]

Many of the countries have subsequently seen a sharp acceleration of bank lending. This has been associated with high levels of capital inflows in general, and, in many cases, with substantial current account deficits. (For an overview of the lending situation, see Backé and Zumer, 2005.) A striking feature of the acceleration in bank lending has been very rapid growth in lending to households, albeit from a low base.

In this paper, I will examine the determinants of this strong increase in household credit in the transition countries. Supply-side effects are clearly a major cause of the growth in household lending, as banking reform and privatisation have produced well-capitalised banking systems that are ready and able to provide a growing range of banking products. Additionally, interest-rate differentials have been large enough to allow for profit margins that are more than sufficient to compensate for any additional risk.

At the same time, demand-side conditions have also stimulated household lending. Pent-up demand for consumer durables and especially for housing has been a major factor. Robust economic growth has certainly played a role, and the expectation of higher future income, in part aided by the prospect of EU membership, has also boosted loan demand.

The macroeconomic implications of increased household lending have been readily visible. Theory tells us that household lending affects consumption if households are liquidity constrained. Cross-country research by Baccheta and Gerlach (1997) shows that liquidity constraints are common, and that credit aggregates have substantial impacts on aggregate consumption in advanced countries. Estimates by Corricelli *et al.* (2006) suggest that substantial numbers of transition country borrowers are also liquidity constrained, so that the provision of credit to households has significant effects on aggregate consumption and also on imports in transition countries as well.

Additionally, Herrmann and Jochem (2005) find that part of the current account deficit of Central and Eastern (CEE) and Southeastern (SEE) European countries can be accounted for by the level of GDP per capita. That is, when income grows, the estimated 'normal' current account deficit falls. Although the cross-country regressions cannot directly explain this, it would seem that demand for capital inflows fall as income increases, while previous investment raises productivity and exports, decreasing the merchandise trade deficit.

This suggests that to some extent, the current account deficits and also the rapid growth of credit seen in CEE and SEE countries can be attributed to a normal catching-up process. However, even if such a conclusion is correct in general, it does not imply that catching-up is without its dangers and pitfalls, nor that catching-up countries cannot experience harmful lending booms and subsequent crisis. And, of course, very rapid household credit growth may be problematic in this context.

At the same time, rapid credit growth has been identified as a key factor in banking and currency crises around the world. This raises the question of whether transition countries can have 'too much of a good thing' (Duenwald *et al.* (2005); see also Caprio and Klingebiel, 1996; Eichengreen and Rose, 1998; Eichengreen and Arteta, 2000; Borio and Lowe, 2002; Cottarelli *et al.*, 2003). Much dispute rages about whether credit growth thresholds really exist, and whether they are relevant everywhere. For example, Gourinchas *et al.* (2001) suggest that problematic lending booms are mainly a Latin American phenomenon.

Using a case study of Croatia, I find that the expected negative effects of rapid lending growth on loan quality have not (yet?) materialised in the household sector. Furthermore, the rapid growth of housing credit, probably the best-collateralised and least default-prone subcategory of household loans, suggests that the relatively benign prudential status of household lending may continue in the future.

After the Croatian case study, I turn to a cross-country analysis. Using a sample of 90 countries, I study the main determinants of the ratio of household lending to GDP. I include a 'transition effect', which encapsulates the legacy of non-market banking systems offering little household credit. The transition effect, however, seems to be fading away over time as CEE and SEE banking systems converge towards EU standards.

Importantly, the rate and level of convergence varies from country to country. To analyse the diverse experiences of transition countries, I use the European Bank for Reconstruction and Development (EBRD) transition indicators, which provide quantitative indicators of reform progress in several particular areas of transition. The results of a second-step regression analysis of the residuals from the cross-country growth equations for transition countries suggest that stronger banking sector reform increases the level of household credit to GDP, evidently by increasing the supply of credit and in particular household credit. At the same time, stronger real sector reform decreases the supply of household credit by increasing enterprise sector credit demand and creditworthiness. This suggests that there may be a danger of unbalanced reforms, in which banking sector reform proceeds more rapidly than real sector reform, leading to strong household lending growth and weak enterprise

sector lending growth, contributing to rapid consumption growth, high current account deficits and foreign debt problems.

The paper is structured as follows: the next section is a case study of Croatia, discussing the evolution of credit quality, and examining possible explanations for continued high repayment rates. It is followed by a brief overview of the household lending phenomenon in the transition countries as a group. The next part of the paper provides a cross-country regression analysis of lending to households, which is followed by an analysis of residuals for transition countries aimed at identifying the specific determinants of household lending in transition countries, and a concluding section.

Motivating the cross-country analysis: the case of Croatia

Like most of the transition countries, Croatia emerged from early transition with a minimal stock of household loans, roughly 5% of GDP in 1995. Since then, household lending has grown rapidly, rather faster than lending to enterprises. Household lending was a bit more than 34% of GDP at the end of 2005 (Figure 7.1).

The restructuring of Croatia's banking system was accelerated by a wave of bank failures starting in 1998–1999. The failures were also one of the triggers of a recession that lasted from the fourth-quarter of 1998 through the third-quarter of 1999. During the recovery, the government

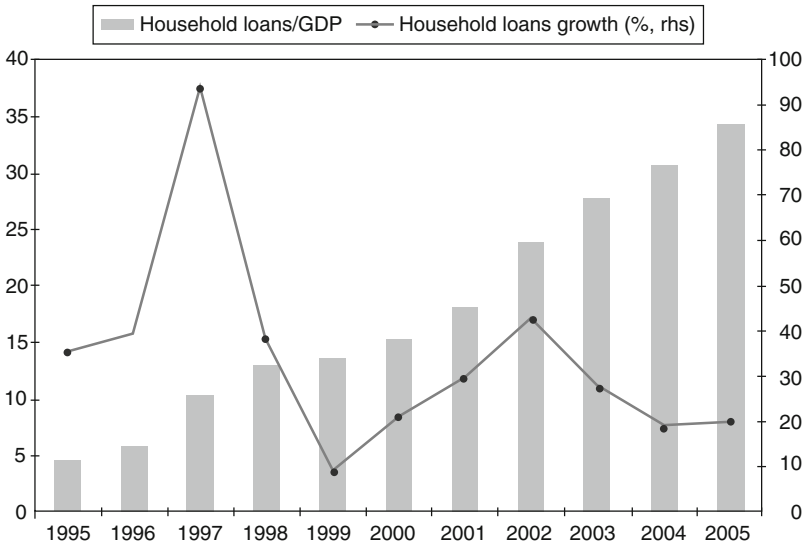

Figure 7.1 Croatia – Household loans to GDP and household loan growth

privatised three of the four largest banks. By the end of 2000, banks with majority foreign owners controlled 84.3 % of total assets in the Croatian banking system. This combination of economic recovery and ownership transformation resulted in sharp improvements in bank performance, leading to substantial increases in credit availability.

On the funding side, the euro conversion process in the late 2001 brought a substantial inflow of deposits, as euro-legacy currency held 'in mattresses' flowed into bank deposits. Foreign exchange deposits grew by 2.8 billion euros (ECB, 2002). But after this extraordinary inflow, deposit growth simply was not adequate to fund banks' credit expansion plans. Banks closed the gap with extensive foreign borrowing.

The persistent interest-rate gap between Croatia and the Eurozone is a key explanatory factor in the persistent growth in lending in general, and in household lending in particular. Since 2000, interest earned on lending in Croatia has been far higher than on lending in the Eurozone (6%–10% *versus* 3%–5%), so that earnings (unadjusted for risk) are higher.

At the same time, with the ECB main reverse repo rate at 2% after June 2003, and exchange-rate pressures on the kuna more often on the appreciation side, borrowing on the European market at less than 4% was a useful complement to deposit funding. However, it must be kept in mind that one of the key developments in this period has been the increasing importance of long-term lending, most notably mortgage (housing) lending. This type of lending creates funding issues, since long-term sources of Croatian kuna are difficult to come by. Thus maturity, and not only price, is one of the important drivers of bank foreign borrowing.

In the light of the rapid growth of household lending, it is important to look at how the quality of household loans has held up. Somewhat surprisingly, it seems that quality has actually improved over time (see Figure 7.2). The usual 'seasoning effect' has not kicked in, at least yet.

A more detailed breakdown is available starting in the early 2004. The most rapidly growing subgroup is housing loans (37.4% of total loans as of end of 2005), which also has the lowest past-due rate (under 0.5%). The increasing share of housing loans provides further reason to suspect that loan quality will hold up in the future, since such loans are the last ones that households will fail to repay. By contrast, the category with the highest default rate is 'other', which includes loans for white goods as well as overdrafts on current accounts. The consequences of default on such loans are far less cataclysmic than those of default on loans for one's house or car, and a high and growing share of this kind of loans would be more of a cause for concern.

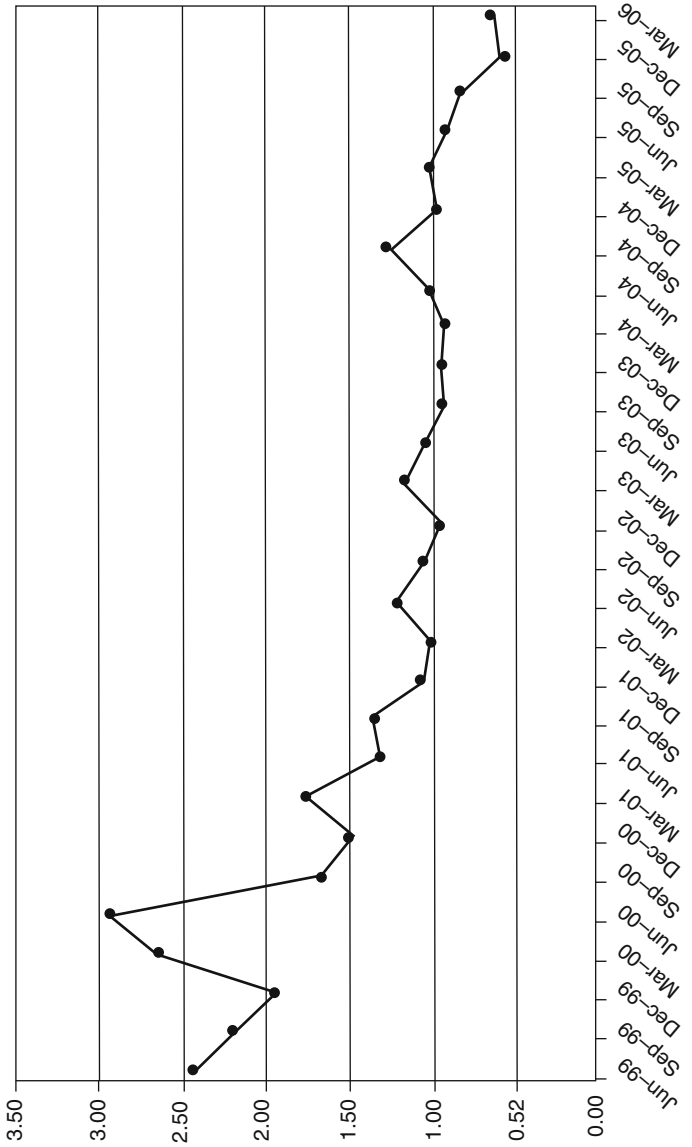

Figure 7.2 Croatia – Past due loans to households, %

What can account for the improved quality of household loans in Croatia? Obviously, cyclical factors (sustained growth since 2000) should come first. In addition, it is important to know that loans to households in Croatia have traditionally come with very stringent conditions. Either a co-debtor or two guarantors (or both) were often required on many loans. In addition, collateral levels have been very high, with banks sometimes taking real estate worth substantially more than the loan amount, or requiring the holding of compensating balances deposits at the bank.[3] Although these requirements are now being eroded by an ever-growing competition, they remain common.

Two other considerations deserve mention here. First, due to the large unofficial economy, and strong family ties that bind Croatians in Croatia with relatives in more prosperous countries such as Germany, Switzerland and Australia, both the income and wealth of Croatian borrowers is probably underestimated by official statistics.

Second, the distribution of credit is biased towards wealthier households. Using data from the Household Budget Survey of the Central Statistical Office, Croatian National Bank (2006) shows that the debt burden is highest in the seventh to tenth (ie highest) income deciles (see Figure 7.3). These deciles account for some 65% of total disposable income, so it is clear that they are the ones who also have received the lion's share of household credit. Furthermore, the absolute amount of lending to the first decile is lower than lending to the seventh decile by

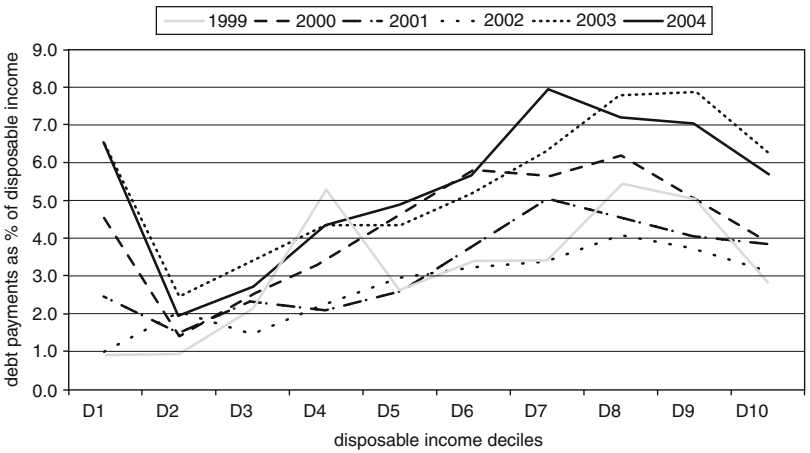

Figure 7.3 Croatia – Distribution of household debt burden by income deciles, 1999–2004

a factor of about 7, so that the high indebtedness of the lowest decile need not present a problem for the banking system as a whole.

The Croatian National Bank became seriously concerned about rapid lending growth in the late 2002. It imposed a 'tax' on lending growth above a 4% quarterly growth rate in 2003. This measure did slow lending growth, but was accompanied by a surge in foreign borrowing by banks and enterprises. In the mid-2004, the central bank responded with a marginal reserve requirement on increments in banks' foreign liabilities. This marginal reserve requirement was raised in several steps, reaching some 55% in early 2006. While the rate of growth of foreign borrowing did slow, the country's foreign debt-to-GDP ratio remained above 80%, and the current account deficits in 2005 and 2006 were uncomfortably high.[4]

To summarise, in the Croatian experience, predictions of prudential problems resulting from the household lending boom have not materialised, but macroeconomic problems have.

Household lending in transition countries

While cross-country data on loan quality are difficult to obtain and generally too methodologically heterogeneous to compare rigorously, it does seem that other countries seem to be sharing Croatia's experience of rapid household lending growth without significant worsening of aggregate loan quality. For example, Duenwald *et al*. (2005) do not see significant prudential effects of rapid loan growth in Bulgaria and Romania. Although they do express concern about financial stability in Ukraine, it is not clear how large the role of household lending is in this respect. In any case, Duenwald *et al*. spend much more time worrying about macroeconomic effects.

Of course, the situation in the transition countries is quite heterogeneous. Figure 7.4 shows the household credit to GDP ratio for the transition countries as of 2005. It is immediately apparent that quite a few transition countries still have extremely low stocks of household credit. In particular, Albania, Armenia, Azerbaijan, Georgia, the Kyrgyz Republic and Romania have levels below 5% of GDP, and Belarus is just above. These are all countries whose transitions have been slow and, in some cases, fraught with setbacks (eg the Albanian pyramid schemes, and armed conflict in Armenia, Azerbaijan, and Georgia, among others).

At the other extreme, Croatia and Estonia have ratios above 30%. This is above Italy's 28%, and not so far away from such EU-15 members as Greece (36%), Belgium (41%) and Austria (44%).

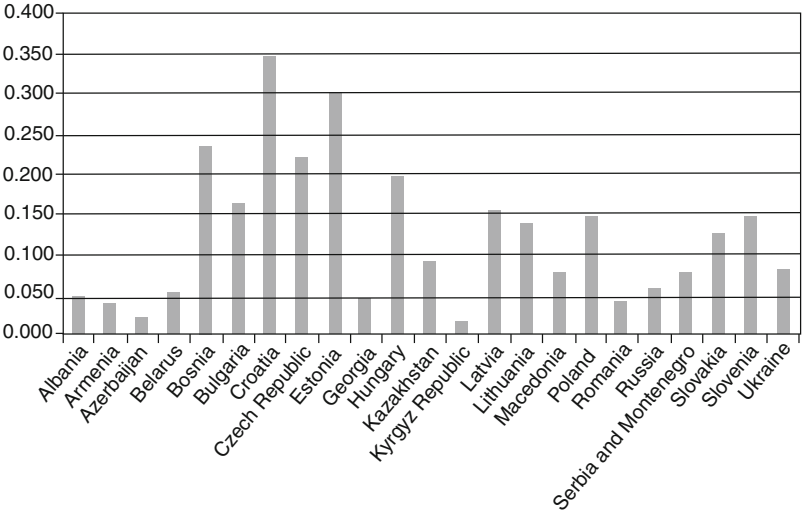

Figure 7.4 Household credit to GDP in transition countries, 2005

However, household credit in transition countries has grown extremely rapidly. This can be seen by plotting the size of household loan growth relative to GDP (Figure 5). Here, several of the countries with larger stocks stand out: Estonia, with growth of over 7 percentage points of GDP per year in 2004–2005, and Bulgaria and Lithuania, with growth of more than 4 percentage points of GDP per years in 2004–2005.

Cross-country determinants of household lending

This brief data survey shows clearly that household credit is growing rapidly in most of the transition countries, and that, while some transition countries have very low stocks of household credit, in some other transition countries stocks have caught up to some of the highly developed European economies. These observations lead me to pose two questions:

(1) To what extent are the stocks of household credit in transition countries still below 'normal'?
(2) What policy variables, if any, can explain the extent to which different transition countries stocks vary from the 'normal' level?

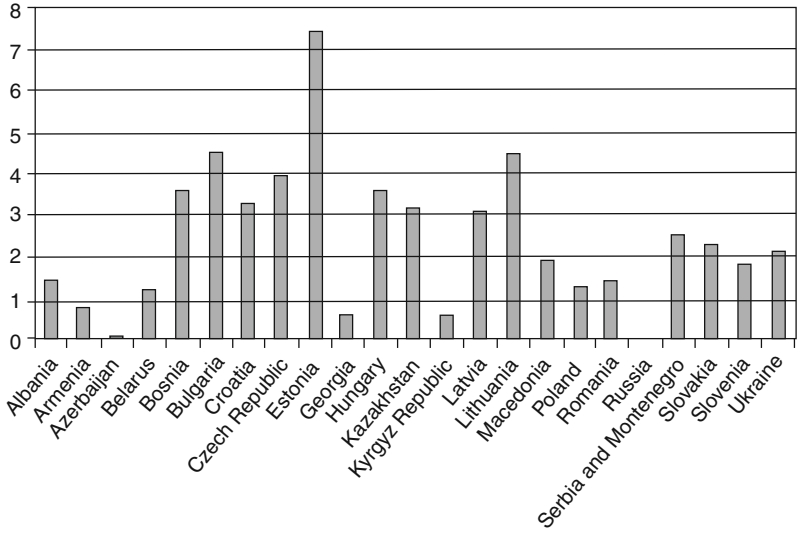

Figure 7.5 Average change in household loans/GDP in percentage points, 2004–2005

To answer the first question, in this section I will use a broad cross-country data to analyse the cross-country determinants of lending to households. This analysis will produce a cross-country curve that can serve as a benchmark against which transition country stocks of lending can be judged.

To answer the second question, in the next section I will analyse the residuals for transition countries from the cross-country regressions.

Turning to the cross-country analysis, I choose to model the stock variable household lending to GDP, as an indicator of the degree of development of this aspect of the financial system. This choice is inspired by the finance-growth literature finding that overall bank credit to GDP is a powerful explanatory variable for long-term growth (King and Levine, 1993; Levine *et al.*, 2000; Wachtel, 2001; Rousseau, 2002). Household credit to GDP is of course a subcategory of the broader credit to GDP ratio.

The econometric strategy followed here is to use a broad sample of countries to study the main determinants of household lending. The use of a broad sample also allows us to pin down the degree to which transition countries lag behind in providing household lending, controlling for the main cross-country determinants of such lending.

Intuitively, it is clear that the provision of household credit should be a function of income, measured as GDP per capita.[5] In countries where

much of the population is close to subsistence, households would have very limited ability to repay credit. Although the microcredit movement has developed a technology for lending to the very poorest, the aggregate amount of such lending remains very small.

While income levels will turn out to be powerful explanatory variables in explaining credit to households, we need to examine factors that can explain the development of the financial system in general. To begin with, macroeconomic stability should be relevant to the level of household credit. High inflation, in particular, often decreases the deposit base, and banks' inclination to lend. To take this into account, I include the cumulative increase in consumer prices over the five prior years. That is, I relate the ratio household credit to GDP in 2003 to the ratio of the price level in 2002 to the price level in 1998. For scaling purposes, I use the logarithm of this variable in the regressions.

Another important factor is that the structure of enterprise lending might affect household lending. In advanced countries, enterprises rely more heavily on direct finance, although of course the degree of reliance on direct finance varies dramatically between the capital markets-based financial systems such as the US and UK and the bank-based systems of Germany and Japan. Still, there might be a positive correlation between stock market development and credit to households if high levels of stock market development are associated with fewer corporate lending opportunities for banks that are then more eager to lend to households. Conversely, heavy corporate demand due to low stock market capitalisation might compete with lending to households.

However, it is reasonable to question the strength of the affect of enterprise credit demand on the supply of loans to households. That is, can we argue that there is a given lump of credit' to allocate in the short-run? I suggest that credit is difficult to expand beyond certain limits in the short-run, whether due to funding constraints, limited bank managerial and loan processing capacity, and costs of opening new branches or distribution outlets.[6]

Much recent research has emphasised the role of strong institutions in fostering development in general, and financial development in particular. For this reason, I use the Transparency International Corruption Perceptions Index, which is available for a very broad sample of countries, as an indicator of institutional quality. In addition, I use the World Bank's estimate of the number of days required to start a business as an alternative index of business climate and institutional quality. A highly bureaucratised system, with many legal barriers to entry and therefore

a long start-up time, would presumably be a harder system for banks to operate in, and have lower levels of household credit to GDP.

Additionally, I draw on the law and finance literature pioneered by La Porta *et al.* (1997, 1998). They suggest a strong role for legal factors in explaining the degree to which creditor rights are protected, which in turn helps explain financial development. La Porta *et al* study in detail creditor protection provisions in legislation, and suggest that broad differences in the degree of creditor protection can be explained by the origin of countries' legal systems. Countries modelled on English common law generally provide relatively strong protection, while countries modelled on French civil law provide rather weak protection. The German and Scandinavian legal families fall somewhere in between.

While the classification used by La Porta *et al.* has been criticised by Berkowitz *et al.* (2003), who emphasise the difference between 'receptive' and 'unreceptive' legal transplants, their classification is useful here because of its simplicity. I therefore include legal origin variables, but only for non-transition countries. Transition countries have drastically rewritten their legal codes since 1990, so that the question of legal origin seems less relevant for them. Also, as Pistor *et al.* (2000) show, enforcement is a key issue in transition countries, with the degree of enforcement perhaps being a more important indicator of legal system quality than laws on the books.

What about the overall level of household lending in transition countries? Large portions of the pre-existing stock of bank assets in transition countries, mainly claims on large socialist enterprises, were written off during transition. This, as well as high inflation in many of the transition countries, led to very low levels of credit to GDP in transition countries. Furthermore, transition countries faced the challenges of banking sector reforms, which required time to put in place.

Thus, the transition countries may not fit the cross-country pattern for the rest of the world. For this reason, I include a 0–1 transition dummy in the cross-country regression. In the next section, I examine the transition country residuals more closely.

The data comprise observations on 90 countries in the years 2003–2005. The time series is limited because relatively few countries provide longer time series for this category of lending. The major international source for financial data, the IMF's *International Financial Statistics,* does not break lending down by sector, so there is no single source for the main time series required for this analysis. The ECB began to publish data on consumption lending in 2003, and this seemed to be a convenient starting point.[7] Furthermore, some 23 transition countries have

provided series on household lending in their publications for the years 2003–2005, allowing a relatively full coverage of the transition sample.

An important statistical caveat is that, while some countries classify loans purely by borrower (ie loans to households), others classify by use (ie consumption). The latter is what I would like to measure and both the European Central Bank data for all the Eurozone countries and data from the United States are defined in this way. However, data for the transition countries are on a borrower basis. This imparts an upward bias to the transition country data, since some loans to households are actually loans to single proprietors or small businesses that are used for productive purposes. As we will see, despite this bias, transition countries clearly lag the overall curve.

In addition, among transition countries, while there is some variation in the proportion of sole proprietors, there is no reason to believe that this variation is greater than the variations among the large sample of developing countries that also report data on a sectoral rather than a user basis.

Another caveat is that I am unable to include credit to households granted *via* leasing or cross-border borrowing. While these channels clearly are important for enterprise lending, and leasing is clearly of some importance to households, it is not clear how important cross-border lending to households is. Because of this data limitation, this study should be understood to be confined to *bank* lending to households (in some cases including finance companies and various types of savings cooperatives, housing banks, etc), and not to the broader issue of credit available to households in general.

A final caveat is that it would probably be useful to control for asset prices and in particular for the extent of home ownership. However, I was unable to find a reasonable cross-country data series to represent this.

The regressions use panel OLS, with White robust standard errors to correct for panel heteroskedasticity. Although the issue of causality between financial variables and growth has been an important issue in the finance-growth literature, in this context there is no strong case for arguing that household lending causes long-term growth. Clearly, household lending is tied to consumption, if households would otherwise be liquidity constrained. This implies a possible correlation between household credit and short-term fluctuations in GDP or GDP per capita, but these variables are also determined by a longer-term growth. Still, as a precaution to limit the chances of endogeneity, all explanatory variables are lagged.

In addition, the short data series makes it impossible to use the technique widely employed in empirical growth analysis of regressing 5-year

averages of economic growth on initial condition variables for the year prior to the 5-year growth period. Also, because the dynamics of transition country catch-up are very rapid, 5-year averages would actually make it more difficult to see the catch-up process than year-by-year variables.

In initial regressions, I noticed that multicollinearity between the Transparency International Corruption Perceptions Index and GDP per capita made it difficult to identify their effects. To avoid this problem, I regressed the Corruptions Perceptions Index on GDP per capita and then used the residuals from this regression as on explanatory variable. It is an estimate of the extra corruption holding the influence of GDP per capita on the index constant.

As a robustness check, I also constructed a longer series for the years 2000–2005. Unfortunately, to gain these three additional years, I lose about one-third of the sample: I was only able to gather data for 54 countries for 2000–2005.

The results of the cross-country regressions are shown in Table 7.1. Columns (1)–(4) provide results for the 2003–2005 sample, while column (5) shows results for the 2000–2005 sample.

As expected, GDP per capita proves a very powerful variable. The coefficient on GDP per capita does not vary substantially with the inclusion of other variables. Past inflation inhibits household lending, as expected. Latin American countries show lower levels of household credit, and English and German legal origin contribute positively. The adjusted corruption index proves highly significant. However, a longer time to start a business, as a sign of a weaker legal environment and also lower business credit demand, turns out to be insignificant. The development of securities markets, measured by the market capitalisation of listed companies as a share of GDP, is positively associated with household lending. This could be either a substitution effect (less business demand for loans), or a supply-side effect (stronger financial markets).

The results for the longer sample from 2000 to 2005 confirm the shorter sample results. However, it should be noted that the longer time series includes only 15 transition countries, as compared to the 23 included in the 2003–2005 sample.

In short, a high level of income, a history of macroeconomic stability in the recent past, and strong institutions (low corruption and English or German law) all contribute to higher household lending.

Finally, the transition dummy is consistently significant and negative, but shrinking from 2003 on. This shows that transition countries indeed lag behind established market economies in the provision of

Table 7.1 Cross-country determinants of lending to households dependent variable log (household loans/GDP)

	(1)	(2)	(3)	(4)	(5)
Constant	–6.99**	–6.78**	–6.97**	–7.06**	–7.71**
	(36.42)	(47.18)	(23.33)	(94.62)	(29.10)
Log (GDP per capita-1)	0.60**	0.56**	0.59**	0.61**	0.68**
	(18.95)	(32.21)	(21.56)	(69.58)	(24.48)
Log (cumulative price change	–0.31**	–0.29**	–0.31**	–0.58**	–0.55**
in previous 5 years)	(16.23)	(12.72)	(15.58)	(132.34)	(11.53)
Transition country dummy	–0.48**	–0.44**	–0.44**	–0.38**	–0.48**
	(11.67)	(17.81)	(8.69)	(9.11)	(10.02)
Transition dummy x 2004	0.21**	0.23**	0.18**	0.33**	
dummy	(42.00)	(38.80)	(40.37)	(12.82)	
Transition dummy x 2005 dummy	0.31**	0.32**	0.29**	0.45**	
	(40.19)	(37.33)	(46.50)	(16.20)	
TI corruption index	0.20**	0.16**	0.20**	0.18**	
(lagged, adjusted for GDP per capita)	(10.37)	(7.95)	(8.89)	(8.55)	
2004 dummy	0.05	0.03**	0.07**	0.06**	0.15**
	(18.64)	(9.74)	(9.70)	(11.76)	(26.01)
2005 dummy	0.16**	0.14**	0.18**	–0.35**	0.22**
	(31.95)	(29.89)	(15.74)	(0.58)	(27.79)
Latin America		–0.22**			
Dummy		(8.96)			
English legal origin dummy		0.41**			
		(8.64)			
German legal origin dummy		0.50**			
		(18.10)			
Time required to start-up			–0.00		
company			(0.60)		
Market cap of listed companies				0.00**	
				(8.33)	
Transition dummy x 2001					–0.08**
dummy					(8.91)
Transition dummy x 2002					–0.05**
dummy					(4.11)
Transition dummy x 2003					0.16**
dummy					(6.56)
2001 dummy					–0.03**
					(10.36)
2002 dummy					0.05**
					(11.67)
2003 dummy					0.13**
					(28.28)
Total observations	239	239	239	145	315
Countries included	83	83	83	75	54
Adjusted R^2	0.750	0.774	0.751	0.749	0.805
F-Statistic	90.15	75.05	72.56	71.45	93.51
Probability (*F*)	0.000	0.000	0.000	0.000	0.000

White cross-section standard errors, absolute values of t-statistics in parentheses.
* Significant at 5%, **significant at 1%.

household credit, once other major determinants are controlled for, but that the lag is decreasing for the group of transition countries as a whole. Using the coefficients in equation 1, the equation implies that a non-transition country would have had 62% higher household loans than a transition country with the same characteristics in 2003. This gap then fell to 31% and only 18% in 2004 and 2005, respectively, a remarkably rapid convergence.

An examination of the residuals for individual transition countries shows that Croatia and neighbouring Bosnia-Herzegovina have high positive residuals that are outside the normal confidence bounds. In other words, Croatia and Bosnia-Herzegovina seem to be outliers at this stage. Albania (2003 and 2004), the Kyrgyz Republic (all years) and Romania (2003 and 2004) are outliers at the lower end of the spectrum, indicating exceptionally slow development of household lending even for transition countries.

Reform and household lending: analysis of residuals

In this section, I try to explain the variation in the residuals for transition countries in the cross-country analysis above. I subject the residuals from the cross-country regression for 2003–2005 for transition countries to regression analysis, using reform progress indicators as explanatory variables. Since these residuals represent deviations from a cross-country regression that takes structural factors such as level of development and legal system into account, and also incorporates an across-the-board transition effect, variation in the residuals may to a large extent be explained by differences in the progress made in reform among the transition countries. By narrowing the sample down to the transition countries only, I am able to use the EBRD's transition reform indices, one of the few quantitative measures of reform progress in existence.

The analysis of residuals looks at three sets of factors: (1) the relative strength of the banking system, indicative of loan supply, (2) the degree of privatisation and enterprise reform, as an indicator of enterprise credit demand and enterprise credit worthiness and (3) the development of non-bank financial intermediation as a substitute to bank lending. The variables are taken from the EBRD's *Transition Report,* and are available for 23 transition countries.

The basic hypotheses of the transition residuals analysis are that greater progress in banking reform will lead to higher residuals (higher levels of household lending than predicted by the cross-country analysis), while greater progress in enterprise reform and privatisation will

lead to greater enterprise credit demand and lower residuals. Similarly, greater progress in development of non-bank financial intermediaries is expected to result in less household lending, as non-bank financial intermediaries provide a larger role in the household credit market.

Note that the overall cross-country analysis included two policy-related variables: cumulative inflation and corruption. More precisely, these variables represent outcomes of policies and therefore reflect both the policies adopted and the economic and social conditions in the countries. In any case, since these variables are universal ones that can be expected to affect all the countries in the sample, they were included in the large data set. The transition country variables reflect specific reform challenges facing transition countries. Finally, to minimise possible endogeneity, residuals in 2005 are explained by reform indicators for 2004.

Table 7.2 shows the regression estimates where the dependent variable is the residuals from equation 2 in Table 7.1 (the cross-country equation with the highest R^2). However, the results from other specifications are similar. Only two explanatory variables are entered in each regression because of strong multicollinearity among the explanatory variables.

Expectedly, banking reform, representing the supply side of lending, is highly significant. However, so are all four of the indicators of the enterprise demand side: percent of GDP produced by the private sector, EBRD scores for large-scale and small-scale privatisation and enterprise reform. The development of non-bank financial institutions turns out to have a positive coefficient, something of a surprise. This could either reflect complementarities between the development of banks and non-banks, or may simply be the result of multicollinearity.

Furthermore, examination of the residuals from equation 1, which has the highest adjusted R^2, shows that that the country with the largest positive residuals is Bosnia-Herzegovina. Bosnia-Herzegovina is clearly a case of unbalanced reforms. Although its banking reform score was only 2.3 in 2002, which was better than Belarus and Russia, and equal to the scores for four other countries (Albania, Armenia, Serbia and Montenegro and Ukraine), Bosnia-Herzegovina scored next to last on small-scale privatisation, only better than Belarus. Bosnia-Herzegovina's share of the private sector was also tied for next to last, suggesting very slow privatisation progress indeed.

The Kyrgyz Republic's residuals are strong negative outliers in 2003–2004, but in 2005 move to roughly zero. Romania is also a negative

Table 7.2 Analysis of transition country residuals

	(1)	(2)	(3)	(4)	(5)
Constant	0.87	–0.60*	0.62	–0.88**	–0.99**
	(1.08)	(8.89)	(6.38)	(8.57)	(11.73)
EBRD banking reform	0.69**	0.67**	0.66**	0.59**	0.24**
score	(11.43)	(5.06)	(9.87)	(14.23)	(5.96)
Percent of GDP produced	–0.03**				
by the private sector	(20.06)				
EBRD large-scale		–0.44**			
privatisation score		(9.00)			
EBRD small-scale			–0.66**		
privatisation score			(19.19)		
EBRD enterprise reform				–0.35+	
score				(27.69)	
EBRD non-bank financial					0.11**
institution reform score					(4.09)
Number of observations	69	69	69	69	69
Countries included	23	23	23	23	23
Adjusted R^2-squared	0.435	0.258	0.422	0.209	0.110
Durbin-Watson	0.276	0.219	0.336	0.220	0.152
F-statistic	25.45	12.82	25.80	10.00	5.16
Probability (F)	0.000	0.000	0.000	0.000	0.008

(Equation 2, Table 1).
White cross-section standard errors, absolute values of t-statistics in parentheses.
*Significant at 5%, **significant at 1%.

outlier in 2003–2004, and, intriguingly, so is Slovenia. The Kyrgyz Republic and Romania could perhaps be categorised as slow starters in household lending: once household lending began to grow rapidly, they quickly moved into the mainstream of transition countries. However, Slovenia is a more difficult case to understand. It seems that household lending is well below what would be predicted from the country's high GDP per capita and strong reform record. One might speculate that the strong role of the Slovene government in ownership of the largest banks might have bolstered lending to enterprises as opposed to lending to households.

Finally, it is interesting that the two countries with the highest levels of household credit, Croatia and Estonia, have residuals within the confidence bands. What this tells us is that the high levels of household

credit in Croatia and Estonia can be explained by reforms and policy outcomes. Both countries have high scores on banking reform, and reasonably good inflation records. Croatia's performance on privatisation and enterprise reform has been weaker than Estonia's, suggesting lower enterprise credit demand.

Concluding discussion

This paper studies the implications of the rapid increase in household lending in transition economies in the last several years. The Croatian case study suggests that rapid household loan growth does not necessarily lead to major prudential problems. The bulk of lending is skewed towards wealthier households, which, so far, seem to be able to service their obligations. Furthermore, much of lending growth is in the area of mortgage lending, which tends to be less problematic both because of the high collateral values involved and because of the strong commitment of households to protecting their homes from foreclosure. Of course, all of this comes with major caveats, since it will only be after the next recession that we will be able to fully see the adequacy of banks' provisioning and capitalisation policies. The presence of reputable foreign banks, mainly from the EU-15, gives some comfort here, but is no guarantee of sound risk-management policies by the banks. And, of course, the situation may vary somewhat in other transition countries.

If prudential concerns are muted, it seems that the main threat to financial stability posed by the household lending boom comes through macroeconomic effects. By increasing consumption, the household lending boom can exacerbate current account problems. Over a period of years, lopsided allocation of credit to households, as opposed to firms, could lead to lagging productivity growth and slower output growth than what would be available with a more balanced allocation of credit.[8]

The cross-country regressions provided above suggest that successful macroeconomic policy stimulates consumer lending to the extent that it achieves low rates of inflation. Similarly, successful banking reforms, and the achievement of lower levels of corruption, also stimulate household lending. In other words, one of the fruits of successful reforms is higher household lending.

At the same time, countries can become victims of their own success to an extent. For while all of these things are positive in and of themselves, if progress along these dimensions listed above outstrips progress

in enterprise privatisation and restructuring, the stage can be set for lopsided, consumer-oriented credit allocation.

The challenge for policymakers in transition countries, then, is to ensure reform progress across the board. Privatisation and real sector restructuring often involve severe political obstacles and constraints. But failure to make progress in these areas will ultimately result in failure to improve living standards, slower growth and problems with external debt. Strong banking reform can raise living standards temporarily, but if more wealth is not produced, increased consumption levels and external imbalances may become unsustainable.

While it would certainly be wise to work towards broad reform progress, and not just progress in macroeconomic stability and banking reform, it is realistic to expect that substantial progress in macrostability and banking reform is likely to lead to stronger consumption growth. Accelerations in imports and foreign borrowing also become very likely. Prudent macro-economic policymakers should therefore adjust their projections accordingly, and consider proactive measures.

For some of the transition countries, the process of negotiating accession to the European Union, and the process of gradual adjustment to EU norms *via* the Stabilisation and Association Process, should provide a useful framework for planning and implementing the needed reforms. The countries of the former Soviet Union studied here (Ukraine, Russia, Georgia, Armenia, Azerbaijan, Kazakhstan and the Kyrgyz Republic) however, have much smaller chances, if any, of EU membership in the foreseeable future, and will need to find a different set of motivations for their reform processes. Nonetheless, they face the same danger if they are more successful in banking reform than in real sector reform.

In either case, the authorities are likely to face unpleasant choices between allowing household lending, and current account deficits and foreign debt ratios, to expand at uncomfortable speed, and implementing restrictive policies, including administrative measures such as those used by Croatia. The use of administrative measures may improve macroeconomic stability in the short-run. But there may well be trade-offs between greater short-term stability and the distortions created by administrative measures. Such distortions are likely to be inimical to long-term market development, and thus the stability gains must be weighed carefully against the development losses. Unfortunately, there seems to be little chance of avoiding such unappealing dilemmas in practice.

Data appendix

Table A1 Descriptive statistics for variables used in the cross-country analysis

	Mean	Maximum	Minimum	Observations	Source
Household loans/ GDP	0.266	1.087	0.004	255	Central banks, IFS
GDP per capita	13961	77784	113	257	Central banks, IFS
Inflation (cumulative price change in preceding 5 years)	1.71	4.20	0.86	266	Central banks, IFS
Corruption Score	5.12	9.70	1.80	246	Transparency international (www.tranparency.org)
Legal origin					
English	0.22	1.00	0.00	270	LaPorta *et al.* (1997)
German	0.04	1.00	0.00	270	LaPorta *et al.* (1997)
Stock market capitalisation	65.53	528.59	0.13	150	World Bank Development Indicators
Time to start a business	40.33	152.00	2.00	233	World Bank Development Indicators

Table A2 Transition variable descriptive statistics

	Mean	Maximum	Minimum	Observations	Source
Cross-country equation residual	0.003	1.190	–1.688	69	Author's calculation
EBRD banking reform	2.89	4.0	1.7	69	EBRD transition report
% of GDP produced by private sector	66.38	80	25	69	EBRD transition report
EBRD large-scale privatisation	3.13	4.0	1.0	69	EBRD transition report
EBRD small-scale privatisation	3.90	4.3	2.0	69	EBRD transition report
EBRD enterprise reform	2.46	3.3	1.0	69	EBRD transition report
EBRD non-bank reform	2.42	3.7	1.7	69	EBRD transition report

Notes

1. The views expressed in this paper are the author's, and do not necessarily represent those of the Croatian National Bank. The author would like to

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2. For an introduction to banking reform in transition countries, see EBRD *Transition Report* (1998), and the issues thereafter. For recent findings on competition in Croatia, see Kraft (2006).
3. For details on these practices, see the Croatian National Bank surveys: Kraft (1998, 2000), Galac (2005), Galac and Dukić (2005).
4. For further discussion of the macropolicy issues, see Kraft and Jankov (2005).
5. I use GDP at market prices, because it is more readily available than GDP at PPP. Experiments using GDP at PPP for 1 year showed no major differences in regression results compared to GDP at market prices.
6. I would like to thank Maxwell Watson for suggesting this point to me.
7. I would like to thank Adalbert Winkler from the ECB for providing me with the ECB data and kindly explaining its background.
8. I thank Maxwell Watson for emphasising this point to me.

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8

Are Weak Banks Leading Credit Booms? Evidence from Emerging Europe

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This paper examines the behaviour of weak banks during episodes of brisk loan growth, using bank-level data for central and Eastern Europe and controlling for the feedback effect of credit growth on bank soundness. No evidence is found that rapid loan expansion has weakened banks during the last decade, but over time weak banks seem to have started to expand at least as fast as, and in some markets faster than, sound banks. These findings suggest that during credit booms supervisors need to carefully monitor the soundness of rapidly expanding banks and stand ready to take action to limit the expansion of weak banks.

Introduction

In an environment of brisk credit growth, supervisors tend to watch carefully whether weak banks are starting to expand rapidly.[1] Sounder banks may have a competitive advantage in meeting the demand for credit owing to their larger capital cushions and better risk management, but weaker banks may have strong incentives to expand aggressively, in an attempt to grow out of problems by boosting their market share and profits. If the pace of expansion overwhelms banks' ability to manage risk, their asset quality would deteriorate over time. How sound are the banks that are driving credit expansion is a question that is particularly relevant for emerging Europe, where bank credit has been growing rapidly – at average annual rates of 25%–40% – during the last decade.

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This question has remained underexplored in the literature. Most studies on countries' experiences with credit booms have focused on the other side of the relationship between bank soundness and credit growth – whether credit booms weaken the banking system, and hence, are associated with financial instability (see, eg, Gourinchas *et al*., 2001). When examining this question in a sample of banks from the new member countries of the European Union (EU) and accession countries, Maechler *et al*. (2007) found that rapid loan growth has been associated with an improvement in bank soundness indicators, except when credit growth accelerated sharply. Macro-level studies on credit growth in Eastern European economies focussed on assessing whether credit growth in the region has been excessive. These studies tend to conclude that bank intermediation in the new EU member states is still below the equilibrium levels consistent with their levels of economic development and the structural characteristics of their banking sectors, and there is ample room for further financial deepening (see, eg, Schadler *et al*., 2005; Cottarelli *et al*., 2005).[2]

This paper complements the literature by examining whether credit growth in emerging Europe has been led by weak banks, controlling for the effect of credit growth on bank soundness. The empirical setting is based on a simultaneous-equation framework, where bank soundness and credit growth are modelled as functions of each other as well as other bank-specific and macroeconomic factors. The analysis uses detailed bank balance sheet data for the Baltic countries (Estonia, Latvia, and Lithuania) and other Central and Eastern European Countries (CEECs) – the Czech Republic, Hungary, Poland, the Slovak Republic, and Slovenia – for the period from 1995 to 2004. After examining the question of whether credit growth is driven by weak banks, the study explores where the pockets of vulnerabilities are located: in the Baltics or the CEECs, in foreign- or domestically owned banks, in banks focusing on household or corporate lending, or those that are heavily exposed to foreign- or domestic currency-denominated lending. For the latter two parts of the analysis, the publicly available bank-level data are complemented with supervisory data.

The analysis shows that a long spell of credit expansion in emerging Europe has indeed heightened prudential risks. Over time, weaker banks have started to expand at least as fast as, and in some cases faster than, sounder banks. In contrast to the late 1990s, rapid credit growth during 2001–2004 was no longer limited to relatively sound and stable banks. These findings are most pronounced in the group of the weakest banks, those in the lowest quintile. They are also robust to alternative measures of bank soundness and alternative model specifications and estimation techniques.

The increased prudential risks are most vivid in rapidly growing credit markets: the Baltics and markets for household loans and loans denominated in or indexed to foreign currency. Foreign bank affiliates seem to be taking on more risk than domestically owned banks, although this is commensurate with the strength of their parent banks. All in all, the results suggest that credit booms in some parts of emerging Europe are being led by weak banks.

The rest of the paper is organised as follows. The next section describes the simultaneous-equation model, estimation method, and data. Then the further section discusses results, their robustness, and the main driving factors. Finally the last section concludes the study.

Modelling how bank soundness affects credit growth

Empirical model

The general specification of the model is as follows:

$$\begin{aligned} BankCreditGrowth_{ijt} = f(&DistanceToDefault_{ij,t-1},\ BankCreditGrowth_{ij,t-1},\\ &GDPperCapita_{j,t-1},\ GDPgrowth_{j,t-1},\ RIR_{j,t-1},\ \Delta RER_{j,t-1},\\ &CostToIncome_{ij,t-1},\ InterestMargin_{ij,t-1},\ Liquidity_{ij,t-1},\\ &Size_{ij,t-1},\ Foreign_{ijt},\ Public_{ijt}) \end{aligned}$$

$$\begin{aligned} DistanceToDefault_{ijt} = f(&BankCreditGrowth_{ij,t-1},\ GDPperCapita_{j,t-1},\\ &GDPgrowth_{j,t-1},\ RIR_{j,t-1},\ \Delta RER_{j,t-1},\\ &DistanceToDefault_{ij,t-1},\ CostToIncome_{ij,t-1},\\ &InterestMargin_{ij,t-1},\ Liquidity_{ij,t-1},\ Sizei_{j,t-1},\\ &Foreign_{ijt},\ Public_{ijt}) \end{aligned}$$

where i denotes individual banks, j denotes countries, and t is the year index. *BankCreditGrowth* is the annual percent change in real bank credit to the private sector. *RIR* is the real interest rate and ΔRER is the annual percent change in the real exchange rate. *CostToIncome* and *InterestMargin* stand for the cost-to-income ratio and the net interest margin. *Public* and *Foreign* are measures of public and foreign ownership.

Distance to Default (DD) measures the probability of bank default, that is, that the value of assets would become smaller than the value of capital (see, eg, Gropp *et al*., 2006). The measure is calculated as $DD \equiv (k+\mu)/\sigma$, where k is the equity capital as percent of assets, μ is the return on average assets in percent, and σ is the standard deviation of return on average assets as a proxy for return volatility. DD measures the number

of standard deviations a return realisation has to fall to exhaust equity, assuming that banks' returns are normally distributed. A higher DD corresponds to a lower upper bound of insolvency risk, implying a lower probability of insolvency. We calculate DD using annual balance sheet data on equity capital (valued at end-year market prices) and return on assets.[3] The standard deviation of returns is calculated for the entire sample period to obtain a long-term view on the risks banks face.[4,5]

While focusing on the importance of bank soundness for credit growth, we control for macroeconomic factors that may affect credit growth. Although there is some variation in the set of macroeconomic variables used as controls in studies of credit growth, most studies include: (i) GDP per capita to indicate the catching-up phenomenon, whereby credit growth tends to be slower in countries with a higher level of economic and institutional development; (ii) real GDP growth, positively correlated with the demand for bank loans; (iii) real interest rates, which tend to be negatively correlated with demand for loans; and (iv) real exchange rate depreciation, which is expected to reduce the demand for foreign-currency loans. These macroeconomic variables are also included in the feedback equation, as they reflect the risks faced by a bank and may affect its soundness.

Bank-specific factors (other than DD) may also affect the rate at which banks expand their loan portfolios. More profitable (higher net interest margin), liquid, and efficient (lower cost-to-income ratio) banks are likely to be able to expand credit at a faster rate. One might also expect loan growth to be positively correlated with bank size and foreign ownership and negatively correlated with state ownership (the share of capital owned by foreigners and the government, respectively).[6] These variables may indirectly capture the effect of financial and other institutional reforms on banks' incentives and their ability to lend to the private sector. These bank-level variables can be thought of as reflecting the supply-side determinants of credit growth. They are also included in the feedback equation to control for bank-level factors that may affect DD. All variables in the model, except for those measuring the degree of foreign and public ownership, are lagged to mitigate against simultaneity. Lagged dependent variables are also included to allow for persistence in DD and loan growth.

Estimation method

The model is estimated using the three-stage least squares (3SLS) method – a convenient method for estimating simultaneous-equation models in the presence of dynamic random effects (Zellner and Theil, 1962;

Arellano, 1990). By taking into account the cross-equation correlation, 3SLS yields more efficient estimates for simultaneous-equation systems than two-stage least squares (2SLS) and single-equation ordinary least squares (OLS) while taking care of potential endogeneity issues.[7] In addition, 3SLS has the desirable feature of leaving the autocovariance matrix of errors unrestricted, so that, in contrast to full information maximum likelihood method, 3SLS does not require that the distribution of errors is known. The 3SLS estimates are robust to the residual autocorrelation of an arbitrary form. Hence, 3SLS renders unbiased estimates, in contrast to 2SLS or single-equation OLS, in models with lagged dependent variables.

However, the efficiency advantage can disappear if autocovariances in a 3SLS model with lagged dependent variables and a sufficient number of strictly exogenous variables satisfy some restrictions. Several tests are conducted to examine the covariance structure of the baseline specification and to confirm the absence of specification problems. Testing for unit roots is complicated by the short time dimension of the data set. Nonetheless, feasible unit root tests for three-dimensional panel data (Kónya and Ohashi, 2005) reject unit roots at the 1% significance level. The Hausman specification test, based on a model excluding lagged dependent variables, is inconclusive, but the examination of the residual structure of this model points to nonstationarity problems due to the failure to capture persistence. These specification analyses confirm that the baseline specification is adequately specified by including lagged dependent variables.

As shown in Woolridge (2002), 3SLS is equivalent to the random effects estimator (RE), provided that the covariance matrix has indeed the random effects structure. From a conceptual point of view, the short time dimension and unbalanced nature of our data, in addition to the fact that the period we are looking at was characterised by enormous structural changes in Eastern Europe, suggests that RE could be preferred to the fixed effects estimator (FE). Since the FE only uses the within-variation and ignores the between- variation, it is less likely to be suitable for our purposes where information contained in the means across banks and across time is particularly important. From a purely econometric point of view, a Hausman specification test indeed rejects the presence of fixed effects.[8]

Data

Estimating the model requires bank-level and macroeconomic data. Bank financial ratios are calculated using bank balance sheet data from the Bankscope database published by the *Bureau van Dijk*.[9] Bankscope

covers most banks operating in central and Eastern Europe (around 80%),[10] accounting on average for more than 80% of total assets of the respective banking systems (Table 8.1). The Bankscope sample of banks is diverse, including domestically and foreign-owned banks; large, medium-sized, and small banks; and subsidiaries and branches. Nonetheless, the sample is somewhat biased towards larger banks, as suggested by the fact that the coverage of banks in many countries (the Czech Republic, Estonia, Hungary, Lithuania, and Poland) is higher when measured as a share of total bank assets than as the share of the total number of banks.

The sample used in the study includes 217 commercial banks that operated in central and Eastern Europe during 1995–2004. The average number of observations per bank (around seven) is less than the maximum possible number (10), which is not surprising given significant structural changes in the banking sectors of CEECs during the last decade. Macroeconomic data needed to calculate real GDP growth, GDP per capita, real interest rates, and real exchange rates were taken from the IMF's *International Financial Statistics*.[11]

Sample statistics point to a significant dispersion in credit growth and DD at the bank level. The distribution of DD is asymmetric, skewed towards positive values. The distribution of credit growth values is more balanced, although, like with DD, there is a fat tail corresponding to banks rapidly expanding their balance sheets. Both in the CEECs (the Czech Republic, Hungary, Poland, the Slovak Republic, and Slovenia)

Table 8.1 Sample coverage

	Number of banks		**Proportion of banks included in the sample[a]**		**Average number of observations per bank**
	Total	**Bankscope**	**Number**	**Assets**	
Czech Republic	35	26	74.3	97.6	7.2
Hungary	36	23	63.9	81.7	8.3
Poland	60	33	55.0	85.6	7.6
Slovak Republic	21	20	95.2	83.1	7.1
Slovenia	22	18	81.8	79.9	7.8
Estonia	6	5	83.3	94.1	7.9
Latvia	22	21	95.5	93.2	8.0
Lithuania	13	9	69.2	93.7	6.2

Source: European Central Bank, Bankscope, and authors' estimates.
[a]In percent of the total number of banks and total bank assets, respectively.

and the Baltics (Estonia, Latvia, and Lithuania), banks were lending at higher rates on average during 2001–2004 than 1995–2000, and the variation of credit growth rates across banks decreased over time (Table 8.2). Banks in the Baltics on average were growing faster than banks in the CEECs in both periods. DD was higher on average in the CEECs than in the Baltics during both periods in question. (Slovenian banks had the highest DD and Latvian banks the lowest, as shown in Appendix A.) DD increased in both subgroups of CEECs over time, but the improvement was much more significant in the Baltics. At the same time, the variation in Baltic banks' DD also increased markedly.

This basic statistical analysis implies that CEEC and Baltic banks have grown stronger over time and have stepped up their lending activities; at the same time, the heterogeneity of banks in terms of their soundness also increased, especially in the Baltics. Together with the finding of lower variation in bank credit growth, increased heterogeneity in bank soundness suggests that weak and sound banks were expanding at similar rates, especially in the Baltics.

Correlation analysis points in the same direction, weakening relationship between DD, especially in the Baltics. In the full sample, the correlation coefficient between bank credit growth and (lagged) DD was 0.10 and statistically significant in the earlier period and declined to 0.05 and became statistically insignificant in the later period. The weakening

Table 8.2 Summary statistics by period and region

Variable	CEECs				Baltics			
	1995–2000		2001–2004		1995–2000		2001–2004	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Bank credit growth	17.9	40.1	27.3	32.7	28.7	56.6	46.8	43.8
Distance to default	14.0	12.5	14.8	13.0	7.7	9.2	12.5	15.3
Net interest margin	4.5	2.6	3.6	3.1	6.1	2.5	3.3	1.3
Cost-to-income ratio	67.4	99.7	71.9	31.8	95.5	107.8	69.6	19.2
Liquidity ratio	17.4	16.1	17.2	18.0	11.2	9.8	17.1	18.0
Bank size	6.4	1.3	7.0	1.3	4.8	1.3	5.8	1.3
Real GDP growth	2.9	2.4	3.3	1.9	5.3	3.5	8.1	1.2
GDP per capita	58.1	23.5	70.1	25.7	30.9	3.9	45.8	10.6
Real interest rate	3.2	3.5	2.5	3.7	−0.5	4.5	0.5	1.9
Real depreciation	0.2	0.3	−0.4	0.3	−0.1	0.8	−0.5	0.7
Foreign ownership	36.2	44.4	52.2	46.3	31.1	39.7	41.1	42.8
Public ownership	15.3	33.7	6.1	21.5	12.5	29.2	3.7	15.0

Source: Bankscope, International Financial Statistics and authors' estimates.

of correlation in the full sample is driven by developments in Latvian, Lithuanian, and Slovak banks. For these countries, the coefficients of correlation between bank credit growth and (lagged) DD turned from positive and statistically significant in the earlier period to insignificant in the later. For other countries, no major changes in significance or signs of the correlation coefficients were observed.

When comparing correlations across different types of banks, the relationship between credit growth and (lagged) DD is found to be weakening in several groups of banks. Correlations for privately owned banks were positive and statistically significant only in the first period and became statistically insignificant in the latter period. For foreign- and government- owned banks, correlations were insignificant in both periods, but the signs of coefficients turned from positive in the earlier period to negative. However, only in domestically owned banks correlations remained positive and statistically significant throughout the period in question.

Are weak banks driving credit expansions?

Main results and their robustness

We estimate the model for the entire period, 1995–2004, and for two subperiods, 1995–2000 and 2001–2004, focusing on the impact of bank soundness on credit growth (Table 8.3). The main finding is that in the earlier period the coefficient on DD was positive and statistically significant, but in the later period it became insignificant – weaker banks started to expand just as rapidly as sounder banks during 2001–2004. The size of the coefficient implies that a one standard deviation increase in DD added about 4% points to annual bank credit growth in the earlier period. In the later period, improvements in DD had no significant impact on credit growth.

The signs of other coefficients are in line with expectations. Higher real GDP growth has a statistically significant positive impact on credit growth. Similarly, lower real interest rates are found to boost credit growth, although the significance level is marginal. Credit growth also reflects financial catching-up: the coefficient on GDP per capita is negative. Higher bank efficiency, as measured by the cost-to-income ratio, also boosted credit growth, especially in the earlier period. This, together with the significant negative coefficient on the share of bank capital owned by the state, implies that financial sector reforms have given the private sector better access to credit. Bank profitability, as measured by net interest margin, was also a significant driver of credit

Table 8.3 Simultaneous modelling of bank credit growth and distance to default

	1995–2004		1995–2000		2001–2004	
	Bank credit growth	**Distance to default**	**Bank credit growth**	**Distance to default**	**Bank credit growth**	**Distance to default**
Bank credit growth	0.096*** [5.83]	−0.002 [1.14]	0.100*** [3.89]	−0.002 [0.76]	0.095*** [4.71]	−0.001 [0.54]
Distance to default	0.229** [2.16]	0.896*** [85.84]	0.350* [1.94]	0.854*** [59.85]	0.147 [1.20]	0.927*** [62.15]
Real GDP growth	2.646*** [5.53]		2.415*** [2.92]		2.475*** [4.38]	
GDP per capita	−0.116** [1.99]	0.017*** [2.83]	−0.301*** [3.19]	0.029*** [3.90]	−0.057 [0.73]	0.007 [0.77]
Net interest margin	0.689 [1.47]		1.757** [2.25]		1.200** [2.00]	
Cost-to-income ratio	−0.017 [1.13]		−0.037** [1.96]		0.046 [1.49]	
Real interest rate	−0.558* [1.65]		−0.864 [1.58]		−0.999** [2.24]	
Real depreciation	−4.911* [1.95]		14.750** [2.45]		−7.414*** [2.65]	
Public ownership	−0.178*** [3.73]		−0.153** [2.39]		−0.067 [0.89]	
Liquidity ratio		0.020*** [2.67]		0.013 [1.17]		0.027** [2.55]
Bank size		0.311*** [3.33]		0.240** [2.07]		0.324** [2.22]
Foreign ownership		0.008*** [2.80]		0.012*** [3.28]		0.003 [0.69]
Constant	16.366*** [3.37]	−2.668*** [4.10]	15.992** [2.17]	−2.660*** [3.18]	12.721* [1.87]	−2.252** [2.25]
R^2	0.13	0.91	0.16	0.92	0.15	0.90
Observations	881	881	424	424	457	457

Note: Absolute value of *z* statistics in brackets, *significant at 10%, **significant at 5%, and ***significant at 1%. The table reports two equations from a two-equation simultaneous model. The dependent variable in the first equation is annual percentage change in outstanding bank loans. In the second equation, the dependent variable is distance to default (constructed using bank account data). All the right-hand-side variables, except those measuring the degree of foreign and public ownership, are lagged by 1 year. The model is estimated using three-stage least squares.
Source: Authors' estimates.

growth in the entire period. The effect of the real exchange rate on credit growth differed in the two periods: during 1995–2000, real depreciation had a strong positive impact on credit growth, while during 2001–2004 real appreciation was associated with stronger credit growth, possibly due to the increased importance of foreign- currency lending. Other explanatory variables in the credit growth equation are insignificant. Their coefficients are set to zero, with the validity of the resulting specification confirmed through *F*-tests for omitted variables. The effect of these variables on credit growth is captured indirectly through the feedback equation.

In the feedback equation for DD, significant determinants include the bank size and GDP per capita: larger banks and banks in more developed countries are characterised by greater DD. The coefficient on the foreign ownership variable is positive and statistically significant, but only during 1995–2000, suggesting that the opening of the banking sectors to foreign participation helped strengthen banks only in the earlier period. Liquidity also contributed positively to bank soundness. The coefficient on the lagged DD is positive and statistically significant, suggesting that banks that were sound and stable in the past are likely to remain so in the future. (Although the coefficient on the lagged DD is close to unity, statistical tests confirm that it is different from 1.) There is no evidence that credit growth weakened banks – the coefficient on credit growth is statistically insignificant in all periods – possibly because weaknesses in bank balance sheets get reflected in bank soundness indicators with a lag.

The main findings concerning the role of weaker banks in credit expansions are robust to alternative definitions of bank soundness. In a sample of weak banks, defined as banks in the bottom quintile of DD distribution, the coefficient on DD becomes statistically significant in the later period, implying that weak banks grew faster than healthy banks in that period (Table 8.4). The results are also preserved if the volatility of returns is calculated for subperiods rather than for the entire sample period.[12] In regressions using the share of nonperforming loans in total outstanding loans (the NPL ratio) as a measure of bank soundness, weaker banks are also found to be expanding faster than sounder banks during the later period: the coefficient on the NPL ratio in the credit growth equation is positive and statistically significant during the later period, while during the earlier period it was negative and statistically insignificant.[13]

Results are also preserved in alternative specifications of the model. Controlling for time- and country-specific factors, or adding measures

Table 8.4 Credit growth in the weakest banks

	1995–2000	2001–2004
Bank credit growth	0.096	0.03
	[1.06]	[0.76]
Distance to default	−1.364	−3.361*
	[0.68]	[1.76]
Real GDP growth	2.453	4.528***
	[1.00]	[2.77]
GDP per capita	−0.348	0.079
	[1.18]	[0.35]
Net interest margin	0.928	2.321
	[0.40]	[1.60]
Cost-to-income ratio	−0.018	0.034
	[0.63]	[0.78]
Real interest rate	−2.352	−1.986
	[1.46]	[1.52]
Real depreciation	27.127	−14.029
	[1.62]	[1.49]
Public ownership	−0.273*	−0.249
	[1.91]	[0.96]
Constant	33.804	15.507
	[1.57]	[0.82]
R^2	0.13	0.28
Observations	84	83

Note: Absolute value of *z* statistics in brackets, *significant at 10%, **significant at 5%, and ***significant at 1%. The table reports one equation from a two-equation simultaneous model. The dependent variable in the reported equation is annual percent change in outstanding loans. All the right- hand-side variables, except those measuring the degree of public ownership, are lagged by 1 year. The model is estimated using three-stage least squares on a sample that includes only weak banks, defined as the lowest quintile of banks by their distance to default.
Source: Authors' estimates.

of financial and institutional development, or regulatory measures does not significantly change the coefficients of interest. Using dummy variables for the share of foreign or public ownership exceeding 50% and controlling for the type of foreign ownership (through wholly owned subsidiaries or partial ownership after takeovers of domestic banks during privatisation) also preserves the gist of the results.[14] Estimating the DD equation separately using the Arellano–Bond method does not significantly alter the coefficients of interest either, although the short time dimension of the data set precludes the subsample analysis using the Arellano–Bond method.[15]

What is driving the results?

To understand the factors driving the results, we run the model on various subsamples, split by region (the Baltics and the CEECs), the type of bank ownership (domestically and foreign-owned banks), the currency of loans (foreign- or domestic-currency-denominated loans), and the type of borrower (households or corporates). This helps us identify the pockets of vulnerabilities, which account for the result that weaker banks are increasingly driving credit expansions in emerging Europe.

The analysis shows that the role of weaker banks in credit expansion in the Baltics increased over time (Table 8.5). The opposite is true in the CEECs: sounder banks were expanding more rapidly during 2001–2004, while during 1995–2000 no statistically significant

Table 8.5 Differences in bank credit growth in the Baltics and other central and Eastern European countries

	1995–2000	**2001–2004**
Bank credit growth	0.095***	0.094***
	[3.64]	[4.70]
Distance to default	0.241	0.433***
	[1.23]	[3.01]
Distance to default of Baltic banks	0.684	−0.961***
	[1.46]	[3.72]
Baltic banks	−6.839	18.209***
	[0.81]	[2.77]
F-test	2.14	15.40
	[0.34]	[0.00]
R^2	0.16	0.17
Observations	424	457

Note: Absolute value of *z* statistics in brackets, *significant at 10%, **significant at 5%, and ***significant at 1%. The table reports one equation from a two-equation simultaneous model. The dependent variable in the reported equation is annual percent change in outstanding loans. The equation includes an interaction term for the distance to default of Baltic banks and a dummy variable for Baltic banks. Only the most relevant coefficients are reported and other coefficients are broadly unchanged (see Table 8.3). All the right-hand-side variables, except those measuring the degree of foreign and public ownership, are lagged by 1 year. The table also reports chi-squared statistics and probabilities for the *F*-tests of joint significance of the interaction term and the dummy variable for Baltic banks. The modelis estimated on the full sample using three-stage least squares.
Source: Authors' estimates.

differences in the rates of credit growth through weaker and sounder banks were identified. These results are robust to excluding the lagged dependent variable and estimating regressions separately on the CEEC and Baltic subsamples. One possible explanation of the more prominent role of weaker banks in credit expansion in the Baltics is that in the context of more rapid Baltic credit growth – 10 times higher in real terms than in the CEECs in the later period – ensuring that sound credit assessment and risk management at the individual bank level is much more challenging. The fact that more foreign bank affiliates in the Baltics are branches than subsidiaries may also make supervision more difficult, as branches are regulated less than subsidiaries in host countries.

Weaker foreign-owned banks appear to be lending more aggressively than domestically owned banks, possibly because of easy access to funding through their parent banks. Controlling for the DD of parent banks indeed shows that, although rapid credit growth in recent years has become uncorrelated with the DD of central and Eastern European affiliates of foreign banks, it remains positively correlated with the DD of their parent banks. Separate regressions, using the samples of foreign- and domestically owned banks, also show that lending by foreign-owned banks does not depend on DD; for domestically owned banks, a positive relationship is identified between credit growth and DD. Among foreign-owned affiliates, Nordic banks stand out as the ones whose lending is the least related to DD. This result is consistent with the earlier discussed finding of higher prudential risks in the Baltics, where Nordic banks are particularly active.

Credit growth through banks with large and rapidly expanding foreign- currency loan portfolios is negatively correlated with DD, suggesting that weaker banks are expanding at a faster rate in these market segments (Table 8.6). The opposite is true of banks that are not actively engaged in foreign-currency lending: loans are growing more rapidly through sounder banks. A similar result is found for banks with large and rapidly growing loan exposures to the household sector. These findings point to more acute prudential risks in the banks that are aggressively lending in foreign currency and to the household sector. However, these results are only preliminary. Owing to data limitation, the analysis had to be restricted to a subset of countries (excluding Hungary and Latvia) and to the dummy measures of exposures, with exposed banks defined as those with a higher-than- average proportion and growth of loans in the respective categories.

Table 8.6 Differences in credit growth in banks with high exposures to foreign-currency lending and household lending

	Foreign-currency lending		Household lending	
	1995–2000	**2001–2004**	**1995–2000**	**2001–2004**
Bank credit growth	0.157***	0.073**	0.180***	0.086***
	[4.25]	[2.51]	[5.45]	[3.80]
Distance to default	0.422**	0.279*	0.613***	0.355**
	[2.44]	[1.68]	[3.33]	[2.38]
Distance to default	0.006	−0.794*	−0.886**	−1.889***
of exposed banks	[0.01]	[1.74]	[2.16]	[2.86]
Real GDP growth	3.497***	3.495***	3.991***	3.585***
	[3.91]	[4.27]	[4.49]	[4.64]
GDP per capita	−0.225***	−0.118	−0.375***	−0.065
	[2.77]	[1.32]	[4.68]	[0.79]
Net interest margin	3.754***	1.242	2.318***	1.830**
	[4.54]	[1.00]	[3.00]	[2.05]
Cost-to-income ratio	0.007	−0.037	0.006	0.03
	[0.36]	[0.52]	[0.30]	[1.01]
Real interest rate	−0.133	−1.015*	−0.447	−0.766
	[0.23]	[1.94]	[0.76]	[1.57]
Real depreciation	26.407***	−4.679	26.291***	−4.706
	[4.98]	[1.51]	[5.04]	[1.61]
Public ownership	−0.075	−0.079	−0.103*	−0.059
	[1.28]	[0.96]	[1.76]	[0.76]
Exposed bank	23.238	29.541***	50.436***	28.312***
dummy	[1.48]	[2.80]	[4.35]	[2.68]
Constant	−20.243***	18.981*	−8.001	7.025
	[2.85]	[1.90]	[1.16]	[0.93]
R^2	0.41	0.22	0.45	0.24
Observations	197	258	215	285

Note: Absolute value of *z* statistics in brackets, *significant at 10%, **significant at 5%, and ***significant at 1%. The table reports one equation from a two-equation simultaneous model. The dependent variable in the reported equation is annual percent change in outstanding loans. All the right- hand-side variables, except those measuring the degree of public ownership, are lagged by 1 year. Banks with high exposure to foreign-currency lending are defined as those with higher-than-average proportion of foreign-currency-denominated loans and higher-than-average rate of growth in the proportion of foreign-currency-denominated loans. Banks with high exposure to household lending are defined as those with higher-than-average proportion of loans to households and higher-than-average rate of growth in the proportion of loans to households. The sample is composed of Czech, Estonian, Lithuanian, Polish, Slovak, and Slovenian banks, based on data availability.

Source: Authors' estimates.

Concluding remarks

Using data for emerging European banks, this study finds that in an environment of sustained rapid growth of credit, weaker banks start expanding faster than sounder banks over time. Whether these prudential risks materialise or not in the future would depend on the quality of banks' current lending and risk management decisions, the strength and quality of supervisory and regulatory practices, as well as the stability of the broader macroeconomic and financial environment. The fact that rapid credit growth has not weakened banks so far provides some comfort that banks would be able to manage risks well. Yet, on the other hand, higher prudential risks may simply take time to become visible in bank soundness indicators, as loan portfolios take time to mature and emerging Europe is still in the initial stages of the credit cycle.

All in all, the findings of the study highlight the importance of forward- looking and risk-based supervision during credit booms. Supervisors need to carefully monitor the soundness of rapidly expanding banks and stand ready to take measures to limit the expansion of weak banks. If left unchecked, rapid growth of weak banks may eventually undermine systemic stability, at a severe cost to the broader economy and taxpayers.

Appendix A

Data sources and methodology

Macroeconomic data were taken from the February 2006 version of the IMF's *International Financial Statistics*. Bank-level data were downloaded from the February 2006 version of Bankscope[16] and cleaned up by carefully matching bank identities and deleting duplicate entries, as well as the entries with possible measurement errors. The Bankscope data set was complemented with confidential supervisory data on the composition of bank loans obtained from the central banks of all CEECs, except Latvia and Hungary, as well as data on bank ownership from various sources, such as *Euromoney* and banks' websites. Details on the coverage and compatibility of different components of the data set are also presented below. Tables A1 and A2 present the summary statistics for the final dataset. The definitions of variables and units of measurement for bank-level and macroeconomic data are presented in Table A3.

Matching bank identifiers: Bankscope uses a unique identifier for each bank. This identifier remains unchanged when the bank's name

changes and sometimes even when the bank is merged with or acquired by another bank. Only if a merger or an acquisition intrinsically changes the bank is a new identifier assigned to the new bank. Data for the banks operating in central and Eastern Europe during 2002–2004 were first downloaded using the February 2006 update of Bankscope. The data were then merged with the historical dataset provided by Ugo Panizza, using the unique identifiers and cross-checking based on the 2002 data.

Avoiding duplications: Bankscope includes both consolidated and unconsolidated balance sheet data. When both are available for the same bank, a different identifier is assigned to each type of data. Moreover, at the time of mergers, the banks involved might stay in the dataset along with the merged entity. To make sure that observations are not duplicated for the same bank, the following procedure was applied to include information from only one of the balance sheets. First, using the `rank' variable in Bankscope, which ranks the banks within a country, nonranked banks were dropped to avoid duplications. However, a second step was necessary to make sure that the duplication was not due to a merger event. If a bank was not ranked but had assets greater than the country average, its history of mergers and acquisitions was examined carefully. Next, the premerger banks were reranked to ensure that they were included in the dataset, and the postmerger banks were deranked to exclude them from the premerger period. Many such banks had both consolidated and unconsolidated balance sheets. To be able to identify individual banks, the unconsolidated data were preserved when both balance sheets were available. If unconsolidated data were unavailable, consolidated data were used to avoid dropping the banks from the sample.

Excluding outliers: To ensure that the analysis is not affected by potential measurement errors and misreporting, about 4% of the observations on the tails of the distributions of the two main variables (bank-level credit growth and DD) were dropped.

Coding ownership: Bankscope does not provide historical information about bank ownership; it provides only the share held by foreign and public investors in the current year. Thanks to extensive work by Micco *et al.* (2004), the historical ownership data up to 2002 were available for the study. While extending the time coverage to 2004, the most recent ownership information from Bankscope data on central and Eastern European banks was obtained. This information was complemented with information from banks' websites and Bankscope data on parent banks to update ownership information for 2003 and 2004.

Merging in loan breakdowns: The central banks in six of the eight countries included in the study provided bank-by-bank data on the composition of loans, as collected by supervisory authorities. The data covered the period from 1995 to 2005 (except in the Czech Republic, where the coverage was from 2000 to 2005) and broke down total loans into (i) loans to households in local currency, (ii) loans to corporates in local currency, (iii) loans to households in foreign currency, and (iv) loans to corporates in foreign currency. For confidentiality reasons, most countries were unable to disclose the identity of the banks. Banks from the supervisory dataset and from the Bankscope dataset were matched using data on total loans and total assets. To reduce the likelihood of measurement errors and ensure data consistency, dummy variables identifying banks with rapidly growing household and foreign-currency portfolios, rather than actual data on household and foreign-currency loans, were used.

Table A1 Summary statistics

	Observations	Mean	Standard deviation	Minimum	Maximum
Bank credit growth	1,087	25.31	40.80	−86.74	198.24
Distance to default	1,087	13.55	12.89	−6.27	75.48
Net interest margin	1,086	4.21	2.79	−4.50	23.61
Cost-to-income ratio	1,081	71.99	76.90	−959.51	946.87
Liquidity ratio	1,077	16.74	16.61	0.00	98.39
Bank size	1,087	6.40	1.44	2.30	10.30
Real GDP growth	1,087	3.83	2.78	−2.97	12.05
GDP per capita	1,087	58.52	25.16	24.60	147.32
Real interest rate	1,087	2.29	3.74	−19.52	10.73
Real depreciation	1,087	−0.13	0.52	−2.94	2.59
Foreign ownership	1,087	41.98	45.20	0.00	100.00
Public ownership	1,087	10.50	28.09	0.00	100.00

Source: Bankscope and authors' estimates.

Table A2 Summary statistics by country

	Observations	Mean	Standard deviation		Observations	Mean	Standard deviation
Czech Republic				*Slovenia*			
Bank credit growth	159	25.99	46.19	Bank credit growth	133	15.93	24.95
Distance to default	159	13.32	14.49	Distance to default	133	24.27	14.36
Net interest margin	159	2.38	1.54	Net interest margin	133	3.88	1.90
Cost-to-income ratio	157	73.58	116.09	Cost-to-income ratio	133	70.87	37.23
Liquidity ratio	159	26.32	21.15	Liquidity ratio	133	12.71	7.26
Bank size	159	7.15	1.26	Bank size	133	6.18	1.05
Real GDP growth	159	2.44	2.33	Real GDP growth	133	3.66	1.51
GDP per capita	159	69.28	13.13	GDP per capita	133	112.30	14.40
Real interest rate	159	1.97	2.70	Real interest rate	133	0.13	1.95
Real depreciation	159	−0.14	0.33	Real depreciation	133	0.07	0.60
Foreign ownership	159	46.65	46.23	Foreign ownership	133	11.76	29.35
Public ownership	159	11.09	29.88	Public ownership	133	8.29	25.03
Hungary				*Estonia*			
Bank credit growth	192	20.73	36.11	Bank credit growth	34	40.67	36.64
Distance to default	192	12.15	9.15	Distance to default	34	9.95	9.51
Net interest margin	191	4.85	3.35	Net interest margin	34	4.61	1.84
Cost-to-income ratio	191	74.61	59.54	Cost-to-income ratio	34	76.94	31.46
Liquidity ratio	187	7.55	6.26	Liquidity ratio	31	7.50	11.96
Bank size	192	6.68	1.23	Bank size	34	5.82	1.63
Real GDP growth	192	3.77	2.01	Real GDP growth	34	6.93	2.32
GDP per capita	192	58.40	15.50	GDP per capita	34	47.25	14.54
Real interest rate	192	2.68	2.28	Real interest rate	34	−1.20	6.15
Real depreciation	192	−0.09	0.35	Real depreciation	34	−0.66	1.73
Foreign ownership	192	62.19	45.10	Foreign ownership	34	54.53	40.33
Public ownership	192	5.94	22.70	Public ownership	34	0.00	0.00

	Observations	Mean	Standard deviation		Observations	Mean	Standard deviation
Poland				*Latvia*			
Bank credit growth	262	25.49	36.95	Bank credit growth	137	36.99	54.27
Distance to default	262	12.51	9.47	Distance to default	137	8.86	12.76
Net interest margin	262	5.18	3.19	Net interest margin	137	4.66	2.57
Cost-to-income ratio	259	62.45	38.64	Cost-to-income ratio	137	82.63	95.15
Liquidity ratio	261	11.85	10.40	Liquidity ratio	137	12.22	15.26
Bank size	262	6.76	1.49	Bank size	137	5.09	1.18
Real GDP growth	262	3.24	2.04	Real GDP growth	137	6.94	2.18
GDP per capita	262	46.96	4.60	GDP per capita	137	36.40	8.86
Real interest rate	262	6.38	2.88	Real interest rate	137	−0.31	2.47
Real depreciation	262	−0.02	0.16	Real depreciation	137	−0.14	0.26
Foreign ownership	262	39.46	45.04	Foreign ownership	137	23.60	36.12
Public ownership	262	15.62	33.08	Public ownership	137	6.40	18.93
Slovak Republic				*Lithuania*			
Bank credit growth	119	17.65	35.60	Bank credit growth	51	40.18	50.61
Distance to default	119	12.72	14.47	Distance to default	51	13.94	15.02
Net interest margin	119	3.04	1.88	Net interest margin	51	4.67	2.28
Cost-to-income ratio	119	69.35	120.21	Cost-to-income ratio	51	82.93	21.99
Liquidity ratio	118	38.37	18.44	Liquidity ratio	51	23.91	11.12
Bank size	119	6.48	1.13	Bank size	51	5.57	1.53
Real GDP growth	119	1.89	2.60	Real GDP growth	51	6.07	4.48
GDP per capita	119	46.50	10.44	GDP per capita	51	39.51	10.88
Real interest rate	119	−0.27	2.72	Real interest rate	51	1.79	2.26
Real depreciation	119	−0.22	0.58	Real depreciation	51	−0.63	0.72
Foreign ownership	119	52.95	45.21	Foreign ownership	51	58.56	42.95
Public ownership	119	13.14	31.35	Public ownership	51	17.11	35.68

Source: Bankscope and authors' estimates.

Table A3 Variable description

Variable	Measuring	Description[a]	Data source
Distance to default	Risk of insolvency	Return on average assets plus equity (valued at market prices) as a percent of assets divided by the standard deviation of return on average assets	Bankscope
Net interest margin	Profitability	Interest income, on a taxable equivalent basis, earned on assets less interest expense paid on liabilities and capital divided by average earning assets	
Cost-to-income ratio	Efficiency	Total operating expenses divided by total operating income	
Liquidity ratio	Liquidity	Net liquid assets divided by total deposits	
Bank credit growth	Bank risk	Annual percentage change in total loans	Bankscope
Bank size		Logarithm of total assets	
Foreign ownership		Share of capital held by foreign investors	Bankscope, banking sector publications, banks' websites
Public ownership		Share of capital held by the government	
GDP per capita	Market risk	Real GDP per capita in hundreds of USD	IFS and WEO
Real GDP growth		Annual growth rate of real GDP	
Real interest rate		Money market rate minus inflation[b]	
Real depreciation		Annual percentage change in real exchange rate expressed in domestic currency per USD	

[a]Data used for all calculations are in USD, unless noted otherwise.
[b]In cases where data on money market rate are missing, deposit rate is used instead.

Notes

1. We gratefully acknowledge the cooperation of the central banks of the Czech Republic, Estonia, Lithuania, Poland, the Slovak Republic, and Slovenia in providing breakdowns of bank loan data. We also thank Ugo Panizza for sharing data; Susan Schadler, Juan Jose Fernandez-Ansola, Ashoka Mody, and Poonam Gupta for helping to conceptualise the study; Juan Carlos Flores and David Velazquez-Romero for excellent research assistance; and Jochen Andritzky, Helge Berger, Jörg Decressin, Martin CÏihák, Giovanni Dell'Ariccia, Enrica Detragiache, Wim Fonteyne, Gavin Gray, Paul Hilbers, Andy Jobst, Luc Laeven, Ashoka Mody, Ceyla Pazarbasioglu, Vassili Prokopenko, Christoph Rosenberg, Franek Rozwadowski, Piritta Sorsa, Rachel van Elkan, Jan Willem van der Vossen, and Kal Wajid for comments on an earlier draft. We are grateful to Paul Wachtel and an anonymous referee for helpful and insightful comments and to participants in the XIIIth Dubrovnik Economic Conference.

The usual caveats apply. This paper should not be reported as representing the views of the IMF. The views expressed in this paper are those of the authors and do not necessarily represent those of the IMF or IMF policy.

2. The third stream of literature has focused on the role of foreign-owned banks in credit expansion in central and Eastern Europe (see, eg, de Haas and van Lelyveld, 2006). These studies generally do not find any significant differences in the rate of loan growth in foreign- and domestically owned banks, while confirming that foreign-owned banks have a competitive advantage owing to their higher efficiency and liquidity.
3. Typically, market values of equity are used to calculate the value and volatility of assets. However, these calculations assume that bank stocks are traded in well-functioning and liquid markets. Since these assumptions may not hold for emerging European banks for the period in question, we use a simpler measure of DD based exclusively on balance sheet and income statement data. This measure is sometimes called *z-score* to differentiate it from the market price-based DD measure.
4. DD is weakly correlated with contemporaneous measures of return on assets and capital. It is primarily driven by the volatility of returns, which is a proxy for the risks faced by the bank.
5. The results are robust to alternative calculation methods of return volatility such as computing the standard deviation over 3-year rolling windows.
6. We consider dummy variables for the share of foreign or public ownership exceeding 50% as part of robustness analysis and controlling for the type of foreign ownership (through wholly owned subsidiaries or partial ownership following takeovers of domestic banks during privatisation) as part of robustness analysis.
7. The Arellano-Bond (1991) method, which is commonly used for estimating dynamic panel models, does not apply to a simultaneous-equation setting. We use this method on the credit growth equation only, as part of robustness checks.
8. We use robust standard errors in estimation, which renders similar significance levels as standard errors clustered by country.
9. For subsample analyses, total bank loan data from Bankscope were supplemented with supervisory data on breakdowns of bank loan portfolios by the currency of loan denomination or indexation and the type of borrower (household or corporate). These additional data were provided by the central banks of the central and Eastern European countries in question (except Hungary and Latvia) for research purposes on the condition of strict confidentiality.
10. Except for Hungary and Poland, where the coverage measured by the number of banks is slightly lower (64% and 55%, respectively).
11. For more information on data definitions and sources, see Appendix A.
12. Note that this approach to calculating DD implies a more sanguine assessment of the risks facing banks than the baseline approach of calculating the volatility of returns for the entire sample period, as the volatility of returns declined in the later part of the sample in part owing to favourable macroeconomic conditions.
13. The NPL ratio is an imperfect measure of bank soundness: it can be manipulated by the bank, for example, by restructuring and refinancing loans, to disguise poor asset quality (the evergreening problem).

14. We control for the type of foreign ownership by interacting the continuous foreign ownership variable with a dummy for banks privatized to foreigners. Privatization by selling to foreigners does not have a significant effect on bank soundness over the long run. Even though the coefficient on the interaction term is positive and marginally significant in the earlier period, it becomes negative and insignificant in the later period, suggesting that gains from privatization (at least in terms of enhancing bank soundness) are short-lived.
15. Results are also robust to excluding Slovenia, the most developed Eastern European economy.
16. The Bankscope data set for 1995–2002 was provided by Ugo Panizza. These data were used in a study of bank ownership and performance in developing and industrial countries (Micco *et al*., 2004).

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9

What Drives Bank Lending in Domestic and Foreign Currency Loans in a Small Open Transition Economy with Fixed Exchange Rate? The Case of Macedonia

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This paper investigates two different bank loan supply functions and their determinants according to the currency of bank loans in the Republic of Macedonia. There is robust statistical evidence in favour of the existence of a bank lending channel through foreign currency loans and the foreign reference interest rate. This suggests that the impact of domestic monetary policy over the bank lending channel is limited. The most significant bank-specific characteristic for the foreign currency loan supply function is bank size, whereas for the domestic currency loans no bank-specific variable plays a significant role.

Introduction

The main research aims of this paper are to empirically investigate the existence of the bank lending channel and its determinants in Macedonia. We estimate two different loan supply functions by disaggregating the loans by currency, in denars and in foreign currency (mainly in euros). The rationale for examining the two loan supply functions separately is the relatively high share of foreign currency loans in the total loans in the Macedonian banking sector (see Figure 9.1),

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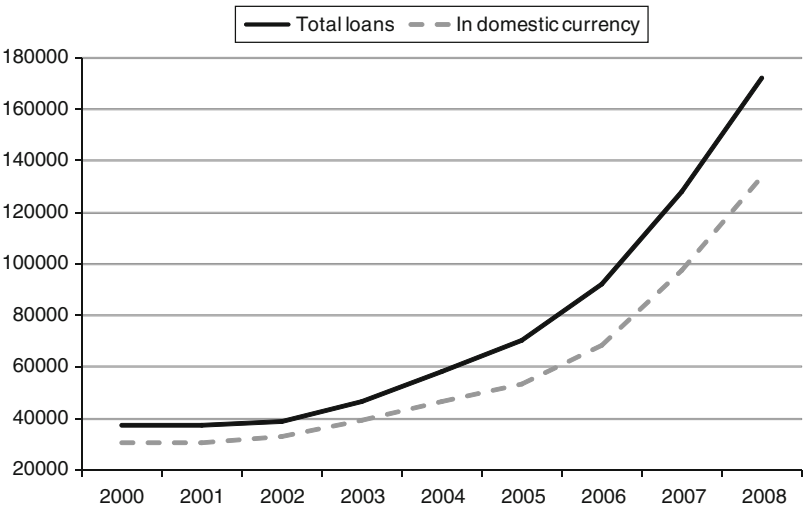

Figure 9.1 Stock of total bank loans and stock of loans in denars to non-financial private sector, in millions of denars
Source: NBRM (http://www.nbrm.mk/?ItemID=A55FFC32FC478E4A89444507A6C02C45).

which is typical of many transition economies, and the belief that such loans may respond to variables different from those affecting loans in domestic currency (Kohler *et al.*, 2005).

Hence, Macedonia's fixed exchange rate, banks' dependence on foreign financing and the level of currency substitution through the presence of foreign currency loans may thus weaken the impact of domestic monetary policy. According to the 'impossible trinity', a country's independent monetary policy setting under a fixed exchange rate and relatively high openness is very limited (Mundell, 1963; Fleming, 1962). This may also be the case in Macedonia. Hence, with this research we investigate whether changes in the domestic reference rate really matter for banks in Macedonia or whether changes in the foreign reference rate are more important in determining their loan supply decisions.

Literature review

The theoretical background of the bank lending channel was initially developed by Bernanke and Blinder (1988).[1] Empirical investigations of the bank lending channel for transition economies usually augment the standard model with some additional variables specific to transition economies. Those variables usually are: the real effective exchange rate

(*REER*), a foreign ownership variable and a foreign interest rate, typically the 3-month EURIBOR rate. The rationale for including the *REER* variable is, according to Schmitz (2004), to capture the effect of changes in the price competitiveness of these economies on banks' assets and their lending potential. A change in price competitiveness may affect the trade balance and the inflow and outflow of funds through the capital account. The latter may in turn directly affect banks' assets and change their lending potential. For example, according to Schmitz (2004), appreciation of the *REER* will worsen the price competitiveness of domestic products, resulting in a deterioration of the trade balance.[2] Consequently, net capital inflows will have to increase raising banks' assets and their lending potential and *vice versa*.

The foreign ownership variable is used to capture the impact of foreign capital in the banking sector on the loan supply. Foreign-owned banks thus react differently from domestically-owned banks in adjusting the quantity of loan supply when the reference rate changes due to the existence of internal capital markets within the foreign-owned banks (De Haas and Van Lelyveld, 2006). The inclusion of the foreign reference rate in the models is due to the high dependence of banks on foreign financing, as well as to the high share of foreign currency loans in total loans (Schmitz, 2004; Kohler *et al*., 2005).

A summary of empirical studies of the bank lending channel in transition economies that are most relevant to this paper are provided in Table 9.1.

These studies can be mainly divided into two groups depending on whether they augment the standard model by including both, the foreign and domestic interest rates or only the domestic rate. The common finding of the studies that include both interest rates, Schmitz (2004) for the eight new EU member states and Kohler *et al*. (2005) for the Baltic States, is that the bank lending channel works through changes in the foreign interest rate but not through the domestic rate. The common finding of the studies that include only the domestic interest rate in the model is that either they find weak evidence for its significant impact on the loan supply function (Matousek and Sarantis, 2009; Havrylchyk and Jurzyk, 2005), or the impact of the domestic interest rate on the loan supply function is much lower (Wrobel and Pawlowska, 2002; Chmielewski, 2006; Pruteanu-Podpiera, 2007 and Golodniuk, 2006) compared to the impact of the foreign interest rate in the studies that include both interest rates.

Regarding the bank-specific characteristics, the major similarity of the empirical analyses is that the most influential characteristic on bank lending decisions is the foreign-ownership variable, implying that foreign owned- banks reduce the quantity of loan supply proportionally

Table 9.1 Summary of the empirical studies that investigate the bank lending channel in transition economies

Country/ area	Study by:	Time period	Frequency of the data	Method of estimation	Size of N and T	Macroeconomic control variables used	Evidence of the existence of bank lending channel	Significant determinants of bank lending channel
Eight/ten new EU member states	Schmitz (2004)	1990–2001	Annual	Static Panel data with fixed effects	$N = 261$; $T =$ 1990–2001	Real GDP, CPI, REER, foreign ownership	YES, through EURIBOR	Foreign ownership, size weakly
	Matousek and Sarantis (2009)	1994–2003	Annual	Dynamic Panel data by 'difference' GMM estimator	N depends from the economy; $T =$ 1994–2003	Real GDP, CPI	Weak evidence through domestic interest rate	Liquidity and size weakly
Baltic States	Kohler *et al.* (2005)	1997–2004	Annual	Static Panel data by OLS	$N = 36$; $T =$ 1997–2004	Nominal GDP	YES, through EURIBOR	Foreign ownership, capitalisation, liquidity
Poland	Wrobel and Pawlowska (2002)	1997 Q1 –2001 Q4	Quarterly	Dynamic Panel data with fixed effects, estimated with Generalized Least Squares method	$N = 648$; $T =$ 1997Q1–2001Q4	Real GDP, CPI	YES	Capitalisation, liquiduty and size weakly
	Havrylchyk and Jurzyk (2005)	1995 Q1 –2002 Q4	Quarterly	Dynamic Panel data by 'difference' GMM estimator	$N = 67$; $T =$ 1995–2004	Real GDP, CPI, REER, foreign ownership	Weak evidence through domestic interest rate	Foreign ownership
	Chmielewski (2006)	1997 Q1 –2004 Q4	Quarterly	Dynamic Panel data by 'difference' GMM estimator	$N =$ N/A; $T =$ 1997–2004	Real GDP, CPI, REER, foreign ownership	YES	Foreign ownership and liquidity
Czech Republic	Pruteanu-Podpiera (2007)	1996 Q1–1998 Q4; 1999 Q1–2001 Q4	Quarterly	Dynamic Panel data by 'difference' GMM estimator	$N = 33$; $T =$ 1996–2001	Real GDP, CPI, foreign ownership	YES	Capitalisation
Ukraine	Golodniuk (2006)	1998–2003	Annual	Dynamic Panel data by 'difference' GMM estimator	$N = 149$; $T =$ 1998–2003	Real GDP, CPI, REER	YES	Capitalisation

less than the domestically owned banks when the interest rate increases (Schmitz, 2004; Kohler *et al*., 2005; Havrylchyk and Jurzyk, 2005 and Chmielewski, 2006). Another bank-specific characteristic that is commonly estimated to have a significant influence on the loan supply function is bank capital, suggesting that better capitalised banks cut the quantity of loans proportionally less than poorly capitalised banks when the interest rate increases (Kohler *et al*., 2005; Wrobel and Pawlowska, 2002; Pruteanu-Podpiera, 2007 and Golodniuk, 2006). The results in regard to the liquidity variable imply that, in the banking systems that have structural excess liquidity such as the Baltic States (Kohler *et al*., 2005) and Poland (Matousek and Sarantis, 2009; Wrobel and Pawlowska, 2002 and Chmielewski, 2006), its sign is opposite to what theory would predict. The results in respect of the asset size of the banks are mixed. The estimates indicate that it has either an insignificant impact (Kohler *et al*., 2005; Havrylchyk and Jurzyk, 2005; Chmielewski, 2006; Pruteanu-Podpiera, 2007 and Golodniuk, 2006), or where it is significant, the results are sensitive to model specifications (Matousek and Sarantis, 2009; Schmitz, 2004 and Wrobel and Pawlowska, 2002).

The estimates of the parameters of the macroeconomic control variables, *GDP*, *CPI* and *REER*, are controversial. The *GDP* and *REER* variables are estimated as statistically significant (Schmitz, 2004; Havrylchyk and Jurzyk, 2005 and Golodniuk, 2006), but the sign of these two variables is not consistent among the studies. The significance of the price level differs among the studies and depends upon the model specification and the country considered.

A major weakness in the majority of these studies is the estimation technique applied. Given the endogeneity of some of the independent variables in the model such as the lagged dependent variable, bank balance sheet items and the *GDP* and *CPI*, the majority of these studies use dynamic panel estimated with difference Generalized Method of Moments (GMM) (see Table 9.1). This estimation technique was seen as being able to deal with the endogeneity of the independent variables in these models most appropriately. However, there has been rapid development in the techniques used in dynamic panel analysis in recent years (Arellano and Bover, 1995; Blundell and Bond, 1998 and Roodman, 2006). Given these developments, the use of difference GMM does not now seem to be the most appropriate estimator due to the non-stationarity of the data. A system GMM estimator is more appropriate in the presence of a unit root process because it is more efficient and has better statistical properties. Therefore, we use the system GMM in estimating the bank lending channel in Macedonia.

An additional weakness of many of the aforementioned studies, apart from Schmitz (2004) and Kohler *et al*. (2005), is that they only include the domestic interest rate as a determinant of the loan supply function and do not consider the impact of the foreign interest rate, which is estimated to have a significant impact on bank lending. Moreover, the cited studies examine the functioning of the bank lending channel by using only the total stock of loans in all currency denominations. This may bias the results because it cannot distinguish to what extent and to which reference rate banks are more responsive, the domestic or the foreign.

Stylised facts about monetary developments and the banking system in Macedonia

Since gaining its monetary independence in 1992, the National Bank of the Republic of Macedonia (NBRM) has changed its monetary policy regime once. From the initial period of transition until the end of 1995, the monetary policy regime was oriented towards money supply targeting (for details see Trajkovic, 2006). At the end of 1995, policy makers switched to a fixed exchange rate by pegging the domestic currency to the German mark and later on to the euro (Trajkovic, 2006).

From the pegging of the exchange rate to the German Mark at the end of 1995 to 1999, the banking system lacked liquid assets. Consequently, the NBRM had to maintain the stability of the nominal exchange rate by injecting liquid assets into the banking system by auctioning bank credits. Since 2000, the liquidity of the Macedonian banking system has improved to the point where it is characterised by excess liquidity. Accordingly, the NBRM had to change its main monetary policy instrument and began to auction Central Bank (CB) Bills with maturity of 28 days to banks and the key policy rate was thus the respective CB Bills rate. This interest rate actually serves as an alternative investment for the banks, because banks can participate in the CB Bills auctions that are conducted exclusively on the primary market and for which no secondary market exists. The market for treasury bills (T-bills) is developing. The CB Bills share in banks' securities portfolio in 2008 equaled 60.4%, whereas the share of the T-bills was around 12%.

As in other transition economies, Macedonia's banking sector is dependent on foreign financing. The share of foreign liabilities in the structure of total banks' liabilities ranges from 8.5% in 2004 to 10.5% in 2008 (Source: NBRM, 2009, p. 20). There is also a relatively high proportion of foreign currency and foreign currency indexed loans.

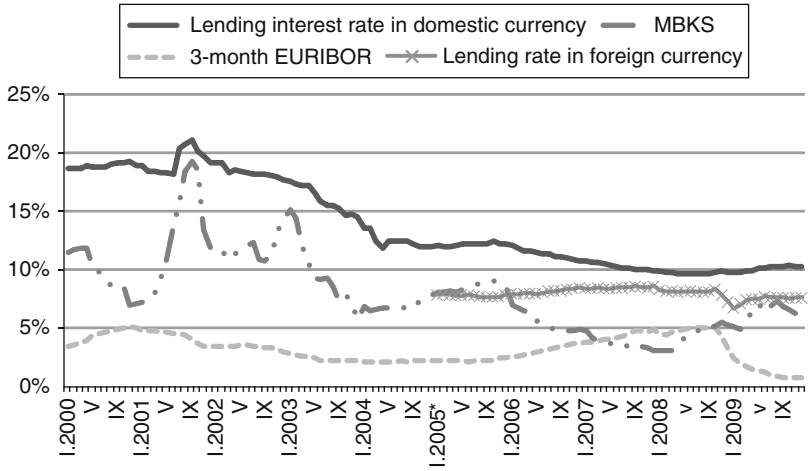

Figure 9.2 Movements of the MBKS rate, the lending rate in denars and foreign currency and the 3-month EURIBOR rate, in %
Source: NBRM (http://www.nbrm.mk/?ItemID=A55FFC32FC478E4A89444507A6C02C45) and EUROSTAT (http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home).

The average share of these loans has grown, reaching 56% of all bank loans in 2008.

The key policy rate (CB Bills rate) and the money market rate (MBKS) declined during the period 2000–2008 (see Figure 9.2).

The lending rates of loans denominated in domestic and foreign currency have also declined over time. However, their level has been higher compared to the MBKS rate and especially the 3-month EURIBOR. This may suggest that banks may be borrowing abroad to engage in a form of interest arbitrage.

The model

The specification used in this analysis is a stock-adjustment model, and is a modified version of that developed by Ehrmann *et al*. (2001) and Kierzenkowski (2005) for an economy with a fixed exchange rate that has a relatively high level of currency substitution. Hence, the modified version of the model presented here allows for the existence of two types of loans and deposits, domestic and foreign currency, in the portfolio structure of the banks. The model is derived as a simplified version of Bernanke and Blinder's (1988) model by incorporating bank-specific

characteristics as determinants of the banks' heterogeneous loan supply functions.

The model is based on three basic equations that model banks' deposits, banks' loan demand and loan supply, respectively. The derivation of the model is as follows[3]:

Banks' deposits (D) are assumed to equal money (M) and are composed of domestic (D_d) and foreign currency deposits (D_f) that are negatively determined by the domestic and foreign reference rates as an alternative risk free assets, r_d and r_f, respectively, (Ehrmann *et al*., 2003) and a constant (β):

$$M = D = D_d + D_f = -\psi_d r_d - \psi_f r_f + \beta \tag{1}$$

In the model, there are also two loan demand and loan supply functions according to the currency denomination of the loans. The domestic currency loan demand function (equation 2), is positively determined by the real income (y) and the price level (P) as macroeconomic control variables, negatively by the interest rate on loans denominated in domestic currency (ρ_d) and positively by the interest rate on loans denominated in foreign currency (ρ_f).

$$L_d^d = \varphi_1 y + \varphi_2 P - \gamma_1 \rho_d + \gamma_2 \rho_f \tag{2}$$

The negative association between the demand for domestic currency loans and their interest rate is due to increasing borrowers' costs of taking a domestic currency loan when the domestic currency loan interest rate increases. However, the borrowers' decision for taking a domestic currency loan is also affected by the interest rate on foreign currency loans. When the interest rate on foreign currency loans increases, ceteris paribus, then the differences between the cost of taking the domestic currency loans compared to the foreign currency loans have decreased, affecting borrowers' decision in favour of the domestic currency loan. In a simplified framework, this may actually represent the interest rate spread between the interest rate of loans denominated in domestic and foreign currency adjusted for risk. Hence, equation 2 can be simplified by introducing the interest rate spread between the interest rate of loans denominated in domestic and foreign currency adjusted by risk (S) (Kierzenkowski, 2005):

$$L_d^d = \varphi_1 y + \varphi_2 P - \varphi_3 S \tag{3}$$

Analogous reasoning can be used to derive the demand for foreign currency loans where, apart from their positive association with real income and price level, they are negatively influenced by the interest rate of loans denominated in foreign currency and positively by the interest rate of loans denominated in domestic currency:

$$L_f^d = \varphi_4 y + \varphi_5 P - \gamma_3 \rho_f + \gamma_4 \rho_d \tag{4}$$

By introducing the interest rate spread (S), defined in the same way as previously, equation 4 can be simplified to:

$$L_f^d = \varphi_4 y + \varphi_5 P - \varphi_6 S \tag{5}$$

Banks' decisions to supply domestic currency loans are positively associated with the amount of total banks' deposits (D) as a source of financing their lending activities and the interest rate on loans denominated in domestic currency (ρ_d) as a rate of return and negatively with the interest rate on loans denominated in foreign currency (ρ_f) and domestic and foreign reference rates (r_d and r_f, respectively).

$$L_d^s = \mu(D) + \gamma_5 \rho_d - \gamma_6 \rho_f - \varphi_8 r_d - \varphi_9 r_f \tag{6}$$

The supply of domestic currency loans is related to the interest rate on foreign currency loans because the latter represents an opportunity cost for the banks. When the interest rate on foreign currency loans increases, then the opportunity cost for the banks of placing their funds as domestic currency loans instead of foreign currency loans will increase as well. The supply of domestic currency loans is a negative function of domestic and foreign reference rates because these rates are the opportunity costs of banks when they borrow in the money market in order to finance their loan supply. The different loan supply reaction to interest rates of loans in domestic and foreign currency denominated loans may be again simplified by the interest rate spread between these two interest rates. Hence, by using the interest rate spread (S) as previously defined, the domestic currency loan supply (equation 6) can be presented as follows:

$$L_d^s = \mu(D) + \varphi_7 S - \varphi_8 r_d - \varphi_9 r_f \tag{7}$$

A similar specification describes the foreign currency loan supply function.

$$L_f^s = \mu(D) + \gamma_7\rho_f - \gamma_8\rho_d - \varphi_{11}r_d - \varphi_{12}r_f \tag{8}$$

By introducing the interest rate spread as defined previously, equation 8 can be written as:

$$L_f^s = \mu(D) - \varphi_{10}S - \varphi_{11}r_d - \varphi_{12}r_f \tag{9}$$

A major contribution of Ehrmann *et al*. (2001) is that the impact of banks' deposits on the quantity of loans supplied is inversely related to other banks' balance sheet characteristics such as size, liquidity and capital. The rationale for this is that when the size of these balance sheet items is larger, then banks are seen to be less dependent on banks' deposits as a source of financing their lending activities. Thus, banks may use one of the other balance sheet items to finance their lending activities or raise non-deposit funding. Consequently, the impact of these variables on the loan supply function is incorporated through the following equation:

$$\mu = \mu_0 - \mu_1 x \tag{10}$$

where μ refers to changes in banks' deposits and x represents one of the aforementioned bank-specific characteristics.
The equilibrium of the market for domestic currency loans, calculated as a reduced form of the model, is:

$$L_d = \frac{\begin{array}{c}\varphi_1\varphi_7\gamma + \varphi_2\varphi_7 P - (\mu_0\psi_d + \varphi_8)\varphi_3 r_d - (\mu_0\psi f + \varphi_8)\varphi_3 rf \\ +\mu_1\psi d\varphi_3 r_d x + \mu_1\psi f\varphi_3 rfx + \mu_0\varphi_3\beta - \mu_1\varphi_3\beta x\end{array}}{\varphi_3 + \varphi_7} \tag{11}$$

The equilibrium of the market for foreign currency loans, calculated as a reduced form of the model, is:

$$L_f = \frac{\begin{array}{c}\varphi_4\varphi_{10}\gamma + \varphi_5\varphi_{10} P - (\mu_0\psi d + \varphi_{11})\varphi_6 r_d - (\mu_0\psi f + \varphi_{12})\varphi_6 rf \\ +\mu_1\psi d\varphi_6 r_d x + \mu_1\psi f\varphi_6 rfx + \mu_0\varphi_6\beta - \mu_1\varphi_6\beta x\end{array}}{\varphi_6 + \varphi_{10}} \tag{12}$$

Equations 11 and 12 can be simplified so that:

$$L_d = \beta_0 + \beta_1\gamma + \beta_2 P - \beta_3 r_d - \beta_4 r_f + \beta_5 r_d x + \beta_6 r_f x + \beta_7 x \tag{13}$$

where $\beta_5 = \frac{\mu_1\psi d\varphi_3}{\varphi_3 + \varphi_7}$ and $\beta_6 = \frac{\mu_1\psi f\varphi_3}{\varphi_3 + \varphi_7}$ from equation 11; and

$$L_f = \alpha_0 + \alpha_1 y + \alpha_2 P - \alpha_3 r_d - \alpha_4 r_f + \alpha_5 r_d x + \alpha_6 r_f x + \alpha_7 x \qquad (14)$$

where $\alpha_5 = \frac{\mu_1 \psi d \varphi_6}{\varphi_6 + \varphi_{10}}$ and $\alpha_6 = \frac{\mu_1 \psi f \varphi_6}{\varphi_6 + \varphi_{10}}$ from equation 12.

The coefficients β_5 and β_6 from equation 13 and coefficients α_5 and α_6 from equation 14 are the coefficients of the interaction terms between the domestic and foreign reference interest rate and banks' specific characteristics. They show the asymmetric reaction of different banks with different financial characteristics in changing the quantity of loan supply induced by changes in the respective reference rates.

On the basis of the foregoing discussion, the basic stock-adjustment model used in this paper is augmented by the explanatory variables *REER* and foreign ownership, which are seen to be specific for the case of transition economies.

The general unrestricted model by each bank has the following specification:

$$\begin{aligned} \log(Loans_{i,t}) = {} & \beta_0 + \beta_1 \log(Loans_{i,t-1}) + \beta_2 MPID_t \\ & + \beta_3 MPIF_t + \beta_4 \log(GDP_t) \\ & + \beta_5 \log CPI_t + \beta_6 \log REER_t \\ & + \beta_7 X_{i,t} + \beta_8 X_{i,t} MPID_t + \beta_9 X_{i,t} MPIF_t \\ & + \beta_{10} ForOwnDum_{i,t} + \beta_{11} MPID_t ForOwnDum_{i,t} \\ & + \beta_{12} MPID_t ForOwnDum_{i,t} + \varepsilon_{i,t} \end{aligned} \qquad (15)$$

Where: β_0 is the intercept term of the regression; $Loans_{i,t-1}$ is the stock of loan by bank i in year $t-1$ in domestic currency and foreign currency, respectively; $MPID_t$ is the domestic interest rate in year t; $MPIF_t$ is the foreign interest rate in year t; GDP_t is the gross domestic product in real terms in year t; CPI_t is the consumer price index in year t; $REER_t$ is the real effective exchange rate of Macedonian denar in year t; $X_{i,t}$ is bank-specific characteristic such as liquidity, size and capitalisation ratio by bank i in year t; $X_{i,t}MPID_t$ and $X_{i,t}MPIF_t$ are interaction terms between each of the aforementioned bank-specific characteristic and the domestic and foreign reference rates by bank i in year t, respectively; $ForOwnDum_{i,t}$ is the foreign ownership dummy variable by bank i in year t. We assign value of 1 if the bank is foreign-owned and 0 otherwise. Foreign-owned bank is defined as bank where the foreign capital combines more than 50% of total shareholders capital; $MPID_tForOwnDum_{i,t}$ and $MPID_tForOwnDum_{i,t}$ are interaction terms between foreign ownership dummy variable and the domestic and foreign reference rates by

bank i in year t, respectively; $\varepsilon_{i,t}$ is the error term composed of v_i – group specific time-invariant unobservable bank- specific effect plus $u_{i,t}$ – i.i.d error term by bank i in year t; i and t are bank and time specific subscripts; β_1, β_2, β_3, β_4, β_5, β_6, β_7, β_8, β_9, β_{10}, β_{11} and β_{12} are parameters to be estimated in the model.

Bernanke and Blinder (1988) assume that inflation and inflationary expectations are constant. However, in empirical studies this assumption cannot be made and there is some inconsistency in its treatment in previous studies. In our model, we include all variables, except *GDP* and *REER*, in nominal terms. The argument for including these exceptions in real terms is that we are interested in examining how aggregate demand (*GDP*) affects credit growth. Accordingly, if we include nominal *GDP* we cannot establish whether changes in loan growth are caused by the real output changes or inflation.

The reason for the lagged dependent variable in the model, as argued by Bernanke and Blinder (1988), is because the model is designed as a stock- adjustment model allowing for some inertia in the adjustment of the stock of loans, that is, the current value may be determined by its own past value. The sign of the parameter is expected to be positive.

The interest rates are included to indicate if there is direct response of loans to their changes. The expected sign of both rates is negative. As representative domestic interest rate we have selected the domestic MBKS, whereas for representative foreign interest rate we chosen the 3-month EURIBOR.

GDP and *CPI* control for demand side effects and the business cycle in the economy. However, the estimated impact of these two variables should be viewed with caution because, in the transition economies, these variables may also capture some other non-economic factors that may influence the loan demand. Particularly in the case of Macedonia, the loan demand may be affected by the transition process that was characterised by a wave of bank failures in the initial period of transition and a wave of failures of savings houses later.

The rationale for adding the *REER* as a measure of the price competitive- ness of domestic products was explained in the Section 'Literature review'. However, for the inclusion of this variable in the case of the Macedonian economy have to be taken with caution because the trade balance deter- ioration caused by appreciation of the *REER* is not fully covered by capital inflows. It is largely covered by other sources, such as private transfers that in 2008 accounted around 14% of the nominal *GDP*.

The impact of each of the three bank-specific characteristics, size, liquidity and capitalisation, and their interaction terms with the MBKS

was explained in the model presented in the beginning of this section. Hence, according to equations 13 and 14, the signs of the single terms of these three balance sheet items and their interaction terms with the reference rate are expected to be positive.

A foreign ownership dummy variable and its interaction term with the policy rate aim to control for the effect of foreign ownership in the banking sector explained in Section 'Literature review'. The signs of both parameters are expected to be positive. However, in the case of Macedonia there may be a divergence between the legal definition of foreign-owned banks (*de jure*) and the one in practice (*de facto*) that may bias the results (Bogoev, 2010). Accordingly, it is not clear that the foreign-ownership variable will have a significant impact on the bank lending channel.

Data issues and summary statistics

We use bank balance sheet data obtained from Banking Supervision Department of the NBRM, which is not publicly available (for details see Appendix). We work with quarterly data with a sample period from 2000 to 2008. The sample is restricted to this time span because the balance sheet items for each individual bank over this period were constructed according to the same accounting methodology with only minor modifications. The balance sheet data before 2000 were not available for all banks and complied according to a different accounting methodology. At the end of 2008, an important methodological change in to the classification of the balance sheet items was implemented and, therefore, later data are not comparable.

The original unbalanced data set that comprises all banks in Macedonia includes 24 banks. However, the sample was adjusted for mergers and acquisitions among banks by backward aggregation of the balance sheet items. Although this is the most commonly used approach in the literature (Ehrmann *et al*., 2001; Worms, 2001; Gambacorta, 2005; Farinha and Marques, 2003; De Haan, 2001; Havrylchyk and Jurzyk, 2005 and Pruteanu-Podpiera, 2007), this may bias the data because changes in the management of the merged bank and the know-how of the staff are not controlled for. After the adjustment of the sample for the mergers between two banks that occurred in 2001 and 2006 and two acquisitions in 2001 respectively, over the whole sample period we work with an unbalanced set of 20 banks. Detailed description of each data series used in the model is presented in Appendix.

Following the approach of Ehrmann *et al*. (2001), the bank-specific characteristics are transformed as follows:

$$Size_{i,t} = \log A_{i,t} - \frac{1}{N_t}\sum_i \log A_{i,t} \tag{16}$$

$$Liq_{i,t} = \frac{L_{i,t}}{A_{i,t}} - \frac{1}{T}\sum_t \left(\frac{1}{N_t}\sum_i \frac{L_{i,t}}{A_{i,t}}\right) \tag{17}$$

$$Cap_{i,t} = \frac{C_{i,t}}{A_{i,t}} - \frac{1}{T}\sum_t \left(\frac{1}{N_t}\sum_i \frac{C_{i,t}}{A_{i,t}}\right) \tag{18}$$

Where: $A_{i,t}$, $L_{i,t}$, and $C_{i,t}$ = assets, liquidity and size by bank i in year t, respectively; N and T = the size and the time length of the sample respectively; i and t = bank and time specific subscripts.

The main reason for this normalisation is that the average of the interaction term $X_{it}MPID_t$ and $X_{it}MPIF_t$ from the equation 15 is zero and consequently, the coefficients β_8 and β_9 are interpreted as the direct impact of domestic and foreign reference rates on banks' loans respectively, conditional on these bank financial characteristics (Ehrmann *et al*., 2001; Gambacorta, 2005). Another reason for the normalisation is that in this way any disturbances caused by minor methodological changes in the balance sheet data can be reduced (Chmielewski, 2006).

Estimation results

In interpreting the results, we will focus on both short-run estimates (Tables 9.2 and 9.3) and long-run estimates (Table 9.4).[4] By estimating the model with system GMM, in order to circumvent the problem of creation of too many instruments *N*, we restrict and collapse the instrument set with the xtabond2 command (Roodman, 2006). Thus, the total number of instruments created was reduced considerably and ranges from 23 for regressions 1–3 in Table 9.2 and regression 2 in Table 9.3 to 30 for regressions 1 and 3 in Table 9.3. In selecting the most parsimonious model, we assess a battery of diagnostic tests such as the Arellano-Bond test for the second-order serial correlation and the Hansen test for the joint validity of the instrument sets. Additionally, we performed the difference-in-Hansen test that may be used to test whether the system GMM is better than the difference GMM. As suggested by Sarafidis *et al*. (2006), this may be used as a proxy indicator for the presence of cross- sectional dependence.

Table 9.2 Short-run estimates of outstanding loans in domestic currency

Variables	Regression 1	Regression 2	Regression 3
	Controlling for size	Controlling for liquidity2	Controlling for capital
L.lLoansDen	**0.816*** **	**0.841*** **	**0.842*** **
W-C S.E.	0.089	0.070	0.104
MBKS	**−0.021** **	**−0.023*** **	**−0.014** **
W-C S.E.	0.010	0.006	0.006
EUR	0.012	0.015	0.010
W-C S.E.	0.012	0.012	0.017
lCPI1	**1.564***	0.623	0.029
W-C S.E.	0.767	0.580	0.560
lGDPr	**−0.493***	**−0.443** **	**−0.518***
W-C S.E.	0.271	0.207	0.273
SizeNorm	0.061	–	–
W-C S.E.	0.086	–	–
SizenormMBKS	0.002	–	–
W-C S.E.	0.005	–	–
SizenormEUR	0.028	–	–
W-C S.E.	0.025	–	–
Liquid2Norm	–	−0.728	–
W-C S.E.	–	1.050	–
Liquid2normMBKS	–	0.035	–
W-C S.E.	–	0.065	–
Liquid2normEUR	–	0.143	–
W-C S.E.	–	0.155	–
CapitalNorm	–	–	0.315
W-C S.E.	–	–	0.541
CapitalnormMBKS	–	–	−0.038
W-C S.E.	–	–	0.046
CapitalnormEUR	–	–	−0.203
W-C S.E.	–	–	0.207
Constant	0.981	3.030	6.445**
W-C S.E.	2.722	2.207	3.045
Number of observations	635	635	635
Number of banks	20	20	20
Number of instruments	23	23	23
F-test for the significance of the whole regression (*p*-value)	*F*(8, 19)=925.35 (0.00)	*F*(8, 19)=1096.21 (0.00)	*F*(8, 19)=309.57 (0.00)
AR(1)/(*p*-value)	−2.41 (0.02)	−2.53 (0.01)	−2.74 (0.01)
AR(2)/(*p*-value)	0.06 (0.95)	−0.20 (0.85)	−0.49 (0.62)
Hansen (*p*-value)	0.87	0.82	0.48
Difference in Hansen 'system' (*p*-value)	0.96	0.50	0.76
Difference in Hansen cross-sectional correlation (*p*-value)	0.49	0.90	0.23
Estimates of L.lLoansDen with FE	0.67	0.75	0.74
Estimates of L.lLoansDen with OLS	0.86	0.92	0.89

Dependent variable: log of the stock of loans denominated in domestic currency.
Notes: Estimated by two-step 'system' GMM estimator with Windmeijer (2005) corrected standard errors, by restricting and collapsing the instrument set with the command xtabond2.
***/**/* denote significance at 1%, 5% and 10% level of significance, respectively.
Windmeijer (2005) corrected standard errors in parenthesis.
Computations have been done in STATA 10.

The final model specifications are variants of the general form presented in equation 15. The initial investigation started from this as reflecting the underlying theory and variables found to be important elsewhere in the transition environment. However, in our specification search we were aware of the need to specify as restricted a model as possible, given the need to keep the number of instruments relatively low.

Starting with the most general model presented in equation 15, for both domestic and foreign currency loans we started by assessing the impact and the statistical significance of the *REER* variable. The results from both models for domestic and foreign currency loans indicated that this variable is statistically insignificant at the 10% level.[5] Thus, given the economic arguments that in the case of Macedonia this variable may *a priori* have an ambiguous impact and its statistical insignificance, we decided to exclude it from the model. We next assessed the statistical significance of the foreign ownership variable and its interaction term with the MBKS. The results indicated that in all model specifications both terms are jointly insignificant at the 10% level. Moreover, even using some insider information from the Banking Supervision department from the NBRM in order to clearly distinguish which banks are *de facto* foreign-owned and which only *de jure* in defining the dummy variable, the foreign ownership remained statistically insignificant.[6] The results of the more restricted model are discussed in the following subsection.

Interpretation of the results of the most parsimonious model

The two-step results with Windmeijer (2005)-corrected standard errors for the short-run relationship among the variables for the currency disaggregated loans are presented in Tables 9.2 and 9.3, whereas the estimates for the long-run relationship among the variables are presented in Table 9.4. The regressions are classified according to the interaction term of each bank-specific characteristic.

As can be seen from the results, all model specifications satisfy the criteria of no second-order serial correlation in the residuals. The null hypothesis of the Arellano-Bond test cannot be rejected at a 10% level of significance (Tables 9.2 and 9.3). The results of Hansen test point to non-rejection of the null hypothesis of validity of the over-identifying restrictions at the 10% level of significance (Tables 9.2 and 9.3). By restricting and collapsing the instrument sets, we managed to substantially reduce the number of instruments. Accordingly, we were able to reduce the *p*-value of Hansen test much below 1 so that it ranges from 0.48 to 0.89.

Table 9.3 Short-run estimates of outstanding loans in foreign currency (mainly in euros)

Variables	Regression 1	Regression 2	Regression 3
	Controlling for size	Controlling for liquidity2	Controlling for capital
L.lLoansFX	**0.627*** **	**0.596*** **	**0.546*** **
W-C S.E.	0.149	0.065	0.033
MBKS	−0.005	−0.007	−0.002
W-C S.E.	0.032	0.016	0.011
EUR	**–0.196** **	**–0.109** **	**–0.177*** **
W-C S.E.	0.075	0.052	0.029
lCPI1	−1.332	−3.114	0.372
W-C S.E.	1.641	3.211	1.299
lGDPr	**1.789***	**1.741*** **	**1.281** **
W-C S.E.	0.866	0.553	0.534
SizeNorm	−0.362	–	–
W-C S.E.	0.409	–	–
SizenormMBKS	0.006	–	–
W-C S.E.	0.026	–	–
SizenormEUR	**0.219** **	–	–
W-C S.E.	0.094	–	–
Liquid2Norm	–	**–5.584** **	–
W-C S.E.	–	2.181	–
Liquid2normMBKS	–	0.093	–
W-C S.E.	–	0.105	–
Liquid2normEUR	–	0.42	–
W-C S.E.	–	0.490	–
CapitalNorm	–	–	**4.240*** **
W-C S.E.	–	–	1.627
CapitalnormMBKS	–	–	0.064
W-C S.E.	–	–	0.049
CapitalnormEUR	–	–	−1.132
W-C S.E.	–	–	1.350
Constant	−6.979	2.075	−8.072
W-C S.E.	7.342	7.360	6.030
Number of observations	478	478	478
Number of banks	18	18	18
Number of instruments	30	23	30
F-test for the significance of the whole regression (*p*-value)	*F*(8, 17)=26.44 (0.00)	*F*(8, 17)=1023.19 (0.00)	*F*(8, 17)=6646.16 (0.00)
AR(1)/(*p*-value)	−1.32 (0.19)	−1.40 (0.16)	−1.34 (0.18)
AR(2)/(*p*-value)	−0.70 (0.49)	−0.77 (0.44)	−0.80 (0.42)
Hansen (*p*-value)	0.89	0.66	0.87
Difference in Hansen 'system' (*p*-value)	0.80	0.65	0.73
Difference in Hansen cross-sectional correlation (*p*-value)	0.95	0.51	0.98
Estimates of L.lLoansFX with Fixed Effects (FE)	0.61	0.55	0.53
Estimates of L.lLoansFX with Ordinary Least Squares (OLS)	0.78	0.81	0.76

Dependent variable: log of the stock of loans denominated in foreign currency.
Notes: Estimated by two-step 'system' GMM estimator with Windmeijer (2005) corrected standard errors, by restricting and collapsing the instrument set with the command xtabond2.
***/**/* denote significance at 1%, 5% and 10% level of significance, respectively.
Windmeijer (2005) corrected standard errors in parenthesis.
Computations have been done in STATA 10.

As an additional specification test, we conducted the difference-in-Hansen test for the joint validity of the differenced instruments used for the levels equation. The results indicated that at a 10% level of significance we cannot reject the null hypothesis of their joint validity, supporting the choice of system over difference GMM (Tables 9.2 and 9.3). Moreover, as a rough test for the presence of cross-sectional dependence in the model, we conducted the difference-in-Hansen test for the validity of the instruments for the two lagged values of the dependent variable (Sarafidis *et al*., 2006; Pugh *et al*., 2010). At a 10% level of significance, we cannot reject the null hypothesis for the joint validity of the instruments for the lagged values of the dependent variable (Tables 9.2 and 9.3).

The lagged value of the log of outstanding loans for both denar and foreign currency loans is, as expected, highly significant and has a positive sign. For lagged denar loans, the coefficient is around 0.8 (Table 9.2) and for the lagged foreign currency loans is around 0.6 (Table 9.3). These results imply relatively high inertia in the adjustment process of the stock of both domestic and foreign currency loans, although higher for domestic currency loans, which might be due to the higher share of long-term loans in domestic currency loans compared to the foreign currency loans.

For domestic currency loans, the coefficient for the domestic MBKS is negative and significant in all regressions, whereas the foreign reference rate (EURIBOR) is insignificant in all regressions for both short- and long-run estimates. The size of the short-run estimates is quite low and ranges between −1.4% and −2.3% (Table 9.2), for a 1% point increase in MBKS. For the long-run estimates, this coefficient is statistically significant in two out of the three regressions and ranges between −12% and −15% (Table 9.4). Thus, the evidence suggests that domestic currency loans react significantly to changes in the domestic MBKS in the short- and long-run but not to the foreign reference rate. However, this reaction is quite sluggish, which may imply that domestic monetary policy is relatively ineffective and the possibility for independent interest rate setting is quite limited.

Regarding the sensitivity of foreign currency loans, the results imply the reverse. More precisely, the foreign currency loans in both, short- and long-run react significantly to changes in the foreign reference rate. However, they do not react significantly to changes in the domestic reference rate. The short-run reactions range from −11% to around −20% (Table 9.3), whereas the long-run estimates range from −29% up to −41% (Table 9.4). This suggests that banks adjust their foreign currency

Table 9.4 Long-run estimates of outstanding loans in domestic and foreign currency (mainly in euros), respectively

	Estimates of the long-run relationship among the variables for the domestic currency loans based on the short-run estimates from table 2	**Long-run relationship among the variables for the foreign currency loans based on the short-run estimates from table 3**
Regression 1 – model with size		
MBKS	−0.115*	−0.011
EUR	0.063	−0.414***
lCPI	8.515***	−2.814
lGDPr	−2.687	3.781**
SizeNorm	0.331	−0.765
SizenormMBKS	0.009	0.012
SizenormEUR	0.153	0.463***
Regression 2 – model with liquidity		
MBKS	−0.282	−0.014
EUR	0.161	−0.287***
lCPI	9.61	−6.18
lGDPr	−5.553	3.456***
Liquid2Norm	−10.400	−11.085**
Liquid2normMBKS	0.088	0.184
Liquid2normEUR	1.442	0.833
Regression 3 – model with capital		
MBKS	−0.145*	−0.002
EUR	0.148	−0.321***
lCPI	0.509	0.672
lGDPr	−8.947**	2.313**
CapitalNorm	5.438	7.656**
CapitalnormMBKS	−0.66	0.114
CapitalnormEUR	−2.512	−2.043

***/**/* denotes significance at 1%, 5% and 10% level of significance, respectively. Computations have been done in STATA 10.

loans in response to changes in the foreign reference rate in both, short and long run but not to the changes in the domestic reference rate. Furthermore, by comparing the size of the coefficients, we see that banks' foreign currency loan supply function is much more sensitive in the interest rates than is the domestic loan supply function. These findings imply that in small open transition economies, especially in those that have a fixed exchange rate regime, the domestic monetary policy may be quite ineffective and its impact over the banks' loan supply function is quite limited, consistent with the concept of 'impossible trinity'.

Regarding the macroeconomic control variables, the price level (*CPI*) enters positively as expected for both, short- and long-run estimates but it is statistically significant only in the model controlling for the size of the banks. Regarding the size of the short-run estimates, where significant, the price elasticity of loan supply is 1.6 (Table 9.2), whereas the long-run estimate, where significant, is 8.5 (Table 9.4). In the regressions for foreign currency loans, the price level does not enter significantly in any of the three models for the short- and long-run relationship (Tables 9.3 and 9.4). This may be explained by the possibility that banks in granting foreign currency loans believe they are hedged from the possible risks of an unstable macroeconomic environment and higher inflation, and the risks of possible depreciation of the nominal exchange rate are transmitted to the borrowers. These results suggest that the price level matters only for banks' loans in the domestic currency loan due to the possible risk of currency depreciation or price instability.

The other macroeconomic control variable (*GDP*) in both domestic and foreign currency loan supply functions enters significantly in both short- and long-run estimates (Tables 9.2, 9.3 and 9.4, respectively). For domestic currency loans, the coefficient is negative. The cases where *GDP* has an insignificant impact are consistent with the findings of Matousek and Sarantis (2009). However, *GDP* enters significantly and with a correct (positive) sign in the short- and long-run estimates for the foreign currency loan supply function, indicating that as economic activity intensifies, banks supply more foreign currency loans.

Regarding the single and the interaction terms of the bank-specific characteristics, the results for the domestic currency loans suggest that none of the single and interaction terms enter significantly in the short- and long- run relationship. Thus, bank characteristics do not play significant role in banks domestic currency decisions.

With the foreign currency loans, the single terms of liquidity and capital enter significantly in the loan supply function for both short- and long-run estimates. Nonetheless, the sign of the single term in respect of liquidity is contrary to the theoretical predictions, probably due to the structural excess liquidity of the banking system that may bias the results. Nonetheless, these results are in line with Wrobel and Pawlowska (2002), Matousek and Sarantis (2009) and Chmielewski (2006) for the case of Poland and Kohler *et al*. (2005) for the Baltic States whose banking systems are also characterised with structural excess liquidity.

Regarding the interaction terms, size is statistically significant with a positive sign in both the short- and long-run horizon. This indicates that bank size is a significant determinant of the heterogeneous loan supply function

in respect of foreign currency loans among Macedonian banks, implying that larger banks reduce the quantity of loan supply by proportionately less when the foreign reference rate tightens than do smaller banks.

Robustness check[7]

The robustness of the results has been checked by using different GMM estimators. More precisely, we have re-estimated the same model specifications with a one-step system GMM estimator with robust standard errors by restricting and collapsing the number of instrument sets, using the xtabond2 command. We have also re-run the same model specifications with the two-step system GMM estimator with Windmeijer (2005) corrected standard errors by only restricting the number of instruments used for the endogenous variables using the STATA default command xtdpd. An additional informal robustness check of the estimates, suggested by Roodman (2006) and Bond (2002), is to verify if the estimates of the lagged dependent variable lie between the estimates using Fixed Effects (FE) and Ordinary Least Squares (OLS) (see Tables 9.2 and 9.3). The first method tends to bias the estimates downwards, while the second method tends to bias the estimates upwards.

In re-estimating the same regressions by one-step system GMM with robust standard errors and reducing and collapsing the instrument sets, the results indicate that all model specifications again satisfy all diagnostic criteria mentioned in Section 'Interpretation of the results of the most parsimonious model'. Regarding the sign and size of the coefficients, the results in general are similar to the ones discussed previously. The only exception is the size of the lagged coefficients of the foreign currency loans and domestic currency loans, which now are a bit higher suggesting a higher inertia in the stock of loan adjustment. Regarding the significance of the coefficients, the major difference in respect of the domestic currency loans is that now the price level enters statistically insignificant in the regression controlling for bank size.

In re-estimating the same model specifications by only restricting the number of instruments with the two-step system GMM estimator with Windmeijer (2005) corrected standard errors, the total number of instruments created increased to more than 100 instruments, depending on the model specification. According to the estimates, again all model specifications fulfil the criteria of no second-order serial correlation, as indicated by Arellano- Bond test. However, although the results of Sargan test indicate that the null hypothesis could not be rejected at a 10% level of significance, the *p*-value of this test in all regressions equals 1. Hence, this implies that the regressions suffer from the problem of too many

instruments (Roodman, 2006, 2008). This weakens the power of the Sargan test and the estimates should be treated with caution. Regarding the sign and magnitude of the coefficients, they are broadly consistent with the two-step estimates reported in the previous subsection.

Conclusions

The aim of this paper is to investigate the bank lending channel and its determinants in Macedonia and to draw a conclusion about the effectiveness of the domestic monetary policy through the bank lending channel. We investigate two different loan supply reaction functions according to the currency of the loans.

The short- and long-run estimates indicate to the existence of a lending channel mainly through the foreign currency loan supply function, which significantly reacts only to changes in the foreign reference rate that is beyond the scope of domestic monetary policy makers. The loan supply function of domestic currency loans reacts only to the changes in the domestic reference rate, but the reaction of the latter is quite weak. This implies that the bank lending channel mainly works through the foreign currency loans and foreign reference rate and the impact of the domestic reference rate is quite limited, consistent with the concept of 'impossible trinity'. Moreover, if the increasing trend of the share of foreign currency loans in the total loans in Macedonia continues (see Figure 9.1), then it may reduce the effectiveness of the domestic monetary policy through the bank lending channel even more in future. The findings presented in this paper are robust to different model specifications and different estimation methods.

Appendix

Data description and construction of the variables used in the model

- LoansDen is the natural logarithm of the nominal value of the stock of outstanding loans to non-financial private sector denominated in denars for each bank individually. Source: author's own calculations upon the data from the Banking Supervision Department of the NBRM. The data is not publicly available.
- LoansFX is the natural logarithm of the nominal value of the stock of outstanding loans to non-financial private sector denominated in foreign currency (mainly in euros) for each bank individually. Source:

author's own calculations upon the data from the Banking Supervision Department of the NBRM. The data is not publicly available.

- MBKS is the weighted average interbank interest rate in nominal terms, in %. Source: NBRM (http://www.nbrm.mk/default.asp?ItemID=9A4CA3589A2 C094A92E4C4EE74B8934C).
- EUR is 3-month EURIBOR in nominal terms, in %. Source: EUROSTAT (http:// epp.eurostat.ec.europa.eu/portal/page/portal/interest_rates/introduction).
- *GDP*r is the natural logarithm of the gross domestic product of the Republic of Macedonia in denars and exchange rate from 1997. Source: author's own calculations upon the data from the State Statistical Office of Macedonia (http:// www.stat.gov.mk/statistiki.asp?ss=09.01&rbs=0).
- *CPI*1 is the natural logarithm of the consumer price index of the Republic of Macedonia with base year: 2000 = 100. Source: author's own calculations upon the data from the State Statistical Office of Macedonia (http://www .stat.gov.mk/statistiki.asp?ss=08.01&rbs=0).
- *REER* is the natural logarithm of the real effective exchange rate of Macedonia with base: 2003 = 100. Source: author's own calculations upon the data from the Research Department from the NBRM. The data is not publicly available.
- Size is the natural logarithm of the asset size of each bank individually. In nominal terms normalised according to equation 16. Source: author's own calculations upon the data from the Banking Supervision Department of the NBRM. The data is not publicly available.
- Liquid2 is the ratio of liquid over total assets, both in nominal terms for each bank individually. The liquidity includes: cash in vault at the NBRM+short term deposits in accounts in banks abroad+CB bills and T-bills with maturity up to 1 year+cheques and overdrafts+short-term restricted deposits in accounts in banks abroad+short-term security holdings issued by banks and saving houses+short-term bonds issued by the state+short-term credits granted to banks abroad. Source: author's own calculations upon the data from the Banking Supervision Department of the NBRM. The data is not publicly available.
- Capital is the ratio of equity + reserves over total assets, in nominal terms, for each bank individually. Source: author's own calculations upon the data from the Banking Supervision Department of the NBRM. The data is not publicly available.
- ForOwn is the foreign ownership dummy variable for each bank individually. Value of 1 if the bank is foreign owned and 0 otherwise. Foreign owned-bank is defined as bank where minimum 50%

of shareholders capital is foreign owned. Source: Banking Regulation Department of the NBRM. The data is not publicly available.

Notes

1. There are previous attempts in the literature that tackle the issue of existence of bank lending channel, but formally the first model that depicts the lending channel is that of Bernanke and Blinder (1988).
2. Appreciation refers to worsening of the price competitiveness of domestic products. Appreciation of the REER of Macedonian denar is indicated by downward movement of the index.
3. The source for derivation of the model is Ehrmann *et al*. (2001) and Kierzenkowski (2005).
4. The overall long-run effect is calculated with the following formula: $\sum_t \beta_t / (1 - \sum_{l=1} \gamma_{t-l})$, where β is the coefficient(s) of the independent variable, γ is the coefficient(s) of the lagged dependent variable, t is the time subscript and l indicates the number of lags. In STATA 10, we use the nlcom command for calculating the long-run coefficients and their statistical significance.
5. The results are available from the author upon request.
6. The results are available from the author upon request.
7. All the results discussed in this section are available from the another upon request.

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10

Do Foreign Banks Stabilize Cross-Border Bank Flows and Domestic Lending in Emerging Markets? Evidence from the Global Financial Crisis

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Foreign banks have increased their market share in many emerging markets since the mid-1990s. We analyse the stability implications of foreign banks for cross-border and domestic bank lending in the global financial crisis. Our results suggest that a higher foreign bank presence was associated with more stable cross-border bank flows. This result is largely driven by two regions: Eastern Europe and Sub-Saharan Africa. However, we fail to find similar evidence for domestic bank lending. This indicates that the financial stability benefits of a stronger foreign bank presence in emerging markets did not spill over from cross-border flows to domestic lending.

Introduction

Does a strong presence of foreign banks amplify or mitigate sudden stops of cross-border bank flows to emerging market economies (EMEs)?[1] Do foreign banks reduce or aggravate the associated decline in bank lending in the respective host countries? The global financial crisis provides a unique opportunity to examine these questions. This is because the pre-crisis years were characterized by substantial cross-border bank flows and rapid credit

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growth in EMEs. In addition, foreign banks became important players in many EME banking sectors, with the average share of assets held by foreign banks in host country banking sectors rising from 21% in 1995 to 38% in 2005 (Claessens *et al.,* 2008). However, in the 'acute phase' (Blanchard *et al.,* 2010) of the global financial crisis, that is, the fourth quarter of 2008 and the first quarter of 2009, EMEs faced a classical sudden stop, which is defined as a large and unexpected fall in capital inflows. Following patterns observed in the past (Mendoza and Terrones, 2008), the bust in cross-border flows was associated with a corresponding contraction of domestic lending.

On the basis of a sample of 84 emerging market countries and controlling for the size of the pre-crisis boom and other determinants of financial instability, we find that banking sectors with a higher share of assets held by foreign banks experienced a smaller decline in cross-border bank flows in the crisis period. By contrast, there is little evidence of a link between a more prominent role of foreign banks in EME banking sectors and the pattern of domestic lending. These results are robust to variations of the instability and boom measures. Closer analysis reveals that the stabilizing impact of foreign banks on cross-border bank flows is a regional rather than a global phenomenon. Only in ECA and SSA, but not in other regions is foreign bank presence related to more stable cross-border bank inflows.

Overall, our results suggest that foreign banks did not act as a crisis amplifier. This was the case even though many parent banks in mature economies were hit by substantial losses and faced severe liquidity shortages. Thus, most arguments pointing to a stability advantage of a strong foreign bank presence in emerging market countries had become invalid. At the same time, our results also indicate that foreign banks are not a panacea to ensure a stable flow of cross-border and domestic credit in EMEs integrating into the global financial system.

The paper is organized as follows: after a short review of the theory and the empirical evidence on foreign banks and cross-border bank lending and domestic credit in EMEs (the section 'Foreign banks, cross-border bank flows and domestic credit in emerging markets'), we describe our data and the model specification (the section 'Data and model specification'). The sections 'Results' and 'Robustness checks' present the results and robustness checks and the section 'Conclusions' concludes.

Foreign banks, cross-border bank flows and domestic credit in emerging markets

Boom–bust cycles in capital flows and domestic credit characterized financial liberalization in emerging markets and developing countries

in the 1990s (Mendoza and Terrones, 2008). Many observers argued that this instability reflects an EME environment characterized by poor governance of domestic banks and a weak supervisory and regulatory framework (eg, Krugman, 1998). Thus, authorities were called upon to put their financial systems on a sounder institutional footing. Inviting foreign banks to enter domestic banking sectors was one element of a strategy to achieve this goal (Sachs and Woo, 1999; Mishkin, 2001, 2006).

Foreign institutions are expected to strengthen financial stability in emerging markets by improving the solvency and liquidity of host country banking systems. Banking sector solvency improves because foreign banks are better capitalized than their domestic peers and provide 'reputational capital' (Hellman and Murdock, 1998) as a result of their long presence in the financial markets of mature economies. Foreign banks are also said to have superior credit technologies, better management expertise and governance structures than domestic banks (Giannetti and Ongena, 2009). Banking sector liquidity is enhanced because depositors' trust in the stability of foreign institutions makes local bank runs less likely. Moreover, foreign banks mitigate the risk of sudden stops, as parent banks will provide the needed international liquidity in crisis periods to safeguard their investments in the respective host countries (Moreno and Villar, 2005) and also because they have access to the relevant international lenders of last resort (Broda and Levy Yeyati, 2002). Finally, foreign bank entry may strengthen banking supervision in emerging markets' financial systems as they are supervised by their home country supervisors, which in general are seen as more demanding compared with supervisors in most host countries (Peek and Rosengren, 2000).

The empirical evidence on foreign banks and financial stability in emerging markets is mixed. Demirgüç-Kunt *et al*. (1998) find that foreign bank presence is negatively associated with the incidence of banking sector fragility. Moreover, the results of several studies covering the pre-crisis period indicate that foreign banks contribute to smoothing cross-border bank flows (Garciá Herrero and Martínez Pería, 2006) and domestic lending (De Haas and Van Lelyveld, 2010). However, the evidence also suggests that the stabilizing impact on domestic lending depends on the relative strength and soundness of the respective parent banks. Thus, foreign banks may also transmit financial distress in their home countries to the respective host countries (Peek and Rosengren, 1997; Galindo *et al*., 2010).

With regard to the global financial crisis, EBRD (2009) provides evidence suggesting that a stronger presence of foreign banks in emerging

markets mitigated the sudden stop in cross-border bank flows during the crisis. De Haas and Van Horen (2011) also find that cross-border syndicated bank lending to non-banks was less affected if the lending banks had a subsidiary in the recipient country, suggesting that local presence reduces information asymmetries and facilitates lending in times of crisis. Finally, Cetorelli and Goldberg (2010) provide evidence suggesting that the transmission of the liquidity shock in the crisis period was severe for those emerging markets with a strong presence of foreign banks that were subsidiaries of parent banks with a US dollar liquidity shortage in September 2008. However, they also find that domestic banks in emerging markets relying on cross-border bank flows from the same mature economies reacted in a similar way, suggesting that foreign ownership as such did not aggravate the credit contraction in host countries. Finally, there is no evidence for the proposition that foreign banks contributed positively to a stable flow of credit in emerging markets in the post-crisis period. This holds for analyses pursued at the macro level and over a large sample of countries, also including mature economies (Aisen and Franken, 2010) as well as studies exploring bank-level data (Claessens and Van Horen, 2012) and focusing on a narrower sample of countries (De Haas *et al.,* 2012).

We contribute to this literature in three ways. First, we construct a new variable to measure the magnitude of instability in cross-border bank flows and, respectively, domestic lending during the crisis. Second, we test *jointly* for the impact of foreign bank presence on this (in) stability in cross-border bank flows and domestic lending in emerging markets' banking sectors. And third, given the substantial regional differences in foreign bank ownership among emerging markets, we conduct a regional analysis to examine whether the contribution of foreign banks to financial stability during the crisis was different across regions.

Data and model specification

We take data on cross-border bank flows from the BIS International Locational Banking statistics. Cross-border bank flows are calculated as exchange-rate-adjusted changes from the quarterly reports of outstanding claims of all BIS reporting banks *vis-à-vis* non-residents in any currency. As the reporting countries include all major economies and the largest centres of financial activity, the coverage of international banking activity is virtually complete (Wooldridge, 2002). We use the Locational Banking statistics because their primary purpose is the measurement of international capital flows from banks in BIS reporting

countries – currently banking institutions in 42 countries – to non-banks and banks, including affiliates in the form of subsidiaries or branches[2] in emerging markets (Gracie and Logan, 2002). Data on domestic bank lending are from the IMF's International Financial Statistics (IFS line 22d). The IFS provides data on the stocks of outstanding credit in local currency and quarterly frequency. For few countries, that is, Ghana, Russia and Kyrgyz Republic, we supplement the IFS data with data provided by local central banks. We calculate quarterly bank lending by taking the first differences of the stocks of private sector credit outstanding. The advantage of the BIS and IMF data we use is that it is available quarterly. This allows us to analyse the immediate response of bank flows and lending up to the *Lehman* collapse in September 2008, which marked the beginning of the financial crisis for most emerging markets (IMF, 2008; Dooley and Hutchinson, 2009). We are aware that BIS and IMF data do not allow us to distinguish between foreign and domestic banks as recipients of cross-border flows and originators of domestic lending. This shortcoming could be overcome by using bank-level data (see eg, De Haas *et al.,* 2012). However, bank-level data is available only at an annually frequency and hence not suitable for the analysis of the sudden stop phenomenon. Finally, the BIS Locational Banking statistics provide data on *aggregate* flows to each emerging market country only, that is, they do not contain information about the individual source countries. Accordingly, we cannot account for source country characteristics, for example, possible differences in the degree to which source countries and their respective banks were affected by the financial crisis, as potential determinants of a sudden stop in cross-border flows.

We measure the instability in bank flows and domestic lending during the financial crisis with a variable called *FALL*. *FALL* is the difference between the average pre-shock flows (2007Q3–2008Q2) and the average post-shock flows (2008Q4–2009Q1). It depicts the sudden drop from the (in most cases) higher level of pre-crisis bank flows, respectively, domestic lending to the level observed in the two quarters following the *Lehman* default, disregarding the third quarter of 2008. Figure 10.1 illustrates the way we calculate the variable measuring the instability of cross-border bank flows and domestic lending, taking cross-border bank flows as an example. The given country experienced on average quarterly inflows of US$950.5 million in the four quarters preceding the shock and average quarterly outflows of $477.5 million in the crisis period. We take the difference, that is, $1.428 billion, and scale it by the respective country's GDP in 2007 in billion USD, that is, $21.7 billion. Thus, in the given country, the *FALL* variable for cross-border bank

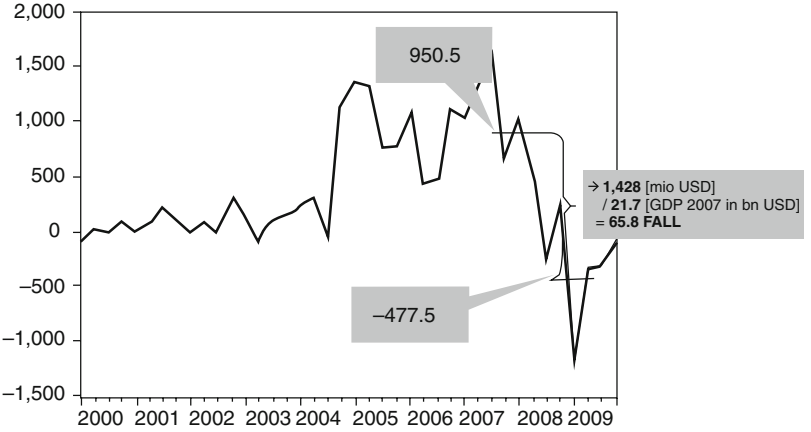

Figure 10.1 Construction of the *FALL* measure
Source: BIS international locational banking statistics.

flows takes the value of 65.8. On average, EMEs in our sample recorded a *FALL* of cross-border bank flows of 20.1 (Table 10.1).[3]

We follow the same procedure to construct a *FALL* measure for domestic lending. Thus, we take the difference between average quarterly pre-crisis and post-crisis lending and scale this difference by 2007 GDP. Thus, a higher *FALL* value indicates a greater financial shock in the respective country.

We keep the post-crisis period deliberately short for three interrelated reasons. First, the *Lehman* default might represent the closest one can get to a global shock affecting – although to different degrees – all EMEs. Second, by settling for a short post-crisis period, we are confident that the instability of the variables of our interest is indeed largely caused by the crisis, that is, reflects a supply-side phenomenon. A longer post-crisis period would imply that domestic demand factors, for example, GDP growth, as well as macroeconomic and structural policies, become increasingly important in explaining cross-border bank flows and domestic lending, creating the need to strictly separate between supply and demand effects. Despite some methodological advances, this is inherently difficult (see eg, Takáts, 2010). Third, focusing on the peak of the crisis reduces the risk that any stabilizing effect of foreign banks we might find reflects the impact of policy initiatives designed in early 2009, such as the Vienna Initiative (Andersen, 2009), which explicitly aimed at stabilizing cross-border exposures of foreign banks to countries

Table 10.1 Descriptive statistics

Variable	*N*	Mean	Standard deviation	Minimum	Maximum
FALL flows	84	20.070	37.403	–31.718	234.535
FALL credit	84	12.850	28.064	–57.629	196.945
FBAS	84	37.634	30.469	0	100
SURGE flows	84	113.365	257.166	–48.402	1559.766
SURGE credit	84	215.804	210.620	17.125	1582.465
FIN.OPENNESS	84	0.412	1.551	–1.808	2.541
ExpP GDP GROWTH	84	–1.660	2.415	–7.698	4.197
INST.QUALITY change	84	0.015	0.069	–0.332	0.157
INST.QUALITY	84	–0.347	0.545	–1.661	1.153
CA/GDP	84	–3.585	11.051	–25.185	40.655
COMMODITY PRICE DEP.	81	0.548	0.291	0.043	0.999
DEBT/GNI	81	41.751	30.501	4.341	166.815
ERR	83	5.169	2.205	1	8
RESERVES/DEBT	78	97.490	240.745	3.117	2075.063
FLD	70	62.334	16.464	20.236	95.863
CDR	82	0.950	0.429	0.257	2.390

Source: Authors' calculations.

in Central, Eastern and South-Eastern Europe, and the Joint IFI Action Plan in Support of Banking Systems and Lending to the Real Economy in the same region (EIB, 2009).

The explanatory variable of our main interest is the asset share of foreign banks in total banking sector assets in the respective host countries (*FBAS*). We use the data set provided by Claessens *et al*. (2008), where foreign banks are defined as banks with direct foreign ownership of more than 50% of capital. We expect foreign bank presence to have a mitigating impact on our *FALL* variables (ie, negative coefficients).[4]

The literature suggests that the pre-crisis boom is a major determinant of the bust. For example, Sula (2006) shows that a surge in capital inflows significantly increases the probability of sudden stops. Thus, we construct measures for the *SURGE* in cross-border bank flows and domestic lending before the shock and use them as additional explanatory variables. The *SURGE* in flows is the aggregated quarterly cross-border bank flows over 3 years before the crisis (ie, 2005Q3–2008Q2) scaled by the GDP of 2007 in billion USD. The *SURGE* in domestic lending is the aggregated quarterly changes in domestic lending in 3 years before the crisis (2005Q3–2008Q2) scaled by the 2007 GDP in local currency. We expect the *SURGEs* to aggravate the *FALLs,* that is, to have positive coefficient estimates. To test the robustness of our results, we will vary

the *FALL* and *SURGE* measures, also by replacing GDP with total banking sector assets as a scale variable.

We aim at explaining the (in)stability of cross-border bank flows and domestic lending during the global financial crisis. A straightforward way of doing this would be estimating separate OLS regressions. However, the disturbances of the two estimations might be correlated due to common determinants for both variables we have not fully controlled for. This would add a cross-equation correlation between the error terms. By estimating a seemingly unrelated regression (SUR) system (Zellner, 1962), we control for this and thereby increase the efficiency of the estimation.[5]

We estimate the following cross-sectional model using Stata:

$$FALL_i = \alpha * FBAS_i + \beta * SURGE_i + \gamma_k * X_{ik} + \varepsilon_i \quad (1)$$

Note that *FALL* and *SURGE* are both, either the fall and surge in bank flows or the fall and surge in domestic lending in country *i*. *FBAS* is the foreign bank asset share in total banking assets in country *i*. *X* is a matrix of the following structural and macroeconomic variables as well as external and internal vulnerability indicators (for an overview as well as the sources, see Table 10.2)

Structural and macroeconomic variables

- *De jure financial openness*. An open capital account facilitates cross-border bank flows and domestic lending spurred by foreign borrowing. Thus, countries with a higher index value should be more vulnerable to external shocks. Accordingly, we expect a positive coefficient.
- *Export partners' GDP growth in 2009*. This variable measure real GDP growth of the 30 main export partners in 2009 weighted by their share in total exports of a given EME in 2008. Following Aisen and Franken (2010), we construct this variable to account for economic activity after the crisis avoiding endogeneity problems. We expect a negative coefficient, as higher GDP growth in the main trading partners indicates higher demand for that country's exports and hence stronger domestic economic activity. This should positively influence bank flows and domestic lending.
- *Institutional quality*. Better creditor protection and information sharing among institutions like public credit registries provide comfort to foreign and domestic investors (Papaioannou, 2009). Thus, we expect a higher level of institutional quality to mitigate the

Table 10.2 Variable definitions and sources

Name	Description	Source
FALL flows	Difference between the average cross-border bank flows in 2007Q3–2008Q2 and the average bank flows in 2008Q4–2009Q1 (logs)	BIS International locational banking statistics, Table 6A
SURGE flows	Aggregated cross-border bank flows over 3 years before the *Lehman* bankruptcy (ie, 2005Q3– 2008Q2) (logs)	
FALL credit	Difference between average monthly real credit growth in September 2007–August 2008 and the average real credit growth in October 2008–March 2009, seasonally adjusted rates	IFS: Credit to private sector (Line 22d), CPI (Line 64) and national sources; seasonal adjusted with Census X-12
SURGE credit	Average month-on-month real credit growth in 3 years before the crisis (July 2005–June 2008), seasonally adjusted rates	
FBAS	Percentage of assets held by foreign banks among total banks	Claessens *et al.* (2008) Claessens and Van Horen (2012)
FIN.OPENNESS	Chinn-Ito-Index value for de-jure financial openness in 2007	Chinn and Ito (2008)
ExpP GDP GROWTH	Real GDP growth of the 30 main export partners weighted by their participation in the total exports to them in 2009	IMF DOTS, WEO
INST.QUALITY	Average of the six individual WGI governance indicators in 2008	Kaufmann *et al.* (2009)
INST.QUALITY change	Change of INST. QUALITY from 2007 to 2008	
COM.PRICE.DEP	Share of SITC categories 0, 1, 2, 3 and 4 in total export value	UN comtrade data
CA/GDP	Current account balance in percent of GDP in 2007	IMF WEO
DEBT/GNI	Total external debt stocks to gross national income in 2007	WDI, World Bank
ERR	Classification of exchange rate regime as of end of 2007	Bubula and Ötker-Robe (2002)
RESERVES/DEBT	Total reserves (percentage of total external debt) in 2007	WDI, World Bank
FLD	Share of total foreign liabilities denominated in foreign currency in 2004	Lane and Shambaugh (2010)
CDR	Private credit by deposit money banks as a share of demand, time and saving deposits in deposit money banks in 2007	Beck and Demirgüç-Kunt (2009)
FALL exchange rate	Average exchange rate in 2007Q3–2008Q2 minus the average exchange rate 2008Q4–2009Q1 divided again by the average exchange rate in 2007Q3–2008Q2	IFS: Exchange rate quarterly period average (line rf)
INDEPENDENCE	Equals 1 if a country became independent from a colonial power after World War II and 0 otherwise	ICOW colonial history data at http://www.ICOW.org

Source: Authors' compilation.

magnitude of our *FALL* measures. Following Kose *et al.* (2009), we use the simple 2008 average of the six individual World Governance Indicators as a proxy for institutional quality. In addition, we control for the change in those indicators from 2007 to 2008, as downgrades occurring in the immediate pre-crisis period might have a disproportionately strong impact on investors' sentiment in the crisis environment.

- *Current account to GDP in 2007*. Countries with a positive (less negative balance) are less prone to reversals in cross-border bank flows as they do not depend on external finance in net terms. Thus, a higher current account surplus should be associated with a smaller *FALL*, that is, we expect a negative coefficient.
- *Commodity price dependence*. Commodity price dependence might explain a significant part of countries' vulnerabilities to a sudden stop, as the crisis period was characterized by a significant decline in raw material and oil prices (positive sign expected). We measure commodity price dependence by calculating the share of exports of primary commodities (SITC0–SITC4) in total exports in 2007 for each EME.

External and internal vulnerabilities

- *External debt to GNI*. Net debtor countries face a higher risk of sudden stops and thus a decline in cross-border bank flows and domestic lending as the indebtedness of a country depicts vulnerability regarding the risk of default (positive coefficient expected).
- *Exchange rate regime*. A floating exchange rate provides a buffer against external shocks. Thus, we expect the sign of the coefficient to be negative as a higher value of the regime index indicates a more flexible exchange rate.
- *International reserves to total external debt in 2007*. A higher ratio indicates that the country is in a better position to deal with liquidity shocks. Thus, a higher ratio should stabilize bank flows as well as domestic lending (negative coefficient expected).
- *Foreign liability dollarization*. A higher share of external liabilities denominated in foreign currency (original sin) in total external liabilities indicates a higher exposure to exchange rate risk, making countries more vulnerable to sudden stops and the corresponding decline in domestic lending (positive coefficient expected).
- *Credit deposit ratio in 2007*. Banking sectors with a higher credit to deposit ratio rely on other funding sources, including foreign funding, to finance credit expansion. Given this dependency, in a crisis

situation, foreign investors are inclined to withdraw from these countries as early as possible, forcing banks to adjust private sector credit, respectively, suggesting a positive coefficient. However, the opposite reasoning might apply with regard to capital flows for countries with a strong foreign bank presence (Cetorelli and Goldberg, 2010). Parent banks might initially withdraw funds from countries with a low credit deposit ratio because headquarters want to make use of the excess liquidity held by their subsidiaries abroad. This argument suggests a negative coefficient.

Further, we use a set of *dummy variables* to account for effects of the different groups of countries regarding region, income and other characteristics.

Results

Benchmark model

Our benchmark estimation includes the share of assets held by foreign banks, *FBAS,* the respective *SURGE* variables to control for the pre-crisis boom as well as financial openness *(FIN.OPENNESS)* and a measure for economic activity *(ExpP GDP GROWTH).* To test whether the results are sensitive to the inclusion of other factors, we add the variables referred to in the section 'Data and model specification'. We adopt a parsimonious approach, adding them one by one to the benchmark estimation as several independent variables are correlated with each other[6] and to keep the sample size as high as possible.

We find the expected negative coefficient estimate for our measure of foreign bank presence in the regressions of *FALL* for cross-border bank flows (upper panels in Table 10.3 and Table 10.4), but not in the ones for domestic lending (lower panels). Thus, countries with a larger share of banking sector assets held by foreign banks had a more stable flow of cross-border bank flows after the *Lehman* event. However, the higher degree of stability of cross-border bank flows was not transmitted into a more stable pattern of domestic lending. While we cannot rule out that our estimations suffer from an omitted variable bias, the coefficient estimates of our main interest *FBAS* are strikingly stable in size and significance in the various estimations for bank flows and domestic lending, respectively.

Our results are of economic significance. The coefficient estimate of *FBAS* of around –0.13 indicates that the sudden stop of cross-border bank flows in countries with a FBAS of more than 50% is reduced by a magnitude of more than 6.5. This is a significant effect given that the

Table 10.3 Controlling for structural and macroeconomic vulnerabilities

	(1)	(2)	(3)	(4)	(5)
Flows					
FBAS	–0.1281***	–0.1253***	–0.1468***	–0.1154***	–0.1380***
	(0.0417)	(0.0418)	(0.0423)	(0.0441)	(0.0433)
SURGE	0.1381***	0.1385***	0.1352***	0.1389***	0.1383***
	(0.0052)	(0.0052)	(0.0054)	(0.0052)	(0.0053)
FIN.OPENNESS	0.4962	0.4950	0.1677	0.5665	0.5158
	(0.8445)	(0.8420)	(0.8472)	(0.8443)	(0.8843)
ExpP GDP GROWTH	0.0933	–0.0048	0.3612	0.0722	0.2414
	(0.5431)	(0.5609)	(0.5519)	(0.5410)	(0.5946)
INST.QUALITY change		–12.7194			
		(18.9650)			
INST.QUALITY			5.0369*		
			(2.7793)		
CA/GDP				0.1054	
				(0.1230)	
COMMODITY PRICE DEP.					–3.8501
					(4.6167)
Constant	9.1822***	9.0628***	12.5487***	8.9268***	12.1587***
	(2.0115)	(2.0134)	(2.7201)	(2.0236)	(3.5383)
Credit					
FBAS	0.0012	0.0071	0.0402	0.0257	0.0245
	(0.0694)	(0.0696)	(0.0709)	(0.0741)	(0.0720)
SURGE	0.1046***	0.1053***	0.1104***	0.1067***	0.1072***
	(0.0100)	(0.0100)	(0.0104)	(0.0101)	(0.0102)
FIN.OPENNESS	3.2006**	3.2362**	4.0301***	3.3975**	3.1938**
	(1.3462)	(1.3423)	(1.3851)	(1.3569)	(1.3924)
ExpP GDP GROWTH	1.9140**	1.7242*	1.4664	1.8962**	1.6708*
	(0.9093)	(0.9399)	(0.9168)	(0.9055)	(0.9757)
INST.QUALITY change		–24.0147			
		(31.1127)			
INST.QUALITY			–8.8127*		
			(4.5218)		
CA/GDP				0.1857	
				(0.2034)	
COMMODITY PRICE DEP.					10.4297
					(7.5435)
Constant	–7.9147**	–8.2367**	–14.7811***	–8.7302**	–15.8254**
	(3.8855)	(3.8908)	(5.2327)	(3.9533)	(6.3171)
R^2 flows	0.911	0.912	0.914	0.912	0.913
R^2 credit	0.570	0.573	0.589	0.574	0.585
N	84	84	84	84	81

The dependent variable is the respective *FALL* measure for flows and for credit. *FALL* for flows is the difference between average pre-shock inflows in 2007Q3–2008Q2 and average post-shock inflows in 2008Q4–2009Q1 (in million USD) as a share of GDP (in 2007 in billion USD). *FALL* for credit is the difference between the average nominal quarterly changes of claims on private sector in the pre-crisis (2007Q3–2008Q2) and the crisis period (2008Q4–2009Q1) to GDP in 2007. *SURGE* is the aggregated bank flows resp. nominal changes in credit to the private sector in 3 years preceding the crisis period, that is, 2005Q3–2008Q2, as a share of GDP.

Stars indicate statistical significance at the *10%, **5% and ***1% level. Standard errors in parentheses below. Seemingly unrelated regression estimation method according to Zellner (1962) applied.

Table 10.4 Controlling for external and internal vulnerabilities

	(1)	(2)	(3)	(4)	(5)
Flows					
FBAS	–0.1090***	–0.1338***	–0.1239***	–0.1199***	–0.1255***
	(0.0422)	(0.0417)	(0.0453)	(0.0440)	(0.0421)
SURGE	0.1399***	0.1393***	0.1383***	0.1255***	0.1379***
	(0.0051)	(0.0052)	(0.0053)	(0.0151)	(0.0051)
FIN.OPENNESS	0.4183	0.6789	0.4842	0.5358	0.5922
	(0.8236)	(0.8562)	(0.8832)	(0.9154)	(0.8589)
ExpP GDP GROWTH	–0.1125	0.3059	–0.0404	0.2267	–0.2747
	(0.5445)	(0.5515)	(0.5925)	(0.7101)	(0.6027)
DEBT/GNI	–0.0415				
	(0.0417)				
ERR		0.6520			
		(0.5645)			
RESERVES/DEBT			0.0006		
			(0.0055)		
FLD				–0.1054	
				(0.0820)	
CDR					–4.1740
					(3.2234)
Constant	10.1512***	6.3392*	9.2289***	16.5273***	12.4238***
	(2.4329)	(3.5711)	(2.3489)	(5.4890)	(3.3150)
Credit					
FBAS	0.0254	0.0008	–0.0113	–0.0371	0.0039
	(0.0733)	(0.0707)	(0.0763)	(0.0761)	(0.0702)
SURGE	0.1066***	0.1042***	0.1051***	0.1040***	0.1093***
	(0.0103)	(0.0101)	(0.0107)	(0.0107)	(0.0104)
FIN.OPENNESS	3.3587**	3.1586**	3.1545**	3.7884**	3.4624**
	(1.3654)	(1.3854)	(1.4281)	(1.5566)	(1.3808)
ExpP GDP GROWTH	1.9164**	1.8487**	2.4652**	1.1861	1.5339
	(0.9486)	(0.9333)	(0.9919)	(1.0819)	(0.9858)
DEBT/GNI	–0.0505				
	(0.0693)				
ERR		–0.3694			
		(0.9305)			
RESERVES/DEBT			0.0014		
			(0.0091)		
FLD				0.2776**	
				(0.1416)	
CDR					–7.0773
					(5.5412)
Constant	–7.2324	–6.0090	–7.0621	–24.7063**	–3.1012
	(4.6827)	(6.3744)	(4.6166)	(9.7872)	(5.5556)
R^2 flows	0.918	0.914	0.912	0.635	0.913
R^2 credit	0.570	0.571	0.561	0.590	0.575
N	81	83	78	70	82

The dependent variable is the respective *FALL* measure for flows and for credit. *FALL* for flows is the difference between average pre-shock inflows in 2007Q3–2008Q2 and average post-shock inflows in 2008Q4–2009Q1 (in million USD) as a share of GDP (in 2007 in billion USD). *FALL* for credit is the difference between the average nominal quarterly changes of claims on private sector in the pre-crisis (2007Q3–2008Q2) and the crisis period (2008Q4–2009Q1) to GDP in 2007. *SURGE* is the aggregated bank flows resp. nominal changes in credit to the private sector in 3 years preceding the crisis period, that is, 2005Q3–2008Q2, as a share of GDP.
Stars indicate statistical significance at the *10%, **5% and ***1% level. Standard errors in parentheses below. Seemingly unrelated regression estimation method according to Zellner (1962) applied.

average *FALL* of cross-border bank flows experienced by the EMEs in our sample was about 20. Moreover, we find strong evidence for the expected boom–bust relationship, as *SURGE* is positive and highly significant in all estimations. The higher the pre-crisis boom in bank flows and domestic lending, the higher is the *FALL* in the crisis period.

Among the control variables, institutional quality significantly affects the stability of bank flows and domestic lending (Table 10.3, Column 3). However, while countries with a higher level of institutional quality experienced a smaller *FALL* in domestic lending, a higher degree of institutional quality aggravated the *FALL* in cross-border bank flows. This conflicting result might reflect that institutional quality, while being a key driver of bank flows in non-crises times (Papaioannou, 2009) becomes largely irrelevant in a period characterized by a high degree of risk aversion, triggering comparatively larger outflows in countries with better institutional quality. Regarding internal and external vulnerabilities, we find that a higher degree of foreign liability dollarization – as expected – significantly aggravates the instability of domestic lending (Table 10.4, Column 4). Overall, our benchmark estimations explain about 90% of the variation of *FALL* in bank flows and 56% of the variation in *FALL* in domestic lending.[7]

Regional differentiation

There is significant heterogeneity among emerging market regions as regards the presence of foreign banks. After the financial crises of the 1990s, many emerging markets opened up their banking sectors to the entry of foreign institutions. However, differences in integration strategies lead to differences in foreign bank presence across regions and countries. Countries in Latin America and ECA were the main drivers, accounting for the rise in the average share of assets held by foreign banks in total banking sector assets in emerging markets (Cull and Martinez Peria, 2007). In SSA, a sizeable presence of foreign banks has a long-standing history. However, this mainly reflects the legacy of the colonial past rather than early efforts to foster and stabilize domestic banking sector development in an increasingly open environment (Van Horen, 2007). Indeed, countries in SSA – on average – take a rather restrictive stance on financial integration. Similarly, most countries in emerging Asia and in the MENA have followed a cautious approach towards financial liberalization in general, which also influenced policies on the entry of foreign banks. As a result, there is no country with a foreign bank penetration ratio above 40% in these two regions (Figure 10.2).

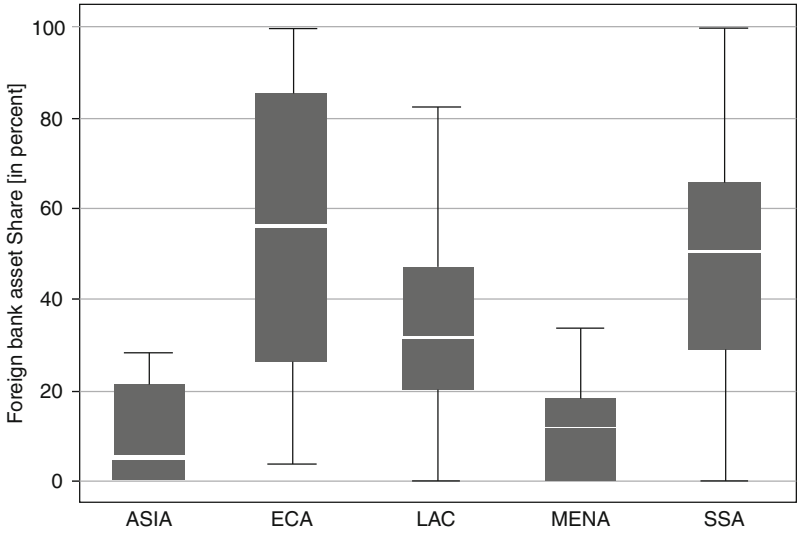

Figure 10.2 Foreign bank asset share within regions (in 2005)
Source: Claessens *et al*. (2008), own calculations.

These regional differences might affect the impact of foreign banks on the stability of bank flows and domestic lending. Thus, we test for the effect of foreign banks in each region by interacting region dummies with our variable for foreign bank presence (*FBAS*). As we explicitly test for the effect of foreign bank presence *within a region*, we do not include a constant and *FBAS* separately in our model.

The results indicate that the mitigating effect of foreign bank presence on *FALL* in bank flows in our benchmark estimations for the whole sample can largely be traced to ECA and SSA (Table 10.5). For these two regions, the *FBAS* interaction has a negative and significant coefficient estimate indicating that a higher foreign bank presence mitigated the *FALL* in bank flows. Moreover, in Eastern Europe, the effect is about twice as large as the one we find for the sample as a whole and for SSA.

We find weak evidence for an aggravating impact of foreign banks on the sudden stop in cross-border bank flows within Latin America as the coefficient estimate is positive and significant in the OLS regression but not in the SUR estimation. Within the other regions, foreign bank presence is not significantly associated with the stability of cross-border bank flows.

Table 10.5 Differences across regions

	OLS		SUR	
	(1a) Flows	**(1b) Credit**	**(2a) Flows**	**(2b) Credit**
FBAS*ASIA	0.1151	1.3502*	0.1087	1.3572***
	(0.3030)	(0.7196)	(0.2773)	(0.5126)
FBAS*ECA	–0.2674***	0.0331	–0.2674***	0.0316
	(0.0827)	(0.1513)	(0.0676)	(0.1251)
FBAS*LAC	0.0851*	–0.0661	0.0859	–0.0651
	(0.0477)	(0.0678)	(0.0809)	(0.1495)
FBAS*MENA	0.3206	–0.0123	0.3232	–0.0212
	(0.2175)	(0.2816)	(0.2874)	(0.5324)
FBAS*SSA	–0.1352*	–0.1046	–0.1406**	–0.0953
	(0.0693)	(0.1324)	(0.0697)	(0.1319)
SURGE	0.1373***	0.1043***	0.1353***	0.1068***
	(0.0115)	(0.0222)	(0.0046)	(0.0100)
FIN.OPENNESS	1.0602	2.0179	1.1951	2.0111
	(0.8929)	(1.4836)	(0.9045)	(1.5609)
ExpP GDP GROWTH	–1.4702**	1.2819	–1.5578**	1.3367
	(0.7236)	(1.1312)	(0.6414)	(1.1414)
ASIA	11.8264**	–28.8997*	11.9435***	–29.5991***
	(5.7871)	(16.3198)	(4.1313)	(8.1261)
ECA	4.7193	–11.6746	4.5895	–12.1396
	(4.7805)	(14.4032)	(4.6683)	(8.8131)
LAC	0.2343	–3.7416	0.0753	–4.0754
	(3.1152)	(4.9350)	(3.9968)	(7.4774)
MENA	–3.4503	–4.1638	–3.5605	–4.4352
	(2.8106)	(4.3951)	(4.7225)	(8.7851)
SSA	11.0164**	–2.3609	11.5526***	–3.2138
	(4.8823)	(9.6581)	(4.0512)	(7.8900)
R^2	0.951	0.683	0.951	0.683
N	84	84	84	84

The dependent variable is the respective *FALL* measure for flows and for credit. *FALL* for flows is the difference between average pre-shock inflows in 2007Q3–2008Q2 and average post-shock inflows in 2008Q4–2009Q1 (in million USD) as a share of GDP (in 2007 in billion USD). *FALL* for credit is the difference between the average nominal quarterly changes of claims on private sector in the pre-crisis (2007Q3–2008Q2) and the crisis period (2008Q4–2009Q1) to GDP in 2007. *SURGE* is the aggregated bank flows resp. nominal changes in credit to the private sector in 3 years before the crisis period, that is, 2005Q3–2008Q2, as a share of GDP.

Stars indicate statistical significance at *10%, **5% and ***1% level. Standard errors in parentheses below. Robust standard errors applied.

Again, we do not find evidence that the stabilizing impact of foreign banks on bank flows translates into more stable domestic lending during the financial crisis. This also holds for ECA and SSA and suggests that a strong presence of foreign banks, even if it contributes to the stability of cross-border bank flows, does not necessarily imply a more stable credit provision in the host country in times of financial distress. Within Asian countries, foreign bank presence even seems to have aggravated the instability of domestic lending. However, a closer look reveals that this result is driven by China, a country experiencing stable credit growth in the crisis period without any foreign bank presence.

The stabilizing impact of foreign banks on cross-border flows is most pronounced in ECA and SSA, that is, the regions with the highest shares of assets held by foreign banks. Thus, the influence of foreign banks might only become statistically significant when the share of foreign banks has crossed a certain threshold. To test this proposition, we run a piecewise regression. We group our sample countries according to their FBAS and test whether the impact of foreign banks in countries with a FBAS of higher than 50% differs significantly from the impact of foreign banks in countries with a FBAS of up to 50%. The results show insignificant coefficient estimates for the interaction term (*FBAS*above 50% FBAS dummy*), indicating that a high foreign bank presence does not have a stabilizing impact *per se* (Table 10.6, Column 1). This also holds when we divide the sample countries into three groups with 33% and 66% being the cut-off values. For none of the three groups does the impact of foreign bank presence differ significantly. Further, we test the relationship with a squared *FBAS* variable instead of grouping and the coefficient is again found to be insignificant. This suggests that the mitigating impact of foreign banks on the sudden stop of bank flows to ECA and SSA is a regional phenomenon and not driven by the comparatively high share of assets held by foreign banks in the countries of the regions as such.[8]

This leads to the question of which characteristics of the two regions, ECA and SSA, respectively, might be responsible for the different impact of foreign banks on the stability of bank flows compared with other emerging market regions. In ECA, countries exhibiting a remarkably high foreign bank presence are characterized by geographic and political proximity to Western EU countries. Indeed, most of them are either EU Member States or EU candidate countries in Central and South-Eastern Europe.[9] Moreover, parent banks are mostly from mature EU countries that consider host countries as part of the single European financial market and hence can be expected to show a stronger

Table 10.6 Testing for further characteristics

	(1)	(2)	(3)	(4)
FBAS* above 50% FBAS dummy	–0.1856 (0.1837)			
Above 50% FBAS dummy	6.9133 (11.0913)			
FBAS* EU perspective dummy		–0.2236** (0.0954)		–0.2814** (0.1183)
EU perspective dummy		7.0654 (5.8639)		11.0370* (5.7468)
FBAS*INDEPENDENCE			–0.0147 (0.0887)	–0.1243 (0.1080)
INDEPENDENCE			8.2606* (4.2711)	10.7228** (4.3340)
FBAS	–0.0170 (0.0969)	–0.0706 (0.0456)	–0.1406** (0.0658)	–0.0294 (0.0907)
SURGE	0.1379*** (0.0113)	0.1400*** (0.0114)	0.1374*** (0.0096)	0.1376*** (0.0102)
FIN.OPENNESS	0.4067 (0.7341)	0.5160 (0.7086)	1.3828* (0.7985)	1.2440 (0.7659)
ExpP GDP GROWTH	–0.0092 (0.5262)	–0.4427 (0.4755)	–0.3746 (0.5260)	–0.7530 (0.4978)
Constant	7.2362*** (2.5452)	7.1273*** (1.9613)	5.4792*** (1.9247)	2.6311 (1.9549)
R^2	0.913	0.917	0.919	0.924
N	84	84	84	84

The dependent variable is the *FALL* in flows. This is the difference between average pre-shock inflows in 2007Q3–2008Q2 and average post-shock inflows in 2008Q4–2009Q1 (in million USD) as a share of GDP (in 2007 in billion USD). *SURGE* for flows are the aggregated capital flows in 3 years before the crisis period, that is, 2005Q3–2008Q2, in million USD as a share of GDP (in 2007 in billion USD).
Stars indicate statistical significance at *10%, **5% and ***1% level. Standard errors in parentheses below. Estimation method is OLS, robust standard errors applied.

commitment to their subsidiaries in crisis times than in other parts of the world (Schoenmaker, 2011). In contrast, foreign bank presence is substantially lower and more heterogeneous in the Commonwealth of Independent States, countries that have no EU accession perspective. Thus, the stabilizing impact of foreign banks in the region of ECA might be due to the differences in the form and degree of financial integration within the region. To test whether being an EU member or candidate

country makes a difference, we create a dummy variable called *EU perspective*, which equals one for countries that are EU members or EU candidate countries and zero otherwise. We interact this dummy with our variable on foreign bank presence *FBAS*.

We find that the coefficient estimate of the interaction variable is negative, significant and in terms of size similar to the one we observe for the ECA region (Table 6, Column 2). Thus, for EU (candidate) countries, the impact of foreign bank presence is significantly more mitigating than for the other emerging markets in our sample. This lends support to the hypothesis that Western EU parent banks were more willing to provide liquidity support to their subsidiaries in an effort to safeguard their long-term investments in an enlarged European home market than were parent banks for subsidiaries in other EME regions.

In SSA, foreign banks with parent banks in mature economies have a longstanding presence that is largely linked to colonial ties (Daumont *et al.,* 2004). In contrast to other emerging market countries, for example, in Latin America, these ties ended for most African countries only after World War II, possibly creating a stronger bond between parent and subsidiary than in countries where colonial times ended much earlier. Thus, we create a dummy variable called *INDEPENDENCE* that equals one if a country became independent from a colonial power[10] after World War II and zero otherwise. *INDEPENDENCE* takes the value 1 for 34 out of the 84 sample countries, of which 20 are located in the SSA region. Again, we interact this dummy with our variable on foreign bank presence. Due to the stronger bond between parent bank and subsidiary, we expect that the effect of foreign banks is more mitigating for countries that gained independence only after World War II compared with other emerging markets. We find the expected negative coefficient estimate for the interaction *FBAS*INDEPENDENCE* which, however, turns out to be insignificant (Table 10.6, Column 3). Results hold when we include the variables *EU perspective* and *INDEPENDENCE* and their interactions with *FBAS* jointly (Column 4).[11]

Overall, there is strong evidence of a mitigating impact of foreign banks related to the EU accession, which suggests that the stabilizing role of foreign banks in ECA reflects the peculiarity of financial integration in the region in the form of the single European financial market. By contrast, we do not find evidence supporting our hypothesis that the stabilizing effect of foreign banks in SSA reflects longstanding colonial ties that were severed only in the post-World War II period.

Robustness checks

We check for the robustness of our results by varying those variables that are not predetermined, that is, *FALL* and *SURGE*.[12] First, we modify the *FALL* variable by bringing forward the start of the crisis to the third quarter of 2007, when money markets in mature economies stopped functioning smoothly, and by extending the pre-crisis and the crisis periods. With regard to the *SURGE* variable, we test the robustness of our results by varying the length of the boom period. Generally, our findings are robust as for cross-border bank flows the *FBAS* coefficients remain significant for most specifications, while we never find a significant impact of foreign banks on domestic lending. Moreover, the checks reveal that the specification of *FALL* is of higher relevance for the robustness of our results than the specification of the *SURGE* variable.

Second, we rerun regressions with the *FALL* and *SURGE* variables scaled by total banking sector assets for 2007 (IFS Lines 20 through 22) instead of GDP. Again, we find that countries with a higher share of banking sector assets held by foreign banks experienced a smaller decline in cross-border bank flows during the crisis. Moreover, when looking at the differences across regions our main findings are confirmed: higher foreign bank presence is associated with a lower *FALL* of cross-border bank flows in ECA and SSA. However, for ASIA, we also find a significant positive coefficient for *FBAS*. Moreover, we are unable to confirm the significant relationship between foreign bank presence and cross-border bank flows for EU countries and, respectively, countries with an EU accession perspective.

The main difference to our results when scaling the *FALL* and *SURGE* variables by GDP relates to domestic lending, as we find a significant negative coefficient for *FBAS* when scaling *FALL* and *SURGE* by total banking sector assets. When interpreting this result, however, it has to be noted that scaling domestic lending by total banking sector assets implies that the size of the computed *FALL* variable also depends on the share of private sector credit in total banking sector assets, that is, on the balance sheet structure of the respective country's banking sector. Countries with banking sectors only marginally engaged in providing credit to the private sector will – by definition – show comparatively small values in the *FALL* of domestic credit, even if, relative to the pre-crisis level of domestic lending, the decline in credit has been substantial. Against this background, we caution against putting too much emphasis on this result.

Recently, Claessens and Van Horen (2012) provided an update of the data set on the share of assets held by foreign banks in total banking

sector assets. As there are some significant changes in the respective shares for some countries of our sample, we re-estimate regressions, replacing the information on the FBAS for 2005 with the information for 2007, that is, the pre-crisis year. We obtain similar coefficients in size and significance for our key variables of interest. In addition, the negative coefficient of the interaction term of colonial independence and *FBAS* becomes significant.

Finally, we replicate all of the above tables without the control variables *(FIN OPENNESS* and *ExpP GDP GROWTH)* when they are insignificant. This does not change our results.

Conclusions

After the financial and currency crises of the 1990s, many emerging markets in particular in Eastern Europe and Latin America opened up their banking sectors for foreign-owned banks. This paper analyses the role of foreign banks for financial stability in emerging markets at the peak of the global financial crisis, that is, after the collapse of *Lehman Brothers,* by looking at their impact on cross-border bank flows and domestic lending in the crisis period compared with pre-crisis levels.

We find robust evidence indicating that countries with a high share of banking sector assets held by foreign banks experienced a more stable pattern of cross-border bank flows during the recent crisis than countries with a low share of banking sector assets held by foreign institutions. The effect is of economic significance: a 10 percentage point higher share of assets held by foreign banks is associated with a reduction of the sudden stop of cross-border bank flows by about 6% of the average *FALL* of cross-border flows EMEs suffered during the crisis. By contrast, we do not find robust evidence indicating that foreign banks contributed to a smoother pattern of domestic post-crisis lending.

A regional analysis suggests that our result showing a smaller decline in cross-border bank flows to countries with a significant share of assets held by foreign banks is a regional phenomenon driven by ECA as well as SSA. This may be due to the special features of both regions. In ECA, in particular in countries that have already joined the European Union or are set to become Member States in the future, foreign banks have been entering host country banking markets because of the European integration process. Thus, parent banks perceive host markets as an extension of their home market and consider the presence of their subsidiaries as a long-term investment. SSA is special as many countries of the region are characterized by a long-standing presence of

foreign banks mainly reflecting colonial ties. The importance of these ties might be affected by the length of time that has elapsed since the countries gained independence. We test both propositions and find supporting evidence. However, the evidence is stronger, although not perfectly robust, in favour of the hypothesis on European integration than of the hypothesis suggesting that colonial ties may still play a role for the behaviour of foreign banks in mitigating sudden stops of cross-border bank flows.

Overall, our results indicate that EMEs where foreign banks play a prominent role experienced a higher degree of stability in cross-border bank flows during the crisis than countries where foreign banks account for a comparatively small share of total banking sector assets. Moreover, there is no evidence that a stronger presence of foreign banks was associated with a higher degree of instability of cross-border flows and domestic credit in the respective host countries compared with countries where the role of foreign banks is less pronounced. This is remarkable because the crisis was a global one, triggered in mature economies with severe negative effects on the strength of the parent banks of subsidiaries in emerging markets. Thus, the financial stability benefits of a stronger presence of foreign banks in terms of a smoother pattern of cross-border flows and domestic credit might materialize more strongly in a typical emerging market crisis setting.

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Notes

1. Our sample includes 84 countries, which, for the sake of convenience, we refer to as EMEs. We subdivide the sample into regional groups according to the World Bank country classification 2009. We exclude high-income countries, with the exception of Croatia and Estonia, which have been classified as high-income countries only recently. The regional groups are Eastern and Southeastern Asia (ASIA): Bangladesh, Cambodia, China, India, Indonesia, Malaysia, Mongolia, Nepal, Sri Lanka, Thailand, Vietnam;

Eastern Europe and Central Asia (ECA): Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Estonia, Georgia, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Macedonia, Moldova, Poland, Romania, Russia, Turkey, Ukraine; Latin America and the Caribbean (LAC): Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, Venezuela; Middle East and Northern Africa (MENA): Algeria, Egypt, Iran, Jordan, Lebanon, Libya, Morocco, Tunisia, Yemen; Sub-Saharan Africa (SSA): Angola, Benin, Burkina Faso, Burundi, Cameroon, Cote d'Ivoire, Ghana, Kenya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Niger, Nigeria, Senegal, Seychelles, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia.

2. By contrast, the Consolidated Banking statistics collect data on a group worldwide-consolidated basis. Thus, claims and liabilities of parent banks and their affiliates are netted out. Foreign claims are split in international claims (cross-border claims and local claims of foreign affiliates in foreign currency) and local claims of foreign affiliates in local currency.
3. Descriptive statistics for each EME region are provided in an unpublished appendix, which is available from the authors on request.
4. See the robustness checks (the section 'Robustness checks') for estimations with data from the updated version of the data set.
5. Simple separate OLS regressions show similar results. The tables are provided in an unpublished appendix and are available from the authors on request.
6. A table of pairwise correlations between all variables is provided in an unpublished appendix, which is available from the authors on request.
7. As data on domestic lending is in local currency and not exchange-rate-adjusted, countries exhibiting a high share of domestic credit in foreign currency show a comparatively smaller decline in lending if they experienced a significant depreciation after the *Lehman* default. To control for this, we also run a regression that takes into account fluctuations of the respective currencies *vis-à-vis* the US dollar, measured as the difference between the average quarterly exchange rate in the pre-crisis year (ie, 2007Q3–2008Q2) minus the average quarterly exchange rate during the crisis (ie, 2008Q4–2009Q1) divided by the average quarterly exchange rate in the pre-crisis year. As expected, the coefficient estimate is insignificant for bank flows, as those flows are already exchange-rate-adjusted, but highly significant for domestic lending. However, the impact of foreign banks on the *FALL* variables remains unchanged for both variables.
8. However, again we cannot rule out an omitted variable bias.
9. These countries are Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Estonia, Latvia, Lithuania, Macedonia, Poland, Romania and Turkey.
10. Colonial powers include Belgium, France, Portugal and the United Kingdom.
11. Further are the sign and significance of both interactions robust to the inclusion of the full set of control variables for separate and joint estimations. Estimation results are available from the authors upon request.
12 All results of the robustness checks are provided in an unpublished appendix, which is available from the authors on request.

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11

Risk Taking by Banks in the Transition Countries

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Although the performance and privatisation of transition banks have been widely studied already, little is known about their risk-taking and risk management activities. We use a new European Bank for Reconstruction and Development (EBRD) survey data set of banks to examine risk taking by banks in the transition countries. We find no indication of excessive risk taking by specific ownership or size categories of banks. Also, we find no connections between risk taking and the quality of the institutional environment although an unsound environment is associated with higher levels of capital.

Introduction

The banking sectors of the transition countries have progressed remarkably in the last 15 years. In fact, banking in most transition countries has largely shaken off the traumas of the transition era. At the start of the 21st century banks in these countries look very much like banks elsewhere. That is, they are by no means problem free but they are struggling with the same issues as banks in other emerging market countries. There have been a surprisingly large number of studies that have told us about the performance of these banks but we know very little about their risk taking behaviour and how the banking environment influences it.

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In this paper, we examine risk taking by banks in transition with information from the EBRD's 2005 survey of bank managers[1] and balance sheet and income data prepared by BankScope. The institutional environment differs considerably among the countries in our sample. The western European countries that joined the European Union (EU) in 2004 were obliged to establish creditor rights and ensure proper law enforcement while many of the other countries were not exposed to these external pressures for reform. Thus, institutions in these countries offer, on average, less protection for lenders as compared to the new member states (see EBRD, 2004 and Pistor, 2000). In this paper, we examine the relationship between the institutional environment and risk taking by banks.

The role of financial intermediaries such as banks is to channel savings to investors. In a modern economy, banks do this by maintaining a delicate balance between risk taking and managing risk. Our aim here is to examine the link between banks' risk-taking and risk management activities and the quality of the institutional environment. An examination of the relationship is interesting because theory is ambiguous about its direction. We can demonstrate this by considering the role of collateral, a widely used mechanism for ameliorating risk.

Bankers face information asymmetries when they engage in lending since only the borrowers know about the 'true' risk of their investment projects. However, there are several covenants that bankers can include in their credit contracts to overcome information asymmetries. Bester (1985) showed that collateral can serve as a signalling device, so that borrowers reveal their true riskiness by the amount of collateral they are willing to offer. To ensure that devices like collateral can be effective, laws that define collateral relationships and adequate institutions for enforcement are essential. More reliable collateral laws and arrangements could result in greater use of collateral to overcome asymmetric information and an overall reduction of risk. In a poor legal environment, a borrower might use the same asset as collateral in several lending agreements or might refuse to surrender the collateral in case of default. In this view, a better institutional environment will be associated with a greater willingness to use collateralised loans and more lending. This is consistent with results in the law and finance literature that show a positive relationship between good creditor rights and credit market development (La Porta, *et al.*, 1997, 1998, commonly called LLSV).

However, Berger and Udell (2002), Berger *et al.* (2001) and Haselmann and Wachtel (2006) have shown that banks behave differently under

different institutional settings. For example, Berger and Udell (2002) find that banks are more willing to provide financing to information opaque borrowers in a better legal system. That is, with reliable collateral arrangements, banks will lend to more risky borrowers even if 'hard' information such as audited financial statements are unavailable. In this view, improvements in the institutional environment are associated with greater risk taking by banks.

We find no indication of excessive risk taking by any specific group of transition banks. Overall banking markets in transition economies are relatively homogenous with only small differences among the average bank operating in different regions, belonging to different ownership groups or having a different size. Interestingly, we find no connection between the level of risk banks take and the institutional environment they operate in. Nevertheless, banks that operate in an unsound environment generally maintain a higher level of capital. Furthermore, banks with higher risk measures compared to their competitors also do more risk management activities. This suggests that banks in transition economies have learned how to manage their risks by now.

The first section discusses the relationship between the banking environment and risk taking, as well as the relevant literature. The next section presents the bank data and the relationship of bank performance to ownership and size. Our measures of bank risk are presented in the following section. The relationship between risk and bank characteristics is discussed in the succeeding section. Bank risk measures are related to risk management activities and specific types of risk taking in the penultimate section. The conclusions are given in the last section.

The banking environment in transition

Banking in the transition countries has quickly passed through four stages (see Bonin and Wachtel, 2003). The first stage of banking development in the transition economies involved the establishment of banking institutions in the early 1990s. During the planned economy era, the only financial institutions were adjuncts of the state mechanism and banking in the contemporary sense of the word was largely unknown. Commercial banks were established as spin-offs of the central bank payments system and new banks were chartered. However, the role of these institutions was largely unchanged. The state-owned banks financed state-owned enterprises and were soon insolvent. The second stage of transition banking involved bank failures and systemic crises that affected every transition economy in the middle of the 1990s (see

Bonin and Wachtel, 2005). The third stage involved a lengthy process of restructuring through privatisation and the entry of foreign banks. By the end of the century, most banks were privately owned and in virtually all of the transition countries foreign banks predominated. The fourth stage brings us to the present. In most transition economies, banks are largely sound, appropriately regulated and competitive institutions. Banking in transition has largely shaken off its planned economy heritage.

Although research on banking on transition is fairly extensive, the issues of risk taking and risk management remain unexamined. The earliest studies of banking in transition focused on the creation and design of banking institutions (see eg Corbet and Mayer, 1992; Udell and Wachtel, 1995). As the transition proceeded, research interest turned to bank performance (see eg Fries *et al.*, 2006; Claeys and Vander Vennet, 2003) and, later on, bank efficiency (Fries and Taci, 2005; Bonin *et al.*, 2005a; Weil, 2003). More recently, research examined the banking crises, restructurings and privatisations that characterised transition (see eg Tang *et al.*, 2000; Bonin and Wachtel, 2005; Bonin *et al.*, 2005b). Finally, de Haas and Lelyveld (2006) and Haselmann (2006) focus on the consequences of foreign banking penetration on banking sector stability.

Studies on risk taking and risk management by banks in transition economies are rare because data on specific banking activities are limited.[2] Schardax and Reininger (2001) examine the vulnerability to financial contagion of the financial sectors in transition economies at the macro-economic level. Focusing more on individual banks, Kager (2002) shows that the problem of bad loans persisted in many banks in transition economies.

Bank data and bank performance

The BEPS (Banking Environment and Performance Survey) was based on a random sample of 423 banks in 20 countries (with an over sampling of banks in the smaller countries and also in Russia). The response rate was 50% but it rises to 63% when Russia is excluded. The countries with the lowest response rates were in addition to Russia, the Ukraine and also Hungary and the Czech Republic.[3] Each bank was linked to the BankScope data after a careful examination to make sure that the correct data were used. That is, care was taken to make sure that the BankScope data used had the proper bank identification and level of consolidation.[4] When the BankScope data for the entire sample frame

were compared to the data for the banks that responded to the survey, there was no indication of systematic response bias.[5] Sample sizes in the analysis are somewhat smaller than the number of survey respondents because BankScope does not provide data for a few banks that responded to the survey and survey respondents often did not provide answers to all the questions.[6]

In order to relate bank risk to the banking environment, we use both objective institutional indicators of the environment and indicators based on the banks' own assessments as provided in the BEPS. The objective measures are based on the EBRD Legal Transition Program (LTP) evaluations of each country's legal system relating to secured transactions. The first indicator is an index of the quality of collateral law (LTP – Quality) and the second is an index of the quality of law enforcement (LTP – Enforcement). The component questions for each index are found in Haselmann and Wachtel (2006).

The BEPS asked bank managers about their perceptions of collateral laws, and the quality of law enforcement and bank regulation. In each instance the survey respondent was asked for his or her opinions on several relevant criteria and the responses were aggregated into an overall index that measures their confidence in the banking environment. Three perceptions indexes based on BEPS were constructed (see Hoshi, 2006, for similar indices with these data). The first two measure perceptions of the quality of the laws regarding collateral on movable assets and collateral on immovable assets. The third measures their confidence in the ability of the court system to resolve disputes.

All of the banking environment indices are sums of several subjective survey responses and thus provide an ordinal ranking rather than a meaningful measure of intensity. Therefore, we divide the legal indicators into below and above median groups to differentiate among banks with lesser and greater confidence in the environment.

Summary statistics for the banks in our data set are shown in Table 11.1. Means for common performance measures are shown for the whole sample and several sub-groups. To begin, we distinguish among three bank ownership groups using BEPS information to determine majority ownership.[7] Bank ownership is important for several reasons. First, government banks might still face soft budget constraints that affect their willingness to take on risk. Second, private domestic- and foreign-owned banks will also have different risk profiles. Foreign banks are likely to have less local expertise or 'soft' information that enables banks to reduce risk through customer relationships.

Table 11.1 Means of performance measures by ownership, region, assets and market share, 2004

	ROA	ROE	NIM	Assets
Total sample				
Mean	0.014	0.115	0.051	19,617
Obs	194	191	193	212
Ownership groups				
Government				
Mean	–0.016	–0.017	0.035	44,472
Obs	16	16	16	18
Domestic				
Mean	0.018	0.129	0.051	10,385
Obs	68	66	67	80
Foreign				
Mean	0.016	0.126	0.053	21,541
Obs	110	109	110	114
Region groups				
EU				
Mean	0.013	0.138	0.039	36,426
Obs	71	71	71	72
FSU				
Mean	0.019	0.143	0.060	11,555
Obs	49	47	48	62
SEE				
Mean	0.011	0.074	0.056	8,609
Obs	74	73	74	78
Asset groups				
0–200 million				
Mean	0.007	0.042	0.057	1,034
Obs	55	53	54	63
200 million–1 billion				
Mean	0.017	0.105	0.061	5,364
Obs	73	72	73	83
>1 Billion				
Mean	0.016	0.184	0.034	50,304
Obs	66	66	66	66
Market share groups				
<2%				
Mean	0.010	0.084	0.043	5,766
Obs	83	83	83	90
2%–10%				
Mean	0.025	0.298	0.062	14,147
Obs	58	58	58	60
>10%				
Mean	0.015	0.157	0.034	71,279
Obs	34	34	34	34

Note: Assets in million of dollars.

Next, differences in transition progress will affect risk characteristics of banks. Since the number of respondent banks in many countries is quite small, a comparison of country averages is not particularly informative. Instead, we show the means for three country groups: the transition countries that are now members of the EU, the countries of the former Soviet Union (FSU) with the exception of the Baltic countries that are already part of the EU, and the countries of south eastern Europe (SEE).[8] Finally, we group the banks into three size groups with roughly about a third of the banks in each group: assets less than $200 million, between $200 million and $1 billion and in excess of $1 billion. Since the largest banks tend to be concentrated in larger countries, we also group the banks by their share of aggregate domestic credit in the country where they are located.[9] Many of the banks in our data set have a small market share; 42% are in the smallest share category and only 16% in largest share category.

Foreign and domestic banks perform similarly and both outperform the government banks. The government banks are on average twice the size of foreign banks and the domestic banks are on average much smaller. The return on assets (ROA) and return on equity (ROE) are negative for the government-owned banks and about the same for the foreign and domestic banks. Similarly, net interest margins (NIM) are smaller for the government banks and about the same for the others. The few banks that are still state owned are in very poor shape, although efforts are underway to improve accounting standards and make them ready for privatisation.

Average ROA is quite similar across the three regions. ROE is about the same in the EU and FSU but lower in SEE. NIM are much lower in the EU countries than elsewhere. Banks in the SEE countries are considerably smaller according to asset size than banks in the other two regions. Grouping our sample by assets or by market share yields similar conclusions. Smaller banks have a lower ROA and ROE compared to their larger competitors.

Measuring bank risk

As noted earlier, banking is the business of balancing risk taking and risk management. However, there is no ideal single measure of risk and, in fact, there any number of measures. We will consider three approaches to risk measurement. First, we present accounting measures that utilise various balance sheet ratios that are standard indicators of riskiness. Second, we will use out of sample forecasts from a default probability model (DPM) to predict the default probability for each bank in our

sample. Finally, we offer Basel type risk measures based on each bank's asset composition.

Accounting risk measures

The Bank Scope data are used to construct standard accounting measures of risk activity. We examine the following balance sheet ratios to describe the risk taking behaviour of banks:

Name	Definition
Solvency	Equity/assets
Liquidity	Liquid assets (deposits with banks+treasury bills)/assets
Custdepo	Customer deposits/assets
Contliab	Contingent liabilities/assets
Loan	Total customer loans/assets
Loanloss	Loan loss reserves/customer loans
Shortloans	Short-term loans/customer loans

The default probability model

Estimation of a DPM requires a sample that includes default experiences. Since the BEPS (conducted in 2005) does not include failed banks, we estimated the model with a different data set and applied the estimates to the banks in our sample to obtain out of sample forecasts of default probability.

The basic idea of a DPM is to predict whether a bank will default with the help of different accounting and macro measures. The model estimated here is based on a different sample of banks (including, of course, those that failed) and a somewhat different group of transition countries. We use these results to make out of sample estimates of default probabilities for the banks in our sample.[10]

The data consists of all banks in the Czech Republic, Hungary, Slovakia and Poland from the period of 1994 until 2002. In order to determine whether a bank has defaulted, further information from Bankers Almanac was collected for each bank. Once a bank has been characterised as defaulted, the actual years of default as well as the two previous periods are classified as defaulted. All other observations for a defaulted bank are excluded from the sample in order to prevent any bias.[11]

The logit model has been widely used to estimate bank default probability.[12] It can be written as:

$$p(L=1) = \frac{e^z}{1+e^z}, \text{with } z = \alpha + \sum_{j=1}^{J} \delta_j X_{ij} + \varepsilon_i$$

where *i* indexes the bank year observations and *j* the proximate determinants of default. In the equation, L is a binary variable, taking the value of one if a bank defaulted and zero otherwise. The probability function is described by $p(L)$. For estimating $p(L)$ an empirically non-observable latent variable z is introduced that is determined by the independent variables X_{ij}. Thus, a linear relationship is assumed for the determination of z, however, not for the estimation of $p(L)$.

The variables in X_{ij} include measures of the risks that a bank faces, which include credit risk, market risk, operational risk and liquidity risk.[13] Specifically, the variables X_{ij} in our model along with their expected effect on default probability are shown in the table below.

Credit risk measures:	Equity/assets	−
	Loan loss reserves/loans	+
	Loans/assets	+
Market risk measure:	Net interest margin/assets	−
Operations risk measure:	Personnel expenses/operational expenses	−
Liquidity risk measures:	Short-term deposits/assets	+
	Liquid assets/assets	−
	Loans/deposits	+
General risk measures:	Net income/assets	−
	Net income/equity	−
Bank characteristics:	Log of assets	−
	Customer deposits/assets	+

The multivariate model was estimated with a rolling forward routine to exclude insignificant variables. The final model included six independent variables and all except the loan to asset ratio have the expected sign. The Nagelkerke R^2, which estimates the explained variance of the dependent variable by the independent variables, is above 40%. The variables and coefficient estimates of the final model are shown in the table below.

Constant	10.071
Loan loss reserves/loans	4.641
Loans/assets	–16.122
Personnel expenses/operational expenses	–2.209
Liquid assets/assets	–19.909
Log of assets	–1.218
Customer deposits/assets	9.545

In order to further evaluate the underlying model, we examine the accuracy of the model predictions. There are two types of possible

prediction errors. First, a bank that has actually defaulted might be classified as non-defaulted by the model (a type I error). As shown below, 28 of the 36 problem bank year observations (78%) have been correctly detected. Second, there is the possibility that a healthy bank will be classified as defaulted (a type II error). 95% of the 595 non-defaulted bank year observations are classified as such.

	Predicted		Percentage of correct prediction
	No-default	Default	
Observed			
No-default	556	29	95.1
Default	8	28	77.8
Overall			94.1

While the overall fit of the model is extremely high, the question of applicability of these results to the broader set of countries and later time period of the EBRD survey remains. In order to answer this question, we examine the influence of year and country-specific controls in the estimated DPM. That is, the model was estimated with year fixed effects and three country-level macro variables (the ratio of private credit to GDP, GDP growth and interest rate spreads). The results show that only the ratio of private credit to GDP turns out to have a significant effect on the banks default probability. The magnitude of this coefficient is, however, in relationship to the coefficients of the bank-specific variables rather small and the overall detection rate of the model including macro and year controls decreases. Therefore, we concluded that the estimation of default probability is not specific to the countries or years included in the sample, but to measures describing the conditions of the individual banks. Thus, we apply the coefficients from the DPM shown above to obtain default probabilities for the banks in the BEPS sample.

Risk-adjusted assets and credit risk

Finally, the EBRD questionnaire asked banks to provide more detailed information about the characteristics of their assets than can be found in BankScope. This information is used to construct two risk measures: a credit risk measure that uses risk weights like those found in the Basle agreements and also a measure of risk-adjusted assets.[14]

The BEPS provides a breakdown of assets by type that is more detailed than the classifications available in BankScope. We use this information to construct risk-adjusted assets, $\sum w_i A_i$ where A_i is the holdings of the

i-th asset category and w_i is the risk weight for that asset category. The risk weights are based on the Basel II risk buckets although the available categories do not match the Basel definitions exactly. The weights assigned are in the spirit of the Basel agreement and are a reasonable approximation. The asset categories and the risk weights % assigned are shown in the table below.

Mortgage loans	50
Other household borrowing	100
Loans to small corporations	100
Loans to medium corporations	75
Loans to domestic subsidies of foreign corporations	20
Loans to state-owned enterprises	20
Loans to government or government agencies	10
All other assets	100

We construct two risk measures using the risk-adjusted assets. First, our measure of credit risk is the ratio of risk-adjusted asset to total assets:

$$CR = \sum W_i A_i / A$$

Second, we will examine a risk-adjusted capital adequacy measure, which is the ratio of capital to risk-adjusted assets.

Bank risk, region, ownership and size

Table 11.2 provides the means for bank groups of the various risk measures. It starts with balance sheet measures based on BankScope data for 2004. The first five columns show ratios to total bank assets for equity (solvency), liquid assets, customer deposits, contingent liabilities and loans. The next two columns provide the ratio of loan loss reserves to total loans followed by short-term loans to total loans. Many banks fail to report contingent liabilities and only about half provide the break down of loans between short and long term. The default probability predicted by the model in the previous section is next. The last three columns provide capital adequacy measures that use BEPS data. First is the Tier I capital ratio which was only reported by about one-half the bank respondents. It is followed by the credit risk measure and, finally, the ratio of capital to risk-adjusted assets where risk-adjusted assets are based on the Basle type weights described above.

There are some noticeable differences in balance sheet characteristics among bank ownership groups and across regions as well. The

Table 11.2 Means of risk measures by ownership, region, assets and market share, 2004

	Ratios to assets					Ratios to loans					
	Solvency	Liquidity	Customer deposits	Contingent liabilities	Loan	Loan loss reserve	Short-term loans	Default probability	Tier I capital ratio	Credit risk	Capital to risk-adjusted assets
Total sample	0.138	0.170	0.569	0.255	0.554	0.046	0.587	0.123	0.184	0.748	0.271
Ownership grousp											
Government	0.195	0.180	0.562	0.282	0.547	0.091	0.689	0.158	0.358	0.722	0.641
Domestic	0.151	0.153	0.587	0.130	0.545	0.049	0.583	0.154	0.185	0.770	0.239
Foreign	0.122	0.178	0.559	0.336	0.560	0.037	0.566	0.106	0.167	0.735	0.239
Region groups											
EU	0.103	0.234	0.562	0.518	0.512	0.027	0.540	0.100	0.126	0.739	0.181
FSU	0.150	0.091	0.536	0.080	0.597	0.046	0.651	0.139	0.182	0.728	0.286
SEE	0.164	0.159	0.596	0.119	0.567	0.062	0.578	0.142	0.237	0.760	0.316
Asset groups											
0–200 million	0.223	0.177	0.563	0.106	0.549	0.067	0.611	0.173	0.261	0.781	0.339
200 million–1 billion	0.121	0.176	0.554	0.226	0.558	0.037	0.681	0.129	0.158	0.751	0.205
>1 billion	0.089	0.156	0.590	0.400	0.553	0.038	0.507	0.078	0.132	0.712	0.205
Market share groups											
<2%	0.152	0.235	0.547	0.347	0.496	0.041	0.630	0.136	0.184	0.790	0.237
2%–10%	0.110	0.115	0.564	0.166	0.608	0.034	0.592	0.110	0.138	0.677	0.211
>10%	0.095	0.136	0.655	0.243	0.582	0.042	0.423	0.102	0.137	0.754	0.194

government banks have more capital, larger loan loss reserves and more short-term loans than the others. The domestic banks make less use of contingent liabilities and are less liquid while the foreign banks maintain less equity than the others.

EU banks have smaller solvency ratios and loan loss reserves but they maintain more liquid assets. The use of contingent liabilities is rare except for EU region banks. Finally, there are some differences by bank size or share. There is clearly an inverse relationship between the solvency ratio and bank size or market share. Also, the very large banks and those with shares over 10% make fewer short-term loans than others.

The estimated default probability summarises the risk characteristics of the balance sheet. It is lower among EU banks, foreign banks and large banks (both size and share). Reported Tier I capital is very high for all bank types. Although the credit risk measure is widely dispersed overall, the means for all of the bank type groups are very similar. There is some variation with bank size; credit risk is higher for small banks, since these banks generally provide a larger fraction of small- and medium-sized enterprises (SME) lending. The capital to risk-adjusted assets varies in the same way (just more so) than the Tier I capital to asset ratio. Government, SEE and small banks have a considerably higher capital to risk adjusted asset ratio than their competitors, which might well reflect a desire to signal their creditworthiness.

Bank risk and the banking environment

The differences in bank risk by bank type discussed in the previous section are generally not large. A bank's taste for risk might well be independent of its size, ownership and even location, and depends instead on its perceptions of the banking environment. Banks with greater confidence in the banking environment or in countries with an objectively better legal environment for banking might be willing to take on more risk.

In order to test this presumption, we present means of our risk measures grouped by the institutional indicators in Table 11.3. We examine how average bank risk differs between those with below median and above median quality of law or perceptions of the legal environment. Interestingly, there is no clear pattern between estimated default probability and the institutional environment. When bankers have better perceptions of the quality of law and when the laws are objectively better, their default probability is higher. This suggests that bankers are willing to take on risky lending when the legal environment for dealing with bad loans is better. However, better perceptions of the courts and

Table 11.3 Means of the bank risk measures grouped by legal indicators, 2004

	Tier I capital ratio	Credit risk	Capital to risk-adjusted assets	Default probability	Solvency	Liquidity
LTP Quality of law						
Below median	0.190	0.743	0.286	0.105	0.148	0.156
Above median	0.198	0.750	0.251	0.153	0.122	0.206
LTP Enforcement of law						
Below median	0.202	0.749	0.308	0.129	0.147	0.163
Above median	0.186	0.744	0.241	0.121	0.131	0.185
BEPS Perception of law on movable assets						
Below median	0.223	0.740	0.324	0.109	0.169	0.163
Above median	0.158	0.755	0.210	0.142	0.113	0.204
BEPS Perception of law on immovable assets						
Below median	0.213	0.736	0.321	0.094	0.151	0.176
Above median	0.175	0.752	0.227	0.146	0.134	0.187
BEPS Court perception						
Below median	0.211	0.757	0.305	0.132	0.152	0.166
Above median	0.173	0.735	0.238	0.102	0.135	0.184

better law enforcement are associated with lower default probabilities. Also no clear pattern could be detected for the relationship between bank risk and credit risk.

On the other hand, we can find a clear pattern for the relationship between our capital risk-adjusted assets ratio, solvency and institutional environment. By all our indicators no matter whether they are based on subjective surveys or bankers' own perception show that banks that operate in a poor environment tend to keep a higher capital risk-adjusted assets and solvency ratio. Results for the Tier I capital support this conclusion. The data lead us to conclude that the legal environment itself does not influence the banks' overall riskiness. However, banks respond to their environment by adjusting their own capital. In Haselmann and Wachtel (2006) we show that differences in the legal environment effect the composition of loan portfolio.

Previous findings are supported when we use the actual index values as continuous variables. Correlations of the quality indexes and the bank risk measures as presented yield some interesting observations. As shown below, there are consistently negative relationships between the quality of the environment and measures of bank capital (the Tier I ratio, capital to risk-adjusted assets ratio and solvency). Credit risk and default probability do not exhibit a consistent pattern with the indexes of the quality of the banking environment.

	Tier1 capital ratio	Credit risk	Capital to risk-adjusted assets	Default probability	Solvency	Liquidity
LTP Law of the book	–0.068	0.012	–0.209	0.166	–0.160	0.069
LTP Enforcement of law	–0.155	–0.128	–0.229	–0.052	–0.209	0.137
BEPS Perception of law on movable assets	–0.311	0.034	–0.339	–0.030	–0.249	0.091
BEPS Perception of law on immovable assets	–0.131	0.023	–0.184	0.087	–0.110	0.109
BEPS Court perception	–0.024	–0.003	–0.072	0.012	0.012	0.080

Correlation coefficients of risk measures and institutional variables.

Panel I from Table 11.4 reports the relationship between further characteristics of a bank's environment and our risk measures. BEPS collected information about the banks' access to credit registry and risk management activities of banks. Banks that have access to a credit registry show a considerable lower default probability than banks that have no access. If such a credit registry exists, the bankers' assessment about the reliability of the registry seems of minor importance.

In Panel II of the same table, we turn to the relationship between risk and the banker's reported risk management behaviour. Generally banks with active risk management show a higher default probability (except to those banks that have an internal risk rating system). However, banks that manage their risk more actively are mostly more solvent, liquid and have a higher capital risk-adjusted asset ratio.

Overall, evidence for a relationship between banks' risk and their institutional environment is not very strong with one exception. Banks that have access to a credit registry clearly show a lower probability of default. Nevertheless, this does not mean that the institutional setting is unrelated to banking risk. One reason for our finding could be the specific nature of banking risk. Bank lending involves uncertainty and an efficiently functioning bank needs to take on risks. Under bad institutional settings, banks are less active lenders (eg Qian and Strahan, forthcoming; Haselmann *et al*., 2006) and mostly lend to borrowers about whom they can easily obtain information like large enterprises and the government (see Haselmann and Wachtel, 2006). Such lending is, however, less risky than lending to information opaque borrowers like households and SMEs. This could explain why we do not find a clear pattern between a solid institutional environment and banks' probability of default.

On the other hand, we find that those banks that operate in an unsound environment have more capital. This finding shows that banks

Table 11.4 Means of the bank risk measures, 2004, grouped by BEPS responses

	Tier I capital ratio	Credit risk	Capital to risk-adjusted assets	Default probability	Solvency	Liquidity
I. Banks' environment						
Does credit agency exist?						
Yes	0.206	0.753	0.280	0.077	0.144	0.197
No	0.179	0.733	0.262	0.168	0.126	0.134
Is information of credit registry accurate and reliable?						
Yes	0.238	0.746	0.310	0.087	0.126	0.218
No	0.207	0.754	0.265	0.075	0.146	0.184
Were loan applicants rejected due to a lack of acceptable collateral?						
Yes	0.165	0.733	0.241	0.124	0.124	0.175
No	0.232	0.758	0.310	0.092	0.157	0.182
Was lack of creditworthy customers the main constraint on bank's ability to make customer loans?						
Yes	0.205	0.771	0.263	0.090	0.139	0.185
No	0.187	0.720	0.280	0.121	0.131	0.163
II. Banks' risk management						
Did your bank obtain information on credit histories of borrowers from credit information registries?						
Yes	0.196	0.757	0.352	0.087	0.146	0.207
No	0.209	0.753	0.265	0.071	0.142	0.197
Did your bank have a separate department responsible for the risk management?						
Yes	0.306	0.787	0.415	0.159	0.187	0.247
No	0.167	0.738	0.240	0.100	0.131	0.165
Does your bank measure the value at risk in its trading portfolio?						
Yes	0.200	0.764	0.286	0.129	0.158	0.167
No	0.196	0.735	0.273	0.087	0.126	0.205
Has your bank an internal ratings based approach for the measurement of credit risk?						
Yes	0.158	0.755	0.224	0.097	0.167	0.237
No	0.208	0.747	0.292	0.116	0.135	0.167

adapt to their environment by adjusting their capital. Furthermore, banks that take on more risk also actively manage their risk by creating a risk management department or obtaining credit histories from their borrowers. These findings suggest that banks are aware about the level of risk they take on.

Conclusion

For the first time, data are available to examine the risk taking and risk management behaviour of transition banks. In this paper, we relate various measures of bank risk – solvency, liquidity, default probability and credit risk among others – to the size, location, ownership, institutional

settings and management characteristics of banks. The following three points summarise our findings:

- Certain groups of banks differ in their riskiness; for example, foreign, EU and large banks show a lower probability of default compared to their competitors. Nevertheless, these differences are not large and generally not statistically significant. This suggests that banking markets are relatively homogenous and no clear groups of banks with excessive risk taking can be identified.
- We find no clear relationship between banks' risk taking and their institutional environment (with banks' access to a credit registry being an exception). Our findings do, however, suggest that banks that operate in an unsound institutional environment respond to their situation by holding more capital and taking less credit risk.
- Banks that take on more risk also actively manage their risk by, for example, establishing a risk management department or obtaining information on borrowers' histories. Such banks also tend to hold more capital.

Overall, we find that no group of banks is subject to excessive risk taking and that those banks that take on risks also take on a higher share of capital and undertake active risk management. Thus, we conclude that the transition banks in our sample seem to basically operate and mange risk as banks in other developed markets.

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Notes

1. The Banking Environment and Performance Survey (BEPS) was a random sampling of banks in 20 transition countries with a common questionnaire that was translated into each local language and presented to a senior bank officer in an interview (EBRD, Transition Report, 2006, Chapter 4).
2. The BankScope data generally only include aggregate balance sheet items.
3. Successful bankers in the advanced transition countries might have been less inclined to set aside the time for an EBRD interview than others. In the

tense environment in Russia and the Ukraine, bankers might have had other reasons to avoid responding.

4. The BankScope data were checked for anomalies. Several corrections were made using information provided by the banks in the survey and one bank in Serbia was eliminated. The BankScope data set was prepared with the help of Dr. Anita Taci of the EBRD.
5. In most countries, the average asset level and the return on assets are about the same for responding and non-responding banks. The correlation of the average country ROAs from full sample and from the survey respondents is 0.97 and the rank correlation is 0.76.
6. The survey design included all banks in the country, which might include some institutions that are not picked up by BankScope. There were 17 respondent banks excluded because there were not adequate BankScope data for 2004 in Moldova, three in Macedonia, three in Belarus, two in Slovakia and one in each of Bosnia, Bulgaria, Poland, Serbia, and Ukraine. One additional Serbian bank is eliminated because of inconsistencies in the BankScope data.
7. Only 8% of the banks were government owned at the time of the survey. The privatization process was largely completed and even banks that reverted to government ownership during banking crises in the late 1990s (eg in Romania and Croatia) had been privatised when the survey was conducted in 2005. Fully 54% of the respondent banks are foreign and that number proportion would be much higher if the FSU were excluded. The foreign banks include both greenfield banks and banks acquired by mergers and acquisitions.
8. The BEPS respondents are about evenly divided among the regions (29% are from the FSU and about 35% from each of the other regions). The countries in each region are: EU: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia; FSU: Belarus, Kazakhstan, Moldova, Russia and Ukraine; SEE: Albania, Bosnia, Bulgaria, Croatia, Macedonia, Romania and Serbia.
9. Domestic credit (IMF IFS line 32) includes credit from non-bank sources as well; so small shares are expected even when we know that banking is highly concentrated. Further, no domestic credit measure was available for Serbia; so Serbian banks are excluded from market share analyses, as are banks that did not report assets to BankScope.
10. Our intention is to develop a simple DPM that can be used for out of sample forecasts rather than fully investigate the specification of such models.
11. There are in total 631 bank year observations of which 36 represent banks in default. For a detailed description of the underlying data set, see Haselmann (2006).
12. The main advantage of logit models over other methods is that no strict assumptions are imposed on the estimation. Furthermore, the results can be directly interpreted as default probabilities.
13. For different specifications of DPMs with accounting measures and other data, see for example Claeys and Schoors (2007) who use Russian data.
14. The familiar Basle measure is the ratio of capital to risk-adjusted assets. The well-known minimum capital requirement is that the ratio of Tier I capital to risk-adjusted assets should be at least 8%. The Basle criterion is our credit risk measure (assets to risk-adjusted assets) multiplied by the capital asset ratio. The credit risk ratio can be constructed for all respondent banks because it

does not rely on BankScope data. Further many additional banks do not provide data on capital in BankScope.

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12

The Sequence of Bank Liberalisation: Financial Repression *versus* Capital Requirements in Russia

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We model how the reduction of required reserves and the introduction of capital rules affect bank risk-taking behaviour in a financially repressed environment. In the absence of capital rules, the reduction of required reserves unambiguously encourages gambling behaviour. The introduction of capital rules only succeeds in mitigating this effect if capital is not too costly and loan default rates are not too high. We use evidence from the Russian banking sector to illustrate the model. We conclude that a moderate amount of financial repression may be preferable to capital rules for the purpose of securing systemic stability if loan default rates are high and the cost of capital is considerable, which may be the case in many emerging banking markets.

Introduction

In this paper, we highlight one particular aspect of financial repression, namely the presence of high, but lowly compensated reserve requirements. Reserve requirements are widely used as a monetary policy tool aimed at maintaining systemic stability. Typically, compulsory reserves yield a low or even a zero return. In an economy with high inflation, this return is often negative in real terms, causing distorted incentives

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for asset allocation decisions. When this occurs, reserve requirements become a tool of *financial repression*.[1] Empirical evidence suggests that countries with high reserve requirements grow slower and have less developed financial systems than countries with low reserve ratios (Haslag and Koo, 1999). Capital rules, on the other hand, have been shown to be able to offset risk behaviour.[2] It therefore appears sensible for the regulator to substitute reserve requirements with capital rules, as she can in this way retain the benefit of increased systemic stability without incurring the cost of financial repression in terms of lower financial development. But first appearances can be deceiving. We model the interaction between reserve requirements, capital rules and banks' risk-taking behaviour in a stylised transition-economy environment. This allows us to assess whether the reduction of financial repression indeed encourages bank gambling and whether the introduction of capital rules mitigates this effect or instead may lead to even more bank gambling.

The model is relevant because several Central and Eastern European economies, during their transition to a market economy, initially adopted a policy of high reserve requirements and later reduced the reserve requirements in favour of capital rules. Table 12.1 shows the evolution of reserve requirements (β), the return on the reserves (r^r) and inflation for four Eastern European transition countries for the period 1993–1999. Even when reserves were remunerated, the return was often negative in real terms. The Central Bank of Russia (CBR) has set (zero return) reserve requirements varying between 5% and 22% for different deposit classes (see the section The Russian experience). In the European Economic and Monetary Union countries, reserve requirements are set at 2% and are remunerated at the Euro Over Night Index Average rate.

Reserve requirements were largely introduced to boost the systemic stability of the banking sector during the period of bank market liberalisation, on which most transition countries embarked after the collapse of the Berlin Wall. After 1989, governments across Central and Eastern Europe abolished or loosened interest rate regulations and asset choice restrictions and gradually reduced barriers to entry for the banking sector. Banks were forced to compete more aggressively in the loan and deposit markets, thereby lowering their current and future expected profits. Banks predictably reacted by shifting assets towards more risky activities that were previously precluded, such as foreign currency trading, interbank market lending, derivatives or real estate lending. Next to the initial introduction of financially repressive reserve requirements, all countries proceeded to adopt new accounting rules,

Table 12.1 Reserve requirements (β), return on reserves (r_r) and inflation (%)

	Croatia			Estonia		
	β	r^r	**Inflation**	β	r^r	**Inflation**
1993			1446.7	10	0	89.9
1994		5.15	107.3	10	0	47.7
1995	39.5	5.5	4	10	0	28.7
1996	35.9	5.5	4.3	10	0	23.1
1997	32	4.5	4.1	10	0	10.6
1998	30.5	5.9	6.4	10	0	8.2
1999	30	5.9	3.7	13	EONIA	3.3
	Hungary			**Romania**		
	β	r^r	**Inflation**	β	r^r	**Inflation**
1993			22.6		10	254.4
1994	12	8	18.8		25	137
1995	17	15.5	28.4		9.1	32.3
1996	12	14	23.5		12	38.8
1997	12	14	18.3		15	154.8
1998	12	10	14.4	15	10.25	59.1
1999	12	8.25	10.3	25	9.5	45.8

Source: Schoors (2002).

install regulations on the classification of problem loans and mandatory provisions for non-performing loans and impose minimum capital requirements (following the Basel Accords) and regulations on banks' exposure to a single borrower (Gorton and Winton, 1998).

The theoretical questions that we pose are: (1) does the reduction of reserve requirements in this environment indeed encourage bank gambling behaviour? and (2) does the introduction of capital rules in this environment reduce or encourage bank gambling behaviour further? We find that the answer to the first question is affirmative (Proposition 1), while the answer to the second question is found to depend on the loan default rates and the cost of capital (Proposition 2). We next evaluate the findings of our model against the Russian setting. Russia represents a nice illustration of a country in which a combined policy of reducing required reserves and introducing capital rules was pursued in the presence of high default rates and a high cost of capital.

The next section provides the main building blocks of the model. In the subsequent section, we derive the propositions that summarise the effects of changes in required reserves and capital rules on bank-risk-taking

behaviour. The penultimate section looks at the Russian experience through the lens of the model. Concluding remarks and policy implications are provided in the last section.

The model

Our model builds on the framework used in Hellman *et al.* (2000), who use a dynamic model of moral hazard in which competition can undermine prudent bank behaviour. They find that while capital requirements may succeed in reducing gambling behaviour, they negatively affect banks' franchise values, and thus induce gambling behaviour. Therefore, they advocate the use of deposit rate ceilings to sustain bank franchise value as a Pareto improvement compared to capital requirements. Repullo (2004) extends the model by Hellman *et al.* (2000) and investigates the effects of introducing a risk-based capital requirement and deposit rate ceilings in a dynamic model of imperfect competition. We assess how bank risk-taking behaviour changes when capital requirements are introduced in a financially repressed economy, extending the model of Hellman *et al.* (2000). By introducing reserve requirements on the bank's asset side, we can analyse the effects of reducing financial repression and simultaneously investigate the interplay with the introduction of a risk-based capital requirement.

Consider an infinite horizon model with $N>2$ banks. The balance sheet of each bank $j = 1, \ldots, N$ consists of two assets, loans L and reserves R, and two liabilities, deposits D and capital C. In each period, the bank offers an interest rate r_j^d in competition with the other banks who offer r_{-j}^d.[3] Depositors are protected by a deposit insurance scheme, such that the total volume of deposits for bank j can be denoted by $D(r_j^d, r_{-j}^d)$, which are increasing in the bank's own interest rate and decreasing in the competitor's rate $(\partial D_j / \partial r_j^d > 0$ and $\partial D_j / \partial r_{-j}^d < 0)$. All banks are subject to prudential regulation under the form of a risk-based capital requirement k, $0 < k < 1$, such that for all banks j, $C_j \geqslant kL_j$ must hold.[4] Each bank j chooses the amount of capital $C_j = k_j L_j$, subject to $k_j \geqslant k$. Further assume that the opportunity cost of capital is exogenous and denoted by ρ.[5] After funds have been raised, each bank allocates its assets. Banks have to maintain part of their deposits with the central bank due to the reserve requirement. For each bank j, $R_j = \beta D_j$ holds, and the required reserves R pay an interest rate r^r. We assume that r^r is below the risk-free rate in order to capture one pervasive aspect of financial repression still present in many transition economies. In what follows, we will refer to financial repression as the situation in which $r^r = 0$ and $\beta > 0$.[6]

Assumptions

Following Hellman *et al.* (2000) and Repullo (2004), we assume that banks invest the remaining funds in either of two assets: a prudent asset, which yields a return of a, or a gambling asset, which yields a return of γ with probability θ and 0 with probability $1-\theta$. We further assume that:

$$\gamma > a > \theta\gamma \tag{1}$$

$$\rho > a \tag{2}$$

$$a > r^r \tag{3}$$

$$a > \rho k \tag{4}$$

Condition (1) implies that the gambling asset is dominated in terms of expected return by the prudent one but yields a higher payoff when the gamble succeeds. Condition (2) captures the problem of moral hazard in banking, namely that bank capital is costly. If bank capital were not so costly, regulators would be able to force banks to hold sufficient capital in order to induce prudent lending without any protest from the banks. Condition (3) unveils a typical feature of financial repression. Specifically, the return on reserves is lower than the interest rate on the prudent loan. Finally, condition (4) states that the *capital cost of loans* should never exceed the return on the prudent loan. If this were the case, no bank would have an incentive to lend prudently.

Timing

Each bank j receives a license from the regulator to operate at an initial date $t = 0$. The asset choice of the bank is observed neither by the depositors nor by the regulator. At the end of each period, the regulator inspects the balance sheet of all banks. When a bank is revealed to be insolvent and cannot repay its depositors, its license is withdrawn. Following Hellman *et al.* (2000), a gambling bank will earn an insufficient return to repay depositors in case the gamble fails.

Prudential regulation in Russia comprises a number of regulatory standards, among which capital adequacy and liquidity rules, with which banks need to comply in order to maintain their bank license. Although enforcement of these regulations is low in general and often entails only minor punitive fines, some enforcement in terms of license

withdrawal is observed for capital and liquidity regulations (Claeys and Schoors, 2007). In contrast to what the model assumptions imply, gambling banks may in reality be able to repay depositors, even when the gamble fails. Only when a bank's capital falls below a specified level such that its solvency is at stake would some regulatory intervention be warranted.[7] We assume that failure of the gamble implies the forced closure of the bank.

All banks simultaneously choose the level of capital and offer a deposit rate. All banks maximise their expected discounted profits: $V = \sum_{t=0}^{\infty} \delta^t \pi_t$; hence, strategies will correspond to the infinitely repeated static Nash equilibrium. V is a measure of the bank's franchise value, in which higher levels of the discount factor δ result in higher expected discounted profits. Depositors choose the bank at which they want to place their funds, after which banks choose to lend prudently or gamble. When returns are realised, the regulator checks the balance sheet.

Competitive equilibrium

At each time t, each bank j chooses the optimal amount of capital it wants to hold *via* the capital requirement k_j and offers a deposit rate r_j^d. The bank places a fraction β of its deposits with the central bank to comply with the reserve requirement. The remaining funds are invested in either the prudent or the gambling asset. Banks incur a fixed cost μ due to the monitoring of borrowers' actions.[8] Bank j's per-period profits for either choosing the prudent or the gambling asset respectively, are:

$$\pi_j^P(r_j^d, r_{-j}^d, k_j) = \alpha L_j + r^r R - r_j^d D_j - \rho C_j - \mu_j \tag{5}$$

$$\pi_j^G(r_j^d, r_{-j}^d, k_j) = \theta\,[\gamma L_j + r^r R - r_j^d D_j] - \rho C_j - \mu_j \tag{6}$$

When the bank chooses to gamble, the total profit depends on the success of the gamble. When it is successful, the bank gets a high return and can repay its depositors. When the gamble fails, the bank will be closed down. Using the balance sheet constraints $C_j = k_j L_j$, $R_j = \beta D_j$ and $L_j = D_j + C_j - R_j$, the objective function of bank j, respectively, becomes:

$$k_j \geq k \max \pi_j^P(\cdot) = \left[r^r \beta - r_j^d + \frac{(1-\beta)}{(1-k_j)}(\alpha - \rho k_j) \right] \times D_j(r_j^d, r_{-j}^d) \tag{7}$$

$$k_j \geq k \max \pi_j^G(\cdot) = \left\{ \theta \left[r^r \beta - r_j^d \right] + \frac{(1-\beta)}{(1-k_j)} \left[\theta\gamma - \rho k_j \right] \right\} \times D_j(r_j^d, r_{-j}^d) \tag{8}$$

Differentiating the objective function with respect to k_j, and using assumptions (1) and (2), gives:

$$(1-\beta)[\alpha - \rho] D_j(\cdot) < 0 \tag{9}$$

and

$$(1-\beta)[\theta\gamma - \rho] D_j < 0 \tag{10}$$

respectively, in which the strict inequality in (9) follows from (2) and we thus have the corner solution $k_j = k$. Indeed, when the cost of capital exceeds the return on the prudent asset, no bank has an incentive to hold any capital above the legal requirement. Because $(1-\beta)[\theta\gamma-\rho]D_j < (1-\beta)[\alpha-\rho]D_j$, $k_j = k$ will also always hold when the bank decides to gamble. Substituting this result into the objective function and differentiating with respect to r_j^d gives the following first-order conditions:

$$-D_j + \left[r^r \beta - r_j^d + \frac{(1-\beta)}{(1-k)} (\alpha - \rho k) \right] \partial D_j / \partial r_j^d = 0 \tag{11}$$

$$-\theta D_j + \left[\theta \left[r^r \beta - r_j^d \right] + \frac{(1-\beta)}{(1-k)} (\theta\gamma - \rho k) \right] \partial D_j / \partial r_j^d = 0 \tag{12}$$

There exists a symmetric Nash equilibrium in which all banks offer the same equilibrium deposit rate $r_j^d = r_{-j}^d$. Call $r_P^d(r_G^d)$ the equilibrium deposit rate when the bank chooses to lend prudently (gamble) and let $\varepsilon = \partial D / \partial r^d r^d / D$. The equilibrium deposit rates are then, respectively, given by:

$$r_P^d = \left[r^r \beta + \frac{(1-\beta)}{(1-k)} (\alpha - \rho k) \right] \frac{\varepsilon}{\varepsilon + 1} \tag{13}$$

$$r_G^d = \left[r^r \beta + \frac{(1-\beta)}{(1-k)} (\gamma - \rho k / \theta) \right] \frac{\varepsilon}{\varepsilon + 1} \tag{14}$$

From (13) and (2), we can infer that r_P^d is decreasing in the capital requirement k. Since holding capital is costly, a bank's per-period profits

will be lower for a higher level of bank capital (the negative franchise-value effect), inducing banks to lower their deposit rates. Moreover, the higher the *k*, the more solvent a bank becomes and thus the less it has to pay depositors for the risk they take by entrusting their savings to the bank. When there is financial repression, one can derive that the intermediation margin increases with the reserve requirement. Higher reserve requirements impose a tax on deposits and banks will be induced to pass this tax onto the depositors in the form of lower deposit rates. This finding is consistent with empirical evidence for Russia (Karas *et al.*, 2006) and Latin America (Brock and Suarez, 2000). In an economy without a capital or a reserve requirement, deposit rates are given by $r_P^d = a(\varepsilon/\varepsilon+1)$ and $r_G^d = \gamma(\varepsilon/\varepsilon+1)$. In this case, the equilibrium intermediation margin will approach zero when competition for deposits becomes sufficiently high ($\varepsilon \to \infty$). Competition can thus be seen as one of the main causes of lower intermediation spreads and the associated erosion of bank franchise value. As long as the capital requirement does not exceed $\bar{k} = \theta/(1-\theta)(\gamma - a)/\rho$, the bank is willing to offer a higher deposit rate when it chooses to gamble compared to choosing the prudent asset. In what follows, we assume that $k < \bar{k}$ always holds. This leads to the following condition for each $k > 0$:

$$\frac{(\theta\gamma - \rho k)}{\theta} > (a - \rho k) \tag{15}$$

namely that the (one period) net gain from gambling, conditional on gambling being successful, should always exceed the (one period) net gain from lending prudently. Would this condition not be fulfilled, no bank would have an incentive to gamble.

Financial liberalisation and prudential regulation

Before we can analyse how financial liberalisation and prudential regulation impact banks' gambling behaviour, we need to determine the conditions under which banks would choose to gamble. As in Hellman *et al.* (2000), each bank maximises its discounted expected profits, $V = \sum_{t=0}^{\infty} \delta^t \pi_t$, choosing strategies that correspond to the infinitely repeated Nash equilibrium. A bank will choose to invest prudently in each period whenever its discounted expected return from investing prudently exceeds the discounted expected return from gambling in each period, that is, whenever $V_G(\cdot) \leq V_P(\cdot)$. This is equal to the following condition:

$$\frac{\pi^G(\cdot)}{1-\delta\theta} \leq \frac{\pi^P(\cdot)}{1-\delta} \tag{16}$$

or after rearranging:

$$\pi^G(\cdot) - \pi^P(\cdot) \leq (1-\theta)\delta\frac{\pi^P(\cdot)}{1-\delta} \tag{17}$$

Condition (17) ensures the existence of an equilibrium in which banks choose to invest prudently in each period: the one-period gain from gambling must be less than the (discounted) franchise value of investing prudently in each period that the bank would lose if the gamble fails (with probability 1–θ). Similarly, as in Hellman *et al.* (2000), condition (17) defines a critical deposit rate, r^{crit}, under which the equilibrium deposit rate has to lie such that banks will not be tempted to gamble in the asset allocation stage, which now also depends on the degree of financial repression. Plugging in the profit functions (7) and (8), condition (17) becomes:

$$r_j^d \leq r^r\beta + \frac{(1-\delta\theta)}{(1-\theta)}\frac{(1-\beta)}{(1-k)}\alpha - \frac{(1-\beta)}{(1-k)}\left[\frac{(1-\delta)\theta}{(1-\theta)}\gamma + \delta\rho k\right] \tag{18}$$

Let r^{crit} be the critical deposit rate for which each bank is indifferent between gambling and being prudent. From (18), we obtain:

$$\begin{aligned} r^{crit} = r^r\beta + \frac{(1-\beta)}{(1-k)}\{&(1-\delta)[(\alpha-\theta\gamma)/(1-\theta)] \\ &+ \delta[\alpha-\rho k]\} \end{aligned} \tag{19}$$

From (19) it is straightforward to see that:

$$\begin{aligned} &\partial r^{crit}/\partial\alpha > 0, \partial r^{crit}/\partial\gamma < 0, \partial r^{crit}/\partial\theta < 0 \text{ and} \\ &\partial r^{crit}/\partial r^r > 0 \end{aligned} \tag{20}$$

The higher the return on the prudent loan and the lower the return on the gamble and its probability of success, the less gambling will occur. Furthermore, an increase in the interest rate on required reserves will reduce gambling.

Capital requirements and gambling behaviour

We restate the result from Hellman *et al.* (2000) that summarises the relationship between capital requirements and bank risk behaviour in the following lemma:

Lemma 1. *For sufficiently myopic banks ($\delta < \bar{\delta}$), capital requirements can successfully reduce gambling behaviour.*

Lemma 1 follows from the fact that higher capital requirements leave shareholders with a larger proportion of funds at stake, which should encourage more prudent behaviour (capital-at-risk effect). This result hinges upon the assumption that banks are sufficiently myopic $(0 < \delta \leq \bar{\delta} < 1)$. One of the main results in Hellman *et al.* (2000) is that for more far-sighted banks ($\delta > \bar{\delta}$), a capital requirement may actually *increase* gambling behaviour because in this case, the negative franchise-value effect dominates the capital-at-risk effect. It is important to note that threshold d is endogenous with respect to a country's institutional and regulatory characteristics. Specifically, banks in countries that are characterised by high levels of loan default risk (θ) and a high cost of capital (ρ) – both typical of emerging financial systems – are more likely to satisfy $\delta > \bar{\delta}$. In such an environment, capital requirements may hinder prudent bank behaviour.

Reserve requirements and gambling behaviour

Central banks in emerging economies often use reserve requirements as one of their most important monetary policy tools. We add this feature to the model to analyse how changes in the level of reserve requirements impact bank risk behaviour. We can show that reserve requirements may indeed be useful in restricting bank risk-taking. More generally, in a financially repressed environment, we can show that the following proposition holds:

Proposition 1. *In a financially repressed environment ($r^r = 0$ and $\beta > 0$) and in the absence of a capital requirement ($k = 0$), a policy of reducing (increasing) reserve requirements will increase (reduce) gambling behaviour (and vice versa).*

Proof. *The no-gambling condition is downward sloping and linear with respect to β, as long as $\delta < \tilde{\delta}$, $\tilde{\delta} \equiv ((\alpha-\theta\gamma)-r^r(1-k)(1-\theta))/((\alpha-\theta\gamma) + (1-\theta)(\rho k-\alpha))$. For $r^r = 0$ and $k = 0$, $\tilde{\delta} \to \infty$. Given that $\delta < 1$, $\delta < \tilde{\delta}$ and $|\partial r^{crit}/\partial\beta| < |\partial r^d/\partial\beta|$ will always hold.*

Proposition 1 indicates that reducing reserve requirements in the absence of a capital requirement may increase bank risk behaviour. Banks will maintain a low capital level, such that the capital-at-risk effect is quasi absent and gambling becomes a straightforward choice. Any reduction in the required level of reserves (β) then leads banks to charge a higher deposit rate consistent with gambling behaviour. Clearly, easing financial repression may not be optimal in an environment characterised with no – or a badly enforced – capital requirement.

Capital requirements in a financially repressed banking system

Proposition 2. *In a financially repressed environment* ($r^r = 0$ *and* $\beta > 0$*) with a stable capital requirement* ($k < \bar{k}$)*, a combined policy of reducing reserve requirements and increasing capital requirements will be successful in reducing gambling behaviour as long as banks are sufficiently myopic, but will increase gambling behaviour otherwise.*

Proof. *The no-gambling condition is upward sloping and linear with respect to* β*, as long as* $\delta > \tilde{\delta}$, $\tilde{\delta} \equiv ((\alpha - \theta\gamma) - r^r(1-k)(1-\theta))/((\alpha - \theta\gamma) + (1-\theta)(\rho k - \alpha))$*. For* $r^r = 0$ *and a capital requirement that satisfies condition (15):* $k < \bar{k}$*,* $\bar{k} = 0/(1-0)(\gamma - \alpha)/\rho$*, it follows that* $\tilde{\delta} < 0$*. Given that* $0 \leq \delta < 1$, $\delta > \tilde{\delta}$ *and* $|\partial r^{crit}/\partial\beta| < |\partial r^d/\partial\beta|$ *will always hold. For* $\delta < (> \bar{\delta})$*, we can show that* $\partial r(\beta)^{crit}/\partial k < (>) 0$ *holds.*

Figure 12.1 shows how the gambling region changes depending on banks' 'farsightedness'. This depends on ρ and θ: for a low cost of capital and a relatively low loan default risk, a capital requirement can attenuate the increase in risk behaviour that follows from the easing of financial repression. *Vice versa*, in countries that are characterised by a high cost of capital and a high default probability of loans, a higher capital requirement will induce more gambling behaviour and make a reduction in reserve requirements a less attractive liberalisation option. The intuition behind this result is that for $\delta > \bar{\delta}$, the capital requirement causes the negative franchise-value effect to dominate the capital-at-risk effect, so that banks prefer to invest the freed-up deposit funds in the gambling asset.

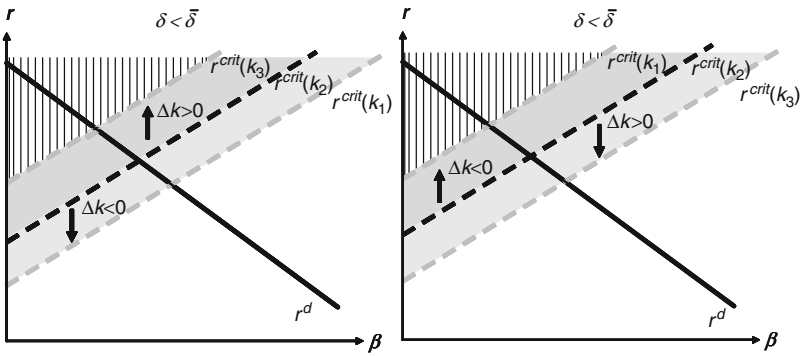

Figure 12.1 Reserve requirements (β), capital requirements (k) and gambling behaviour ($0 < k_1 < k_2 < \cap\, k_3 < \bar{k}$).
Note: The shaded area represents gambling behaviour.

The Russian experience

We evaluate the implications of the model using data from Russia, which represents a good illustration of a country in which a combined policy of reducing required reserves and introducing capital rules was pursued in the presence of high default rates and a high cost of capital. To do this properly, we first devote attention to the history of capital rules and reserve requirements, and to their enforcement, in the Russian banking sector. We suggest that the recent Russian supervisory history can be classified into four periods, two of which provide a proper testing ground for our model and will be considered in more detail below. These periods are not identified by the classical dichotomy of a pre- and post-crisis period, but rather by the changes in required reserve ratios and capital rules, as implied by our model.

The first phase from June 1991 to April 1995 was characterised by a lack of adequate enforcement and consequent irrelevance of both required reserves and capital rules. We describe this period only for the sake of completeness and to clarify the starting point for the two periods that really matter to the model. In the early years of the transition to a market-based banking system, the CBR introduced a system of reserve requirements, at that time its main tool of monetary policy. Reserve requirements were set at 2% on borrowed funds in June 1991, and steadily increased up to 22% for short-term deposits by April 1995. With an annual inflation rate of 122% for the period January 1995–April 1995 (Goskomstat), the obligatory reserves confronted the commercial banks with a severe inflation tax. Nevertheless, Schoors (2001) explains why these reserve requirements did not impose a liquidity constraint on banks at that time. Indeed, in addition to their required reserves, banks held on to high excess reserves – 57% of assets by end 1992 – and substituted these with alternative low-risk (and relatively liquid) assets in the form of treasury bills by the end of 1994, when the Ministry of Finance started to issue so-called GKOs (Korhonen, 1997). Although the CBR did not have an official banking supervision department until 1993, in May 1991, the CBR set a capital requirement for low-risk assets at 10% and for high-risk assets at 15% (see Table 12.2). These requirements were, however, not compulsory and therefore largely irrelevant to bank behaviour. In March 1995, the capital requirements were even temporarily abolished. Given the high level of excess reserves and the lack of a proper supervisory framework, we can safely claim that any changes in bank portfolio composition that occurred during this first period cannot be attributed to changes in either reserve or capital requirements.

Table 12.2 Evolution of capital requirements in Russia

May 1991 – 10%–15% (non-compulsory) March 1995 – no official requirement July 1996 – 5% February 1997 – 6% February 1998 – 7%		
5 million euro	***1 to 5 million euro***	***<1 million euro***
February 1999 – 8%	February 1999 – 9%	Violates minimal capital requirement
January 2000 – 10%	January 2000 – 11%	Violates minimal capital requirement

Source: Central Bank of Russia.

The second phase from May 1995 to March 1999 was characterised by lower financial repression and tighter capital rules in conjunction with a gradually more consistent enforcement. Therefore, this second period provides an appropriate testing ground for the second proposition of our paper. Figure 12.2 shows the monthly evolution of the banking sector aggregate of required and excess reserves (as a percentage total eligible deposits) relative to the requirements (as a percentage) for the period 1995–2003. The reserve requirements were gradually reduced from more than 20% to 5% for short-term deposits. It is not certain to what extent these required reserves were properly enforced and to what extent the reduction in the required reserve ratio therefore reflected a real reduction of financial repression. Nevertheless, Figure 12.2 shows that the required reserves as a share of total eligible deposits decreased substantially from more than 5% in early 1996 to well below 2% in early 1999, which suggests that the pressure of required reserves, no matter how well they were enforced, decreased substantially during this second period.

During the same period, capital adequacy requirements were raised substantially. Following a peak of 97 bank failures in May 1996 (see Figure 12.3), the CBR introduced a capital adequacy requirement of 5% in July 1996, and gradually increased it up to 9% in February 1999.[9] Most small banks were forced to maintain even larger levels of capital adequacy, because the minimal capital requirement dominated the capital adequacy requirement for them. Claeys and Schoors (2007) describe how many banks lost their licenses during a big sweep within the banking sector in 1995 under Tatiana Paramonova (then acting governor of the CBR) and the

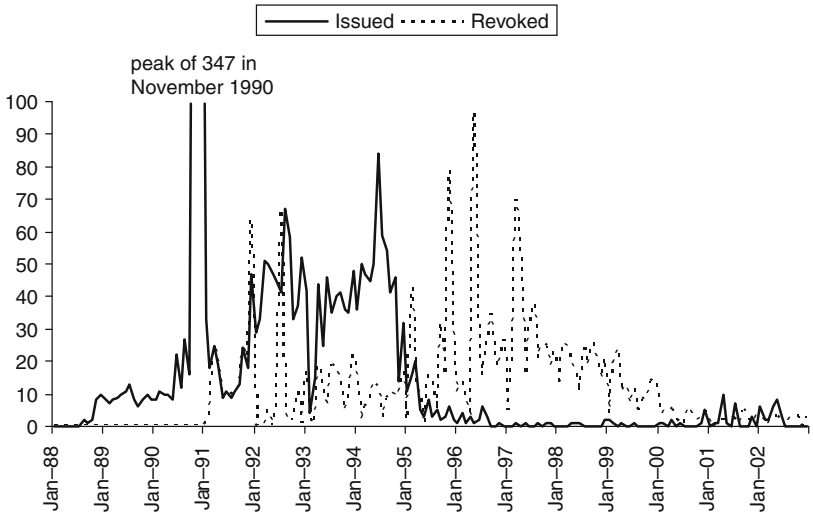

Figure 12.2 Bank creation and bank destruction in Russia (monthly data)
Note: Bank creation is defined as the number of licenses issued; bank destruction is defined as the number of licenses withdrawn.
Source: Central Bank of Russia.

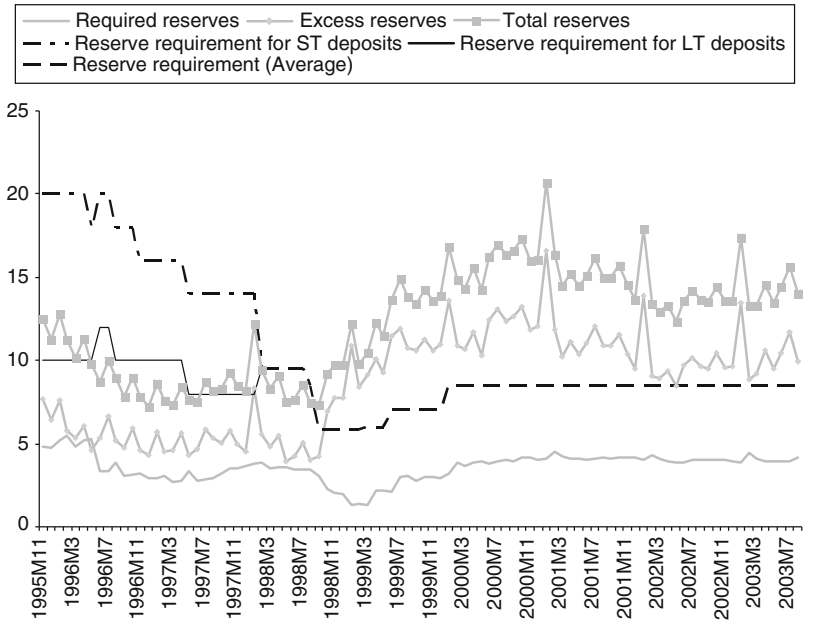

Figure 12.3 Monthly average reserve requirements (short- and long-term funds), banking sector aggregate required and excess reserves in Russia (1995:11–2003:8, percent)
Source: own calculations based on Central Bank of Russia and Goskomstat.

two big consecutive sweeps in 1996 and 1997 under Sergei Dubinin (then governor of the CBR) because of insufficient capital. Proposition 2 predicts that this combined policy of reducing reserve requirements and raising capital requirements will only succeed in curbing gambling behaviour if loan default rates and the cost of capital are sufficiently low.

Aggregate data on non-performing loans and loan loss reserves shown in Figure 12.4 suggest that this combined policy of substituting required reserves with capital rules from 1995 to mid-1999 did not succeed in curbing bank gambling behaviour. Reported non-performing loans started to decline substantially only in June 1999 while the share of loan loss reserves to total assets started to diminish only in July 1999. These figures seem to indicate that the capital requirement played at best only a marginal role in curbing bank risk behaviour before June 1999. One should, however, not overstress these insights, since the observed poor loan quality was not only driven by regulation (as implied by our model) but also by other structural deficiencies, such as the pervasive presence of soft budget constraints in the banking sector (see Berglöf and Roland, 1998) and the dominance of politically motivated loans (see Odling-Smee, 2006).

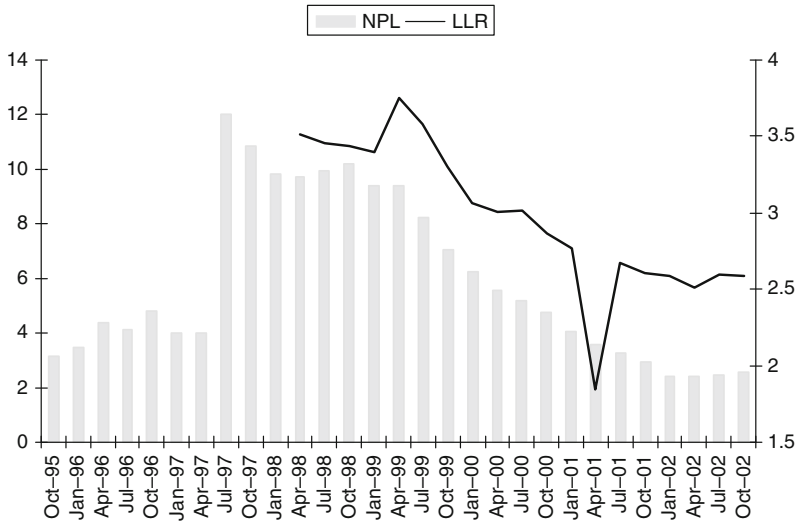

Figure 12.4 Non-performing loans (as a percentage of total loans, NPL left scale) *versus* loan loss reserves (as a percentage of total assets, LLR right scale) (1995:Q4–2002:Q4, percent)
Source: own calculations based on Mobile and Interfaks.

The third period from April 1999 to March 2004 was characterised by a tightening in both capital and reserve requirements. Figure 12.3 reveals that from April 1999, the banking sector's required reserves gradually started to pick up following the increase in the reserve requirements from 5% to a maximum of 10% for funds denominated in foreign currency, while the average annual inflation rate reached a level of 58% for the period April 1999–January 2000 (Goskomstat). Between April 1999 and January 2000, capital requirements increased further from 9% to 11%, but most banks' capital adequacy already exceeded 11% before the rule was introduced. Between January 2000 and March 2004, both reserve and capital requirements remained unchanged at 10% and 11%, respectively, while inflation was, on average, 16%. Claeys and Schoors (2007) find evidence consistent with a considerable level of enforcement of this capital adequacy standard during this period, with the exception for banks that are too big to fail. Proposition 1 predicts that considerably raised reserve requirements, combined with relatively stable capital rules, will ceteris paribus lead to less risk-taking, while Proposition 2 predicts that even mildly increasing capital requirements in a financially repressed environment may lead to more bank gambling, provided that loan default rates and the cost of capital are sufficiently low.

The fourth and most recent period runs from April 2004 to 2007. In the summer of 2004, the reserve requirements were lowered again as a reaction to the mini-crisis and deposit insurance was gradually introduced. In April 2004, an updated version of the 1996 regulation came into effect, with the intention of reducing the opportunities and incentives for banks to manipulate their accounts. Most recently, the CBR screened and approved all banks that want to participate in a deposit insurance scheme (Tompson, 2004). All these events render these later periods inappropriate as an illustration of our simple model without deposit insurance.

Having defined the second and the third period of Russian banking history as relevant periods for the illustration of our model, we now proceed with a more detailed illustration. We use two datasets, provided by the information agencies Mobile (monthly data) and Interfaks (quarterly data).[10] Because the available time-series is too short to perform in-depth statistical tests, we limit ourselves to the presentation of scatter plots. Figure 12.5 tries to relate bank capital and bank risk-taking. On the left panel of Figure 5, we present a scatter plot of bank capital and loans loss reserves with data taken from Mobile. Our model, however, speaks not about capital, but capital adequacy, both of which may not

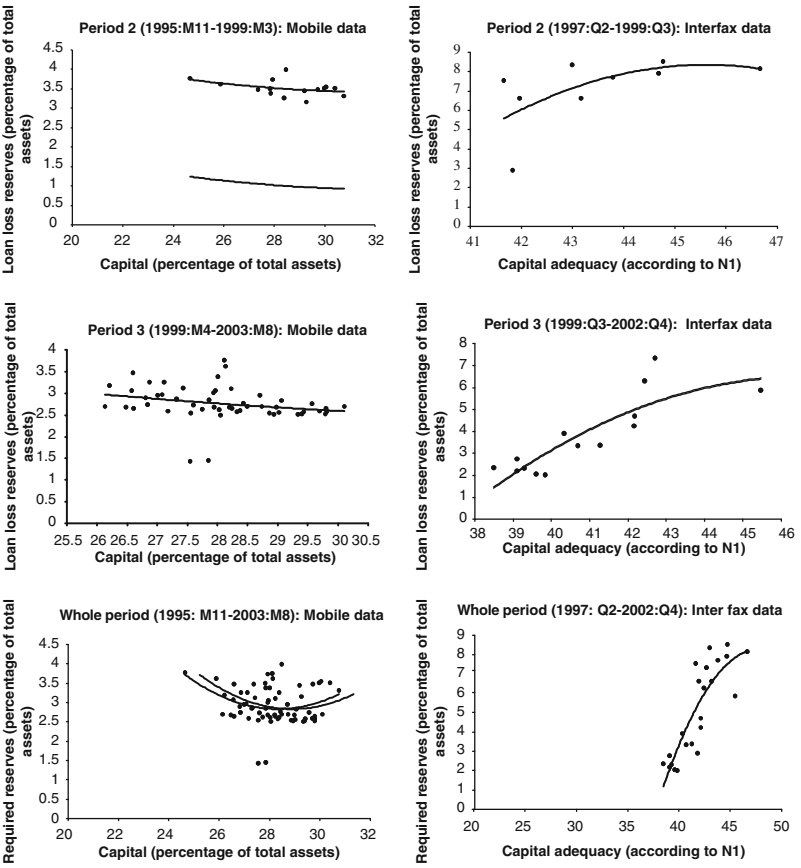

Figure 12.5 Capital adequacy *versus* non-performing loans (percentage of total loans) (1997:Q2–2002:Q4) and capital (percentage of total assets) *versus* loan loss reserves (percentage of total assets) (1995:M11–2003:8)
Note: Capital adequacy according to N1, as specified in CBR Instruction No. 1 of 30 January 1996.
Source: Own calculations based on Interfaks and Mobile.

be highly correlated. We should therefore attach more value to the right panel of the figure, where we use Interfaks data to construct a scatter plot of non-performing loans and capital adequacy for, respectively, the second period (upper figure), the third period (middle figure) and both periods (lower figure). Although the scatter plots do not allow us to draw any conclusions about the causality of the relationship, we find indications of a positive relationship. Indeed, all three figures of the right panel of Figure 12.5 exhibit a positive relation between capital

adequacy and revealed bank risk-taking. This suggests that the cost of capital and the loan default risk were so high during both periods that Russian banks reacted perversely to tightening capital adequacy rules by taking on more rather than less risk, as predicted by Proposition 2. Figure 12.6 relates required reserves and bank risk-taking. The left panel

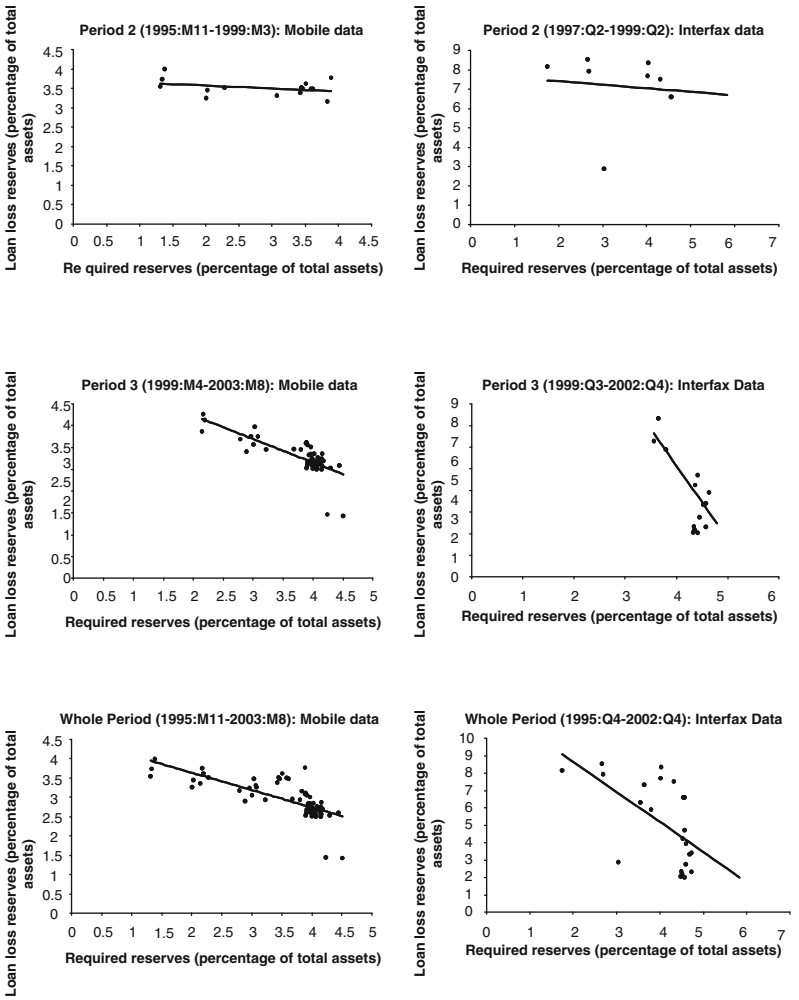

Figure 12.6 Required reserves *versus* non-performing loans (1995:Q4–2002:Q4) and loan loss reserves (1995:M11–2003:M8)
Source: Own calculations based on Interfaks and Mobile.

(data from Mobile) and the right panel (data from Interfaks) are now more comparable, since both datasets provide information on required reserves. The differences between the two panels are due to differences in periodicity and due to the fact that Mobile only provides loan loss reserves, while Interfaks also provides non-performing loans. Although the scatter plots again do not allow us to draw any conclusions about the causality of the relationship, we find indications of a negative relationship between required reserves and bank gambling. This is in line with the prediction made in Proposition 1 that lower required reserves will lead to more bank gambling. It is also noticeable that the relation is much steeper in the third period than in the second period. This may be due to the fact that the enforcement of the required reserve regulations analysed in this paper was stricter in the third period from April 1999 to March 2004 than in the second period from May 1995 to March 1999. Together, the data indicate that the introduction (or better enforcement) of capital requirements did not lead to the desired reduction in risk behaviour. Our model explains that this result is to be expected if loan default rates and the cost of capital are too high. Therefore, the temporary increase of reserve requirements, and thus the increase in financial repression by the CBR in the period after the crisis of 1998, seems justified with hindsight, because it helped to restore systemic stability. Only when the cost of capital and the loan default rate are sufficiently reduced – for example, by improving monitoring and screening skills – will a capital requirement achieve its purpose of reducing bank risk behaviour.

Concluding remarks

The model in this paper predicts that the reduction of financial repression may increase bank risk-taking behaviour, while the introduction or enforcement of a capital adequacy rule will only reduce bank risk-taking behaviour if the cost of capital and the loan default risk are sufficiently reduced. This suggests that, as long as capital is costly and default risk is high, financial repression could be more effective in installing systemic stability than capital regulation. A country desiring to substitute capital rules for reserve requirements is in this spirit well advised to bring the cost of capital and the risk of default down to acceptable levels. Only when capital requirements can successfully reduce bank risk behaviour can financial repression harmlessly be diminished. Our simple analysis of the available Russian data suggests, but does not establish proof of, a perverse impact of capital

requirements with respect to risk behaviour of Russian banks. The Russian supervisory authorities may have fallen in this pitfall explained by our model. The temporary increase of reserve requirements of the CBR in the aftermath of the crisis of August 1998, although heavily criticised, may therefore have been very useful in curbing bank risk behaviour and securing systemic stability.

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Notes

1. Emerging financial markets often tend to be restricted by rules governing the composition of bank balance sheets, such as high reserve requirements, interest-rate ceilings, foreign-exchange rate regulations and other types of explicit or implicit taxes on the financial sector (Denizer *et al.*, 1998). For an analysis of the optimal degree of financial repression, see, for example, Bencivenga and Smith (1992), who develop a model in which an increase in reserve requirements represses the development of the financial system.
2. See for example Rochet (1992) and Dewatripont and Tirole (1994).
3. We do not model the form of competition explicitly. For an overview on issues concerning competition and bank stability, see Carletti and Hartmann (2002). Repullo (2004) used the framework of Hellman *et al.* (2000) to introduce the effects of imperfect competition *via* a framework à la Salop. He finds that imposing deposit rate ceilings does not always guarantee the existence of a prudent equilibrium.
4. The capital requirement is risk-based because the minimal capital requirement is a function of the only class of risky assets, that is, loans.
5. This implies an elastic supply of capital funds.
6. When the rate at which reserves are compensated is lower than the risk-free rate, banks are assumed not to hold voluntarily reserves above what is required by the central bank. If the risk-free rate were lower, a bank could achieve infinite profits by borrowing at a market rate and holding infinite reserves (Mitchell, 1982). However, even when reserves are not compensated, some banks in transition economies do hold excess reserves because they have a only few alternatives to allocate their assets or are faced with low enforcement of creditor rights (Denizer *et al.*, 1998).

7. In this spirit, prompt corrective action (PCA) rules were introduced in 1991 in the US by the Federal Deposit Insurance Corporation Improvement Act (FDICIA) to allow for early intervention in problem banks to save them from becoming insolvent (Goldberg and Hudgins, 2002). PCA aims at preventing banks from 'gambling for their resurrection' (Kane, 1989) by enabling regulators to close down failing banks, even at a positive level of capital.
8. One alternative way to incorporate monitoring into the model is to let banks incur a variable cost depending on the volume of loans. Gropp and Vesala (2004) and Cordella and Yeyati (2002) let borrowers' default risk depend on the amount of monitoring.
9. The CBR also installed a battery of other prudential regulations aimed at lowering bank risk behaviour. The additional prudential regulations included, next to capital adequacy rules, a minimal capital requirement, a set of liquidity requirements, credit risk requirements, insider activity standards and a number of non-compulsory guidelines. These regulations are summarised in the CBR Instruction No. 1 of 30 January 1996, 'On the Procedure for Regulating the Activities of Credit Organizations'.
10. See Karas and Schoors (2005) for a detailed description of the different data sources used.

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13

Impact and Implementation Challenges of the Basel Framework for Emerging, Developing and Small Economies

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This paper focuses on the impact of the Basel III accord on emerging, developing and small economies. It looks primarily at potential unintended consequences of the new rules. The areas of concern for both banks and regulators are found in increases in risk-weighted assets for trading exposures, in capital replenishments in jurisdictions with weaker governance and less developed financial markets, and in coping with enhanced liquidity requirements in multinational groups. The resulting recommendations concern consistent application of rules in various parts of multinational banks and the provision of adequate supervisory powers for adequate control of the institutions and markets.

Introduction

In response to the global financial crisis, the Basel Committee on Banking Supervision (BCBS) introduced two sets of reforms to the international capital framework for banks. The 'Basel 2.5' package of reforms (BCBS, 2009) included measures to strengthen the trading book capital requirements under Basel II and enhance the three pillars of the Basel II framework. Basel III (BCBS, 2010b) introduced two additional capital

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buffers: a capital conservation buffer of 2.5% that should be applied across the board, and a countercyclical buffer, which should be applied during periods of high credit growth. In addition to the level of capital, Basel III addresses the issue of its quality through its focus on common equity. Capital loss absorption is dealt with by the point of non-viability clause that provides relevant authorities with discretion for a write-off or conversion to common shares if the bank is judged to be non-viable. The capital framework was also supplemented by a non-risk-based leverage ratio. There is also substantial strengthening of the counterparty credit risk framework. Most of Basel III relates to Pillar 1 measures (minimum capital requirements), but there are also implications for Pillar 2 (further requirements by supervisor related to risks not covered by Pillar 1) and Pillar 3 (set of disclosure requirements). Basel III also introduced two required liquidity ratios: the liquidity coverage ratio (LCR) and the net stable funding ratio (NSFR).

The Basel III as well as Basel II standards are designed primarily for large internationally operating banking institutions with a focus on their activities in BCBS member states. They set minimum regulatory standards and respect the need to set the overall standards in various jurisdictions according to local conditions. Nevertheless, the Basel standards are to a large extent reflected in the regulations in BCBS non-member countries too. The prime focus of this paper is the impact of Basel III changes to the capital and liquidity frameworks on emerging market and developing economies, and specifically also on small economies. For simplicity, we label this group as emerging market and smaller economies (EMSEs).

The EMSEs are a rather heterogeneous group. Some of the countries have their own currencies, some are members of currency unions, while others utilize the currencies of other economies. Some are members of the European Union (EU), which imposes extensive regulatory requirements designed outside the scope of EMSEs. Furthermore, it is obvious that jurisdictions within this group differ substantially and will continue to do so. Despite all these differences, the EMSEs also have some common features. Their financial markets are typically more volatile than those of large advanced economies, as is their GDP growth, which is meanwhile higher on average than that of advanced economies. They also typically experience stronger credit growth because their financial sectors are in the process of financial deepening. They usually have lower credit ratings and shallower government bond markets, which in some cases implies a lack of high-quality liquid assets (HQLA), a lack of adequate collateral and so on. And they face a whole range of

home-host issues, as many globally significant financial institutions operate branches or subsidiaries in EMSEs.

The presence of branches and subsidiaries of multinational banks is the most important feature of EMSEs' banking sectors. Whether multinational banks operate in a particular jurisdiction as a branch or subsidiary creates striking differences. Nevertheless, as Mayes and Granlund (2008) explain, both ways will inevitably pose problems for the regulatory and supervisory authorities in both home and host countries.[1] As to the choice of a multinational bank regarding preferred organizational form, Cerutti *et al.* (2007) find that banks are more likely to operate as branches in countries that have higher taxes and lower regulatory restrictions on bank entry and on foreign branches. Subsidiary operations are preferred by banks seeking to penetrate host markets by establishing large retail operations. These findings are to a large extent confirmed by Fiechter *et al.* (2011). They conclude that banks with significant wholesale operations tend to prefer a more centralized branch model that provides them the flexibility to manage liquidity and credit risks globally and to serve the needs of large clients. The funding costs for the wholesale group are likely to be lower under the branch structure, given the flexibility to move funds to where they are most needed. A subsidiary structure, in contrast, constrains the banking group's ability to transfer funds across borders and hence may be less suitable for wholesale activities. However, they also find that, given the diversity of business lines and the varying objectives and stages of financial development of different countries, there is no one obvious structure that is best suited to all cases for cross-border expansion.

EMSEs are impacted by the Basel III framework in three ways. First, there is an indirect impact of the implementation of the framework at the consolidated level by jurisdictions that are home to international banks. This involves increased cross-border cooperation challenges, and it is all the more important for countries who are hosts to branches or subsidiaries that may represent a small fraction of the consolidated group but are locally systemic. Second, there is the indirect impact of the reactions of international banks to implementation. In this case, there is the concern that as international banks change their business and deleverage, their exposures to EMSEs might be unduly reduced. Finally, there is the direct impact on EMSEs of implementing the Basel III framework in their own jurisdictions. There are many papers and studies looking at the economic effects and impacts of the Basel III framework in advanced economies using macro-economic models (see the section 'Basel III, regulatory capital and its quality'). The implied

changes in volumes and prices of credit constitute the driving forces in these approaches. In contrast, studies focusing on more detailed effects stemming from changes in individual regulatory parameters often specific to emerging and small economies are scarce. This paper intends to provide a contribution in this direction.

The structure of the paper is as follows. The next section surveys the analyses on the economic effects of the Basel III framework and the potential consequences of new capital regulations in EMSEs. The section after that considers the issues associated with the introduction of macroprudential capital buffers. The following section discusses the implications of new regulation of banks' trading exposures for affiliates of multinational banks. The subsequent section turns attention to the sensitive issue of regulatory treatment of sovereign exposure from both the micro- and the macroprudential perspective. The next section explains potential risks associated with the accelerated move of the EMSEs' banks to advanced approaches to modelling financial risks. The penultimate section describes impacts of the new liquidity framework while the final section concludes.

Before proceeding to these topics, let us note that we agree on the importance and adequacy of most of the changes that are contained in Basel III. However, we deliberately focus mainly on challenges and risks, especially on the identification of possible unintended consequences of the new rules. This is not to say that the unintended consequences prevail over the intended ones. Furthermore, not all the issues discussed here are related directly to Basel III, and not all the unintended consequences are specific exclusively to the EMSE countries. Many of the proposed rules were discussed long before the establishment of the new regulatory framework. However, the creation of the new framework gives new relevance to these issues and consequences.

Basel III, regulatory capital and its quality

The changes in the capital framework that constitute the core of Basel III are just one, though the most important, component of the post-crisis regulatory overhaul. These changes concern not only the traditional part of banking regulation, capital requirements for covering risks faced by the individual institutions that stand at the centre of the Basel II accord. Basel III also contains parts of the new economic policies labelled 'macroprudential policy' that are designed to prevent or mitigate risks of a systemic nature. This reflects recognition that liberalized financial markets have created a favourable environment for

endogenous 'boom and bust' cycles. The new framework thus takes into account both micro- and macroprudential concerns and struggles to achieve robustness as a key to avoiding financial sector vulnerability. For a bank-based system, robustness will be achieved *via* a high loss absorbency capacity, strong liquidity and brakes on credit booms. Loss absorption should cover potential losses through sufficient provisions against loan impairment, through capital cushions, and cyclical losses through countercyclical capital buffers. There should also be a cross-section risk component consisting of capital add-ons for systemically important institutions. Strong liquidity is essential for limiting the fragility of liabilities.

Impact studies of Basel III were naturally a part of its preparation. The focus was mostly on the estimates of macroeconomic effects in advanced economies. BCBS has advocated Basel III on the basis of the Long-Term Economic Impact (LEI) Report (BCBS, 2010c), which focuses on the long-term effects while ignoring transitional costs. The study admits the higher cost of external finance (higher lending rates), nevertheless, the overall balance of cost and benefits is rather positive up to a 15% of capital adequacy ratio. This result is mainly because of the high perceived benefits of a reduced probability of a financial crisis. BCBS has also arranged for a study of transitional effects of Basel III implementation by the MAG (Macroeconomic Assessment Group). This study (MAG, 2010) assumed that banks face higher costs when funding assets by capital than by deposits or by debt. The initial effect of Basel III introduction is an increase in lending rates. However, in the long run the banks get less risky, the costs of funding go downwards, lending rates decline and supply of credit is restored. The result is that in the short run the costs are low and in the long run they disappear. When new liquidity requirements are added, the costs go a bit further, but the overall picture is not affected. This positive view of the long-term effects has been confirmed by Angelini *et al.* (2011), Slovik and Cournède (2011), Kashyap *et al.* (2010), Miles *et al.* (2011) and Admati *et al.* (2011).

Even though the impact studies and estimates of the effects were targeted at the advanced economies, they should hold for the EMSEs as well. In addition, the short-term negative effects on lending rates could be even lower here than in advanced economies since most EMSEs will not have great difficulties in complying with the new definition of capital in Basel III. This is because the banks in EMSEs generally maintain capital levels in excess of internationally agreed regulatory minimums and their capital base is typically dominated by common shares and retained earnings (labelled Core Tier 1, CT1; or Common

Equity Tier 1, CET1). Nevertheless, there may be several implementation challenges. First of all, implementation of Basel III will generate a need for some capital replenishment. Reasons for this include: (i) banks in EMSEs inevitably need to issue additional capital given their relatively fast economic growth and the pivotal role played by banks; (ii) higher minimum regulatory capital requirements at the international level will likely lead banks in EMSEs to build up capital to maintain buffers against a relatively higher degree of macroeconomic and market volatility; and (iii) internationally active banks often use the sovereign credit rating of the host jurisdiction as the credit ceiling or the risk floor for all the exposures incurred by their subsidiaries.

EMSEs with lower credit ratings could thus find their banking system with higher capital levels than in advanced economies, regardless of whether banks in the latter are more exposed to other systemic risks.

The eligibility criteria for Tier 1 (common equity, retained earnings, reserves, non-redeemable preferred stock and other capital not secured by the issuer) and Tier 2 (hybrid instruments and subordinated debt) may turn out to be non-trivial. This applies in particular to the requirement that all these instruments have a 'point of non-viability clause', that is, all regulatory capital instruments should be able to absorb losses in the event that the issuing bank reaches a point of non-viability. In addition, once the clause is triggered, supervisors may face potential governance issues when conversion brings in shareholders that may not be appropriate. More broadly, the change of ownership structure may have implications for the viability of the institution going forward. It should be expected that the supervisor has the authority to replace management or to require some other change in management deemed necessary to ensure that the institution operates in a prudent manner. Basel III establishes a requirement that the terms of capital instruments must allow, at the option of the regulatory authority, for them to be written off or converted into common shares in the event that a bank is unable to support itself in the private market in the absence of such conversions. During the recent financial crisis, some troubled banks never reached the insolvency point where the subordinated instruments would have performed as capital because governments provided support to avoid the liquidation of these banks. It is clear that, if such support had not been provided, these banks would have failed and subordinated creditors would have received payment only after all depositors and senior creditors had been paid in full.

Basel III allows for certain debt instruments issued by banks to be included in additional Tier 1 and Tier 2 capital, subject to a set of

inclusion criteria. Such policy will inevitably create a bias against those banks that are constrained by their market experience and credibility and thus face higher costs in issuing capital. As EMSEs generally lack local infrastructure to facilitate the issuing of structured capital instruments in domestic markets, local banks are faced with difficult, if not impossible, challenges to raise less costly capital. In addition, Basel III allows the instruments issued by subsidiaries to be included in the consolidated group's capital where the pre-specified trigger event is linked to the non-viability condition determined by both home and host authorities. In practice, there is a tendency for the internationally active banks to include their subsidiaries' issuance in the group's capital as these banks manage their risks and maximize their expected risk-adjusted returns by consolidating the group-wide assets and liabilities. Therefore, an immediate consequence of such policy is the potential for complications if the non-viability conditions determined by the home and host authorities are different. In addition, the possible conversion of structured instruments issued by subsidiaries into equity may lead to the potential dilution of shareholder holdings of both subsidiaries and their parent banks if the issuance is included in the group's capital, which will add to both supervision and management complications. All these potential complications will make capital issuance by subsidiaries a less desirable choice for both bank managers and investors.

Basel III also requires the banks to deduct from their common equity capital most of their assets with weaker loss-absorbing features such as minority interests, goodwill and deferred tax assets, as well as some investments or rights. In general, the use of innovative capital instruments and Tier 2 instruments is limited and most of the capital is composed of CET1 and reserves. While overall goodwill is the largest element of deductions for advanced economies, for emerging countries that participate in the quantitative impact study, the deduction of deferred tax assets seems to weight relatively more. In part, this may be because of provisioning and accounting legal frameworks; forward-looking provisions, for instance, frequently are not recognized by tax authorities and create deferred tax assets. For example, the deduction of deferred tax assets proposed by Basel III seems to weigh relatively more in EMSEs than in advanced economies. This may be partly because of provisioning and accounting legal frameworks, for example, forward-looking provisions frequently are not recognized by tax authorities and generate deferred tax assets. The World Bank (2013) estimates that the share of assets with less loss-absorbing characteristics to be deducted from CT1 capital is relatively small on average for banks in emerging and developing economies, except in the Latin America

and Caribbean region. The proportion of CT1 capital to be deducted nevertheless varies greatly across banks. If applied immediately, the deductions combined with market risk adjustments (Basel 2.5 and trading exposures) would lower the CT1 ratio by about 1-3 percentage points on average. The overall impact on the CT1 ratio is the largest for Latin America, the Middle East and North Africa, and Europe and Central Asia.

Difficulties associated with the deductions and eligibility criteria for Tier 1 and Tier 2 instruments under Basel III may create pressure on EMSEs to implement changes to their legal frameworks. In the case of the eligibility criteria for Tier 1 and Tier 2 instruments, the national legal and regulatory frameworks should be consistent to ensure that the non-viability clause is effective. While the criteria driving the trigger for conversions or write-offs can in principle be set out *a priori* in broad terms, allowing for better pricing of the instruments and helping to reduce market uncertainty and the legal risk to supervisors, the decision as to whether a bank can continue on its own will ultimately always be a judgement call. As a result, supervisors need to be given sufficient powers to be able to make such decisions.

EMSEs may also need to take actions to cultivate domestic markets for the issuance of structured capital instruments, including: (i) having in place legal and institutional arrangements to enable the issuance of Basel III-recognized capital instruments; (ii) defining *a priori* criteria for the triggering of the point of non-viability, which may help boost market confidence and acceptance for issuance of structural capital instruments; (iii) having an enabling tax environment where the capital instruments issued by banks are typically tax-deductible and are not subject to withholding tax; and (iv) designing the terms of capital instruments to make such instruments suitable for a broad range of investors. If foreign bank subsidiaries operating in EMSEs issue capital, and this is included in the consolidated group's capital, authorities may need to impose certain regulatory requirements to avoid capital being used to cover losses of parent banks while simultaneously harming the confidence in the stability of subsidiaries. Enhanced communication between home and host regulators needs to be encouraged and should cover, among other issues, regular information sharing about the performance of related parent banks and subsidiaries and related resolution plans.

Macroprudential capital buffers

The supervisory powers to implement the mandatory capital conservation and countercyclical buffers (CCyBs) will be essential to ensure

effective implementation of Basel III. The values of the buffers themselves may not present any particular difficulties for EMSEs. The supervisory powers to implement these buffers may be more problematic. With the capital conservation and counter-cyclical buffers in place, the restrictions on the distribution of profits in cases of non-compliance with these capital buffers should be automatic and imposed on banks through requirements set forth by national legislation. The buffers cannot function as desired if the supervisor does not have sufficient power to restrict the distribution of profits, or if authorities do not have the will to activate the various triggers. Many countries are still struggling to create such powers for their regulators. In many EMSEs that have not yet implemented Pillar 2 of Basel II, the development of supervisory judgement that is crucial for Basel II and Basel III may be lacking. In addition, there are complex issues related to the interaction of these buffers, other additional buffers and Pillar 2. For instance, several countries already include additional Pillar 2 capital requirements for banks that are considered systemically important or to cover idiosyncratic risks. Authorities will need to consider whether these Pillar 2 charges overlap with the Basel III buffers. Supervisors need to assess whether the Pillar 2 add-ons could safely be drawn down in times of crisis. If this is not the case, such add-ons should be considered a minimum requirement for the bank.

Similar issues arise when discussing the calibration of the CCyB. The actual implementation of a CCyB in countries with underdeveloped credit markets seems to be more complex than what was proposed by the BCBS; finding the right indicators of systemic risk and establishing a framework to calculate the adequate levels of CCyB countries is still a work in progress (Drehmann *et al.,* 2010). In many EMSEs, it may not be adequate to mechanistically apply the recommended methodology by measuring excessive growth on the basis of deviations from the actual approximation of the long-term trend of credit relative to GDP.[2] The framework allows flexibility for supervisors to use judgement in defining other indicators, and the BCBS has published principles that can be used to assist supervisors to identify the build-up of systemic risk (BCBS, 2010a). EMSEs have often been well ahead in terms of applying macroprudential logic in their policies (Hahm *et al.,* 2012; Moreno, 2011). Some had already implemented countercyclical and other macroprudential measures such as loan-to-value ratio on mortgage loans, debt-to-income ratio on credit cards and personal loans, and countercyclical provisioning, and now are working on how these measures will interact with the buffer and what their cumulative effect might be. Changes in

the CCyB in EMSEs may also precipitate capital flows. As the volume of liquidity in a domestic banking sector is reduced because of the introduction of the CCyB, the result could be excessive liquidity outflows to other parts of the financial system, including to financial markets abroad. Even though the potential size of the flows induced by the CCyB itself may be limited, in combination with swings in monetary policy the effect could be sizeable.

In setting the CCyB and other macroprudential tools, the supervisors should use the flexibility provided by the framework to use judgement and/or undertake a comprehensive analysis to improve the understanding of credit cycles rather than mechanically relying on credit to GDP de-trending. The principal task is for them to make their own informed judgements about the equilibrium or sustainable level of credit in the economy. Subsequently, a set of forward-looking indicators providing information on the possible materialization of systemic risk resulting from currently emerging financial imbalances has to be employed for a thorough assessment. The CCyB may help the authorities to lean against the expansionary phase of the cycle by raising the cost of credit and therefore slowing down lending if they conclude that the stock of credit has grown to excessive levels relative to the benchmarks. Nevertheless, this potentially moderating effect on the expansionary phase of the credit cycle should be viewed as a positive side benefit rather than as the primary aim of the CCyB regime. The quantitative impact of the CCyB *per se* may be rather weak during a credit boom. Its major contribution is to help maintain the flow of credit in the economy when the broader financial system experiences distress after a credit boom and to assist in ensuring a smooth landing for both the banking sector and the real economy. No single policy tool used in isolation can tame credit booms. Therefore, other macroprudential tools, including as sector-specific ones, that could be used to enhance banks' resilience to credit booms should explicitly be set out in Basel standards.

Basel 2.5 and trading exposures

The capital requirements of Basel 2.5 were set to increase the resilience of banks against market risk in their trading books through a significant increase in the respective capital charge (BCBS, 2009). BCBS indicated that market risk capital requirements associated with Basel 2.5 will increase by an estimated average of three- to four-fold for large internationally active banks.[3] As regards EMSEs, two issues should be highlighted. The criteria for estimating risk-weighted assets (RWA) for

exposures of local subsidiaries in host countries are decided by parent banks and home country supervisors. Global banks manage their risks and estimate RWA by consolidating all their subsidiaries' assets and liabilities at their parent bank. Hence, assets held by subsidiaries result in capital charges for the group as a whole. The highest credit quality risk for a host country local bank, domestic sovereign debt, could be transformed through the process of balance sheet consolidation into a parent bank's foreign sovereign risk exposure. A foreign sovereign risk exposure denominated in foreign currency is often assigned a much higher RWA than a domestic sovereign exposure denominated and financed in local currency.

Basel 2.5 thus produces significant increases in the RWA for trading exposures in the financial markets of EMSEs because they usually have greater volatility and lower global credit ratings. The report by the Regional Consultative Group for the Americas (FSB, 2014) asserts that capital requirements for some countries' sovereign bonds may increase as much as sixteen-fold as a consequence of Basel 2.5. This may thus exacerbate global banks' costs of trading exposures to EMSEs when domestic risk exposures are transformed into foreign ones particularly when global credit ratings are used. This increase in RWA takes place even when the sovereign positions are registered in the books of subsidiaries established in the same country that issues the sovereign debt and the sovereign debt is denominated and funded in the currency of the issuing country. Higher capital charges will also be particularly significant for sovereign domestic debt held by large subsidiaries of global banks because their risk positions may increase the capital requirements for concentration risks. The effect will be the increase in the cost of holding sovereign debt, especially in emerging market economies in which global banks have a material presence. In some cases this could accelerate the deleveraging process of global banks from overseas exposures.[4]

Basel 2.5 through its impact on the RWA for trading exposures may thus harm liquidity and create a less level playing field in the financial markets of EMSEs. Basel 2.5 could have a negative impact on liquidity in local financial markets through the increases in the trading book RWA of the local subsidiaries of foreign banks for their risk exposures in local sovereign debt. These increases would also discourage banks from taking advantage of arbitrage opportunities in local financial markets, decreasing their efficiency. This issue is very important for the development of efficient financial markets in EMSEs where global banks and their local subsidiaries are an important source of liquidity. The requirements associated with Basel 2.5 would also promote arbitrage between

the trading and banking books. In particular, banks could wish to move risk exposures from the trading to the banking book as RWA for same risk exposures could be much higher when registered in the former than in the latter (Pepe, 2013). While all exposures in the trading book must be valued at market prices, banking book exposures can be valued at amortized cost. Hence, this shift of exposures, particularly of securities, from the trading to the banking book decreases the transparency of banks' financial situation.

In some EMSEs, as well as in advanced economies, the implementation of the credit valuation adjustment (CVA) risk charge is still under consideration. The CVA capital charge computes the amount required to cover the losses arising from marking to market the counterparty risk of banks' OTC derivative portfolios. BCBS observed that two-thirds of credit risk losses suffered by banks during the financial crisis in 2008 arose from CVA losses rather than actual defaults.[5] Strong industry pushback and fears from corporate and pension funds that their business costs would increase have caused regulators to create exceptions (EU framework includes exemptions of CVA risk to trades with corporates, sovereigns and pension funds) or postpone their decision.

In order to deal with the challenges of implementing the Basel 2.5 and III capital framework, international regulators should consider issuing specific guidance for the appropriate use of local and global credit ratings and the risk assessment of sovereign exposures (denominated and funded in local currencies) in foreign subsidiaries. When consolidating parent banks and subsidiaries' balance sheets and assigning RWAs, guidance is needed on practices regarding the risk weighting, at the consolidated level, of foreign subsidiaries' risk exposures - both the currency denomination of assets/liabilities and the legal differences between a parent bank's assets/liabilities in an overseas branch from those of a subsidiary should be taken into account. In addition, the regulators should re-evaluate the circumstances in which it may be appropriate to deduct an entity from regulatory capital rather than consolidate its exposures. The latter can be particularly important for structurally separated entities that are systemically important and have limited intra-group exposures.

Basel III and sovereign exposures

The recommendations of the previous section should not be viewed as a call for general acceptance of zero or close to zero risk weights for sovereign exposures. There is a case for a reconsideration of current capital treatment of sovereign debt and for making the framework

globally more consistent instead. The Basel III framework continues to provide preferential treatment of sovereign exposures denominated and funded in domestic currencies. All sovereign exposures of this sort are allowed, at national discretion, to keep the same risk weight regardless of their ratings. Such treatment stems from the unique and central role of government bonds in modern financial systems. These are generally regarded as risk-free (ie, highly liquid, high-quality, HQLA) assets, thanks mainly to the high credibility of the state as issuer and the high quantity of debt issued. However, the preferential treatment brings a risk of reinforcing the links between sovereign and banking sector stresses, as became apparent in the recent global financial crisis, especially the crisis of the euro area. In addition, as jurisdictions may exercise national discretion to assign a zero-risk weight for domestic sovereign exposures under the new capital and liquidity frameworks, there could be further incentives for banks to hold domestic sovereign exposures.

The build-up of sovereign exposures on the balance sheet of banks beyond some point may become a relevant concern for authorities in EMSEs. In line with the development of domestic capital markets, sovereign debt in EMSEs is increasingly being funded in domestic currencies. However, domestic bond markets in a number of EMSEs are still under development, thus limiting the ability of banks to diversify their assets. This poses several challenges, including for the implementation of the LCR (see the section 'The Basel III liquidity framework'). Addressing banks' sovereign exposures is particularly pertinent for those EMSEs whose economies are dollarized, are members of currency blocks and/or issue a significant number of sovereign bonds denominated in foreign currency.

The approaches of international banks to recognizing sovereign risk differ (FSB, 2014). Some banks that apply the standardized approach use global ratings to calculate risk-weighted assets. Other banks using internal risk-based (IRB) models do not take into account whether the sovereign exposure is denominated and funded in local currency. As a consequence, international banks may give asymmetric treatment to comparable risks based on the entity in which the asset was booked. As explained in the previous section, home countries' and host countries' sovereign exposures thus may not always receive similar treatment. In the process of balance sheet consolidation, host country sovereign exposures often lose their place in the local lowest risk-weight category, while home country sovereigns maintain it. This creates inconsistencies when the credit quality of a given counterparty is evaluated both by the subsidiary and by the parent office. Applying different treatment to sovereign exposures booked

in overseas subsidiaries creates a home country bias and makes the playing field in host countries less level.

Several principles can guide the approach aimed at limiting excessive accumulation of sovereign exposures spurred by market and regulatory incentives. While the authorities must recognize that banks have legitimate motivations to hold sovereign exposures on a relatively large scale, the approach needs to: (i) differentiate among types of sovereign debt held by banks; (ii) be tailored to country-specific circumstances; (iii) consider potential unintended consequences; and (iv) be supported and informed by a robust analytical framework.

A potential menu of approaches to address sovereign risk build-up includes: (i) sovereign risk capital buffers, such as incremental capital charges on sovereign exposures under Pillar 1 or concentration charges under Pillar 2; (ii) more robust and consistent cross-jurisdictional application of the Pillar 2 supervisory review process to address risks associated with excessive concentration; (iii) a limit on the size of sovereign debt exposures, possibly as a percentage of total assets or capital; and (iv) supply-side measures to promote sovereign risk diversification, such as vehicles or funds for sovereigns to collectively pool liabilities, as well as initiatives aimed at developing domestic and regional bond markets. The authorities in individual jurisdictions should not apply the measures to sovereign exposures unilaterally, unless these are identified as a significant threat to financial stability. The changes to regulatory treatment of sovereign exposures should preferably be considered and adopted on a globally consistent basis.

The international regulators should study differences in the implementation of the Basel framework for international banks and consider developing guidance in order to achieve consistent implementation of capital standards, and avoid arbitrage and asymmetric treatment of similar exposures. Consolidation practices and home country regulation should avoid a home country bias: sovereign exposures denominated and funded in local currency at overseas subsidiaries should receive the same treatment applied by head offices to sovereign exposures of the home country sovereign denominated in their domestic currencies and funded locally. At the same time, mechanistic use of CRA global sovereign ratings should be discouraged.

Advanced approaches to modelling financial risks

One of the potential consequences of the move towards higher capital requirements of Basel III is that banks in EMSEs could move to the

IRB approaches without being ready and respond to higher capital requirements by not revealing and recognizing all potential risks associated with their balance sheets. The higher requirements may create an incentive for banks to move to the use of the more advanced risk measurement techniques of Basel II in the hope of saving on capital by achieving lower implicit risk weights with the same balance sheets.[6] This would create pressure on supervisors to approve such practices even if a bank is not ready (eg by citing reputational concerns). Similarly, some banks may change their stringent approach to provisioning in a way that would lead to the creation of lower provisions relative to expected losses. Such a possibility is given by the diverse accounting approaches across jurisdictions and also by the discretion in applying the accounting rules (see Bikker and Metzemakers, 2005; Angklomkliew *et al.,* 2009; Packer and Zhu, 2012). Both directions could put somewhat arbitrary cushions against expected and unexpected losses. In addition, an incorrect or manipulative use of IRB methods and accounting rules could weaken consistency and comparability due to excessive variation in risk measurement without better management of the underlying risks.

There is a need to guard against the risk of banks moving in haste to the IRB approach under improper incentives. The IRB approaches, if applied inappropriately, may enable banks to manipulate their RWA numbers to lower risk weights. Only the gradual development of risk-sensitive approaches to regulatory capital calculations and risk management can lead to better risk capture and adequate preparation by both banks and supervisors to address possible future challenges with building internal models. Authorities have to take a conservative and prudent view on reviewing and approving IRB applications by banks. Host supervisors should actively verify and approve the models developed by parent banks, taking into account the specific features of the host country market. The supervisors need to be able to validate highly technical mathematical models as well as to find a right balance of models with qualitative features of the IRB approach.

The relevance of concerns regarding manipulation with risk weights has been confirmed in advanced economies. In recent years, bank equity analysts have frequently remarked on the difficulty of understanding differences in risk-weighted assets and coverage of impaired assets by provisions both across banks and through time. The BCBS (2013b) study on the regulatory consistency of risk-weighted assets in the banking book drawing on supervisory data from more than 100 major banks found that up to three quarters of the considerable variation across banks in average RWAs for credit risk in the banking book

is consistent with the spirit of the risk-based capital framework, that is, it can be explained by differences in the composition of banks' assets. The rest of the variation is, however, driven by diversity in banks and supervisory practices. Some of this stems from supervisory choices at the national level, due either to discretion permitted under the Basel framework or deviation in national implementation from Basel standards. The differences in practices also result from banks' choices under the IRB framework, that is, varying IRB approaches used by banks, conservative adjustments to IRB parameter estimates and differences in banks' modelling choices. In some cases, variations may also reflect differences in interpretation of the Basel framework.

Therefore, priorities for progressive movement to more sophisticated approaches within the Basel framework (eg IRB approaches) should be established. Supervisory authorities should ensure robustness, reliability and transparency of prudential outcomes from the adoption of Basel standards, including the Core Principles for Effective Banking Supervision (Basel Core Principles). In this context, Pillar 3 should be seen as a tool for meeting the needs of investors and counterparties. Decisions on the pace of the implementation would need to consider particular characteristics of banks and banking systems, as well as supervisory constraints. For example, some countries have considered the adoption of a more rules-based approach to Pillar 2 requirements as a way forward in the presence of legal frameworks that significantly limit supervisory powers. When considering the capital framework for smaller and less sophisticated banks, authorities should be aware that Basel standards are designed primarily for large international banks. However, when the majority of the banking sector is owned by these large institutions, supervisory authorities in EMSEs should build relationships with the home authorities of their largest banks and, upon agreement with the home authority, participate in relevant discussions on model validation within supervisory colleges.

In addition to proper calculation of risk-weighted assets, transparent and consistent accounting is crucially important for the robustness of prudential outcomes, even though it is not directly linked to the Basel standards. The recent financial crisis highlighted that having provisions commensurate with expected losses is one of the building blocks of resilience of the banking sector in particular. Provisioning is important not only because the provisions serve as a buffer against expected loan losses, but also because they provide significant information on how banks price credit risk. There are significant differences across jurisdictions as to the factual approach to provisioning. The desired state is that

all banks regulated in line with Basel standards use the International Financial Reporting Standards (IFRS). This is not the case now, even though significant progress has been made in this area. Nevertheless, even such a state would not guarantee adequate provisioning for asset impairment. Further improvements in the IFRS that would limit, among other things, existing procyclicality, are crucially needed (Frait and Komárková, 2013).

The Basel III liquidity framework

Basel III is the first accord that attempts to set a comprehensive quantitative framework for regulating the banks' liquidity (BCBS, 2010d). The LCR is designed to improve banks' resilience to short-term liquidity shocks through holding a reserve of HQLA. The NSFR should ensure that long-term assets are funded primarily by long-term, stable funding. Previously, national practices and experiences of liquidity requirements differed. Nevertheless, many countries, including some EMSEs, had developed approaches based on the concept of banks holding stocks of liquid assets to withstand stressed periods (for examples, see CGFS, 2010).

Implementation of the new liquidity framework will be challenging for some EMSEs. Different macroeconomic and financial environments in these countries, such as the lack of availability of diversified HQLAs, the higher share of foreign currency-denominated banking assets and liabilities, and unique characteristics of depositors, would pose specific challenges for implementing the LCR appropriately. In jurisdictions with limited availability of HQLAs, concentration risk, particularly to sovereign debt (a 'Level 1' asset), can easily emerge. The LCR requires banks to hold a diversified portfolio of HQLA that can be liquidated in a stress event to cover the outflow of liabilities, but the room for diversification will be limited in many EMSEs with limited access to other HQLA than sovereign debt. Furthermore, yields on HQLAs will typically be lower than other securities, implying a cost to banks' profit margins. Greater use of 'Level 2' HQLA, which are less traded in the markets, such as corporate debt, by banks could introduce greater volatility in market risk and increase exposure to credit risk.

Expanding the supply of HQLA through the alternative treatment in the framework would address the problem, at least partially. The LCR framework provides three options to address an insufficient supply of 'Alternative Liquid Asset' (ALA) treatment, with different pros and cons. The first option is to use a contractual committed liquidity facility (CLF) provided by the central bank.[7] This option has the advantage of

avoiding incentives for banks to change their asset portfolios. However, calibration is challenging as it must balance the potential for banks' overreliance on the facility with making the cost of the CLF unduly prohibitive. Central banks must be able to honour a CLF commitment and consider carefully how such a facility would affect monetary policy operations. Foreign currency HQLA, Option 2, can be a practical solution when banks already hold substantial numbers of such assets, but a premium must be placed on strong management of foreign exchange risk. A strong currency risk control framework, including quantitative regulatory requirements such as net foreign open position limits, should be a pre-requisite. Types of eligible assets need to be limited and haircuts must be conservative, based on historical experiences during stressed periods. Additional use of lower-quality HQLA (Level 2) with a higher haircut, Option 3, may be viable when sovereign debt is scarce but capital markets are well developed. Although this option enables banks to diversify away from sovereign bonds and alleviate pressures from their prices, the true liquidity profile of such Level 2 assets, particularly during times of stress, needs to be assessed and conservative haircuts must be set. Furthermore, supervisors must guard against Level 2 assets crowding out Level 1 assets for higher yields the former typically have.

Introducing new instruments that are included in HQLA is a further option. An option considered by some advanced economies is the covered bond, which provided a stable source of funding during the recent crisis. However, risks must be carefully assessed when introducing new instruments. For example, covered bonds encumber assets, potentially prejudicing depositors and unsecured creditors in the event of resolution; mitigation would be to set limits on total asset encumbrance or covered bond issuance.[8]

For some EMSEs, the LCR may increase foreign currency risk if banks meet LCR shortfalls in domestic currency with foreign currency assets. Currency convertibility in the LCR framework for dollarized countries needs further guidance. It is questionable, for example, whether it is prudent to allow surplus in dollar LCR to cover a shortfall LCR in the domestic currency and vice versa. Furthermore, while Basel III does not require the LCR to be met currency by currency, monitoring and reporting of relevant currencies forms part of the LCR framework and banks may feel under pressure to meet the LCR in all individual currencies, thus increasing demand for foreign currency HQLA. This may in turn affect the price and availability of such assets.

Banks in EMSEs generally rely heavily on deposits for funding, putting a premium on applying appropriate run-off rates to deposits.[9]

While this funding pattern broadly reduces the HQLA requirement, close attention needs to be paid to the breakdown of deposits to ensure that low run-off rates are suitable and reflect local conditions. This means not only must the authorities set run-off factors that are appropriate in their jurisdiction but they also must be satisfied that banks are capable of distinguishing correctly between different types of deposit liability, taking account of followings. Probabilities of funding run-off in some countries could differ substantially from those assumed in the LCR framework. Typical examples could be smaller jurisdictions where non-resident deposits or cross-border mobility of deposits is a major feature. This heightens the need for national discretion in EMSEs in calibrating run-off rates for certain types of liability. The applicable run-off rates for deposits range from 3% to 100% depending on the stability of the deposit's characteristics, making it vital for banks to categorize funding accurately to generate a meaningful LCR figure. A bank must have systems that can distinguish the relevant criteria in its deposit base, such as identifying retail and small business deposits, tracking insured deposits from uninsured funds and distinguishing operational deposits from other wholesale deposits. Where supervisors doubt the banks' operational and systems capabilities, they should impose more conservative definitions and assumptions.

Enhanced liquidity requirements could affect the way international banking groups hold liquid reserves in their different levels of group structures (CGFS, 2010). There are concerns among authorities of EMSEs that the availability of group-level liquidity to foreign subsidiaries, including deposits placed by them to parent banks, would be affected by the implementation of the LCR. These authorities are also worried that the efforts by home supervisors to improve those groups' resolvability, including the preparation of recovery and resolution plans as well as application of structural measures on bank activities, could result in banks 'compartmentalizing' their different operations, which may weaken the ownership chain and the availability of group liquidity and capital support.

The LCR implementation demands careful planning and dedicated resources. Transition to the LCR, which is relatively more sophisticated than most existing Basel methodologies, could pose a substantial challenge for many countries. Authorities in these jurisdictions may wish to consider the following issues when implementing liquidity standards. Jurisdictions must determine the scope of LCR coverage. For internationally active banks in BCBS member jurisdictions, the LCR is mandatory. For the more advanced banks in EMSEs where a similar methodology already exists, there is considerable value in implementing the LCR

and applying it to banks that have material cross-border activities. For jurisdictions where an LCR-like rule does not exist and cross-border activities are minimal, the aim should be to move to the LCR framework gradually to give banks time to improve their capacity. During this transition, consideration should be given as to whether the LCR parameters are sufficiently stringent or need to be tightened as appropriate to the local context.

Jurisdictions must also assess national discretions and ALA options in the context of their own systems. A first step is to understand the availability and characteristics of liquid assets and the liquidity characteristics of banks' sources of funding. The pros and cons of the ALA options must be carefully assessed. The flexibility the LCR framework offers in terms of the ALA and national discretions should enable an orderly transition based on careful consideration of quantitative impact study (QIS) information and stringent application of criteria for ALA treatment. Nevertheless, the Basel framework provides stringent criteria and processes for jurisdictions to be qualified for the ALA treatment, including periodic self-assessment and independent peer review. EMSEs should strive to adhere to these as much as possible. It is advisable for supervisors to monitor the LCR by currency irrespective of the importance of foreign currency in banks' balance sheets. Such information allows the supervisor to identify any potential currency mismatches and to consider the liquidity risk in foreign currencies. A QIS is needed to design the LCR appropriately for EMSEs. The QIS must provide granular data, such as numbers of different types of HQLA that banks hold, or banks ability to categorize deposits based on their stability. Fluent two-way communication mechanisms with the banks, such as workshops, are recommended to ensure that banks understand the standard, and authorities understand the banks' capacities so that adjustments to local standards, criteria, haircuts and run-off rates can be made where appropriate.

Further guidance by the regulators will be important to ease transition for EMSEs. Areas for further guidance include: the use of ALAs in countries with less developed capital markets, the treatment of currency convertibility in the LCR framework for dollarized economies and the exercise of national discretion in applying run-off rates for deposits. The regulators should further encourage home supervisors to reach understandings with international banking groups and host supervisors on group-wide liquidity management. Absent such understandings, including on the provision of centrally held liquidity to subsidiaries and branches, host supervisors may be compelled to require subsidiaries and

branches to retain minimum liquidity at the local level to protect their national financial stability.[10] More generally, the international regulators should place a stronger emphasis on consolidated supervision by the home supervisor while maintaining close communication with the host supervisor, and encourage a wider sense of continuing responsibility for group-wide banking operations. Market-wide solutions like those adopted in the EU should be explored and could help home supervisors avoid retrenching and becoming more inward-looking. In addition, more flexible treatment of deposits placed by foreign subsidiaries should be allowed to reflect the nature of the underlying depositors, which would reflect the reality of the business model of these foreign subsidiaries and support the continued diversification of funding.

Conclusions

In this paper we have discussed the impact of changes to the capital and liquidity frameworks brought about by the Basel III accord on emerging market, developing and small economies (EMSEs). Even though we believe that Basel III will deliver significant benefits over the longer time horizon, our intention was to identify challenges, potential unintended consequences of the new rules and their adverse economic effects. Some of them are associated with the presence of branches and subsidiaries of multinational banks in EMSEs' banking sectors, and resulting home-host relations and conflicts. We surveyed the analyses on the macroeconomic effects of Basel III framework and potential consequences of new capital and liquidity regulations, as well as issues associated with the introduction of macroprudential capital buffers. As to the specific areas, we looked at implications of new regulation of banks' exposures in trading book, regulatory treatment of sovereign exposures and potential risks associated with an accelerated move to advanced approaches to modelling financial risks.

We identified several key areas of concern for both banks and regulators. Potentially most pressing are increases in risk-weighted assets for exposures in trading books located at foreign affiliates of multinational banks. The effect will be the increase in the cost of holding sovereign debt, especially in emerging market economies, which could lead to partial deleveraging of global banks from overseas exposures. To mitigate such risks, both national and international regulators should promote consistent application of rules in various parts of multinational banks, especially the ones regarding local sovereign exposures denominated and funded in local currency, and assess the methods of consolidation practices regarding the risk weighting of foreign subsidiaries' exposures.

The challenges may also be generated by the need for capital replenishments and required capital deductions, especially in jurisdictions with weaker governance and less developed financial markets. The condition that regulatory capital instruments should be able to absorb losses in the event that the issuing bank reaches a point of non-viability may create governance issues, for example, when conversion brings in shareholders that may not be suitable. Coping with these issues requires strengthening legal and institutional arrangements to enable smoother issuance of capital instruments, and also encouragement of the provision of adequate supervisory powers.

Enhanced liquidity requirements may run against limited availability of truly liquid assets that at the same time are of high quality in a number of jurisdictions. In such jurisdictions, concentration risk, particularly to sovereign debt, deemed both liquid and of high quality, can easily emerge. The new regulation could also encourage groups to hold liquid reserves at the parent level. However, it may not always be clear when and how these reserves should be made available, while deposits placed at a parent bank by foreign subsidiaries could become subject to bail-in arrangements. The implementation of liquidity standards thus demands careful planning and proper assessment of alternative sources of high-quality liquid assets in the context of concrete jurisdictions. If such assets are sought abroad, special attention will have to be paid to currency mismatches and liquidity risk in foreign currencies.

Overall, when transitioning away from Basel I, EMSEs could usefully take into account some guiding principles. Capital requirements are only one part of a good supervisory framework. First, the effective implementation of the regulatory framework for capital definition, buffers and disclosures depends on sufficient powers and resources. In this sense, countries that have successfully implemented Pillar 2 and Pillar 3 of the Basel II framework would be better placed to implement Basel III as well. Compliance with Basel Core Principles for Effective Banking Supervision (BCP) should be a priority for all countries, advanced or developing. A lack of supervisory powers, capacity and independence in supervision is a greater hurdle to safe banking systems and effective supervision than solvency alone. Second, a progressive movement towards implementing elements of Basel II and III could be beneficial – these represent a higher level of requirements for both banks' risk management and supervisors' review. Implementation planning should start by building capacity to manage the process effectively. Decisions on the pace of the implementation would need to consider particular characteristics of banks and banking systems, as well as supervisory constraints.

Some countries have considered the adoption of a more rules-based approach to Pillar 2 requirements as the way forward in legal frameworks where interpretation powers of supervisors may be limited. Third, there are elements of Basel III that could be implemented in Basel I countries, even if Basel II has not been implemented. While some requirements of Basel III regarding the denominator of the capital adequacy ratio are directly linked to the Basel II securitization framework, the enhanced definition of capital, the buffers and enhanced disclosures could be introduced without Pillar 1 of Basel II as a prerequisite. Ensuring that the capital base is of good quality and market discipline is functioning should be a supervisory goal independent of the capital regime adopted.

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Notes

1. The issues regarding the functioning and regulation of multinational banks are discussed in Calzolari and Loranth (2001). How regulatory intervention depends on the liability structure and insurance arrangements for non-local depositors is investigated in Calzolari and Loranth (2005).
2. See, for example, Gersl and Seidler (2011). The BCBS itself pointed out that aggregate private sector credit-to-GDP gap might not be a good indicator for all jurisdictions (BCBS, 2010a).
3. Press release from 10 June 2010 'Adjustments to the Basel II market risk framework announced by the Basel Committee'.
4. The issue of deleveraging is covered, for example, in Aiyar and Jain-Chandra (2012), Feyen *et al*. (2012) and Herman and Rai (2010).
5. 'During the financial crisis, however, roughly two-thirds of losses attributed to counterparty credit risk were due to CVA losses and only about one-third were due to actual defaults', Basel Committee on Banking Supervision, Press release, 1 June 2011.
6. Such risk has been studied intensively by regulatory authorities in recent years. (See, eg, BCBS, 2013a, 2013b, 2013c; EBA, 2013).
7. Australia and South Africa have introduced this option.

8. Covered bonds have been introduced in countries such as Australia, Belgium and Italy, among others.
9. For example, banks in Malaysia, the Philippines and Saudi Arabia enjoy very high levels of deposits, over 80% of their total funding.
10. There is some evidence that during the last crisis, parent institutions were not, in a number of cases, a particular source of strength for their affiliates (De Haas and Van Lelyveld, 2014).

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