Inter-industry FDI Spillovers from Foreign Banks: Evidence in Follower Countries

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Abstract

Although foreign service firms may participate in the innovation process by local firms in other industries, prior studies have not systematically examined this type of inter-industry foreign direct investment spillover. In this paper, we take the first step by focusing on the influence of foreign banks on the innovation of local firms in other industries in follower countries that lag behind in national innovation. Drawing on the literature on knowledge sourcing, we argue that foreign bank presence is positively related to local firms' innovation because foreign banks may transfer new knowledge directly to local firms and/or serve as a matchmaker connecting local firms with other knowledge providers. We further argue that the positive effects of foreign bank presence are more significant for local firms with limited access to alternative sources of foreign knowledge, including those that do not have any foreign parent and that do not compete in the global market. Analysis based on a sample of 6,197 firms across 22 countries from Europe, the Baltic States, and the Caucasus offers support for our predictions.

INTRODUCTION

How foreign direct investment (FDI) influences local firms' performance in areas such as innovation and productivity, often called FDI spillovers, has been attracting substantial interest from scholars in economics, public policy, strategic management, and international business. A major reason is that the answer to this question can help policy makers decide how open they should be to FDI. Innovation and productivity growth are crucial for the long-term economic growth of an economy (Helpman, 1992; Romer, 1990). FDI in general possesses different and possibly better technology, management and marketing skills, and other intangible resources and capabilities than local firms in follower countries that are technologically behind (Furman and Hayes, 2004). One view suggests that foreign firms' knowledge and capabilities can be transferred to local firms, thereby improving local firms' innovation and productivity (Blomström and Kokko, 1998; Caves, 1974). According to this view, follower countries should be open to FDI. An opposite view, however, suggests that FDI may instead lower local firms' innovation and productivity by forcing them to downsize or by stealing local talents (Aitken and Harrison, 1999; Girma, Greenaway, and Wakelin, 2001), and follower countries should limit the amount of FDI or impose strict restrictions.

In fact, the literature does not provide a clear-cut answer to the question of how FDI influences local firms' innovation and productivity. Most of the literature investigates the presence of FDI spillovers within the same industry. Although some studies find positive intra-industry FDI spillovers (e.g., Blomström, 1986; Buckley, Clegg, and Wang, 2002; Kokko, 1994; Tian, 2007; Wang and Wu, 2016; Wei and Liu, 2006), many others find that FDI may have a negligible or even negative effect on local innovation and productivity (e.g., Aitken and Harrison, 1999; Djankov and Hoekman, 2000; Feinberg and Majumdar, 2001; Haddad and

Harrison, 1993; Javorcik, 2004; Konings, 2001; Liu, Lu, Filatotchev, Buck, and Wright, 2010). The mixed evidence prompts researchers to explore conditions favoring knowledge transfer from FDI to local firms. For instance, some studies show that local firms with sufficient absorptive capacity (Blalock and Simon, 2009; Liu and Buck, 2007) or strong ties to foreign firms (Eapen, 2012) can learn more from FDI. Zhang, Li, Li, and Zhou (2010) show that positive intra-industry FDI spillovers are more likely to take place when country-of-origin diversity of FDI is greater. Other researchers, however, focus on inter-industry FDI spillovers. They suggest that local firms gain more from downstream FDI in the supply chain because foreign firms have greater motivation to transfer technology and knowledge to their supply-chain partners than to competitors. Evidence in general supports such positive inter-industry FDI spillovers (e.g., Blalock and Gertler, 2008; Blalock and Simon, 2009; Javorcik, 2004; Wei and Liu, 2006).

In addition to supply-chain partners, service firms such as banks, accounting firms, consultancies, software companies, research institutes, and marketing agencies may also be important value-chain partners for local firms. However, to the best of our knowledge, the literature has studied only intra-industry FDI spillovers, not inter-industry spillovers, from service FDI. Positive inter-industry FDI spillovers from foreign service firms, nevertheless, are plausible because, first, prior studies suggest that service firms are able to raise other firms' technology and innovation (Bessant and Rush, 1995; Hertog, 2000; Lee, Park, Yoon, and Park, 2010; Muller and Zenker, 2001; Schumpeter, 1934; Tether and Tajar, 2008), and second, service firms are willing to undertake knowledge transfer for their clients or partners (Eapen, 2012; Uzzi, 1997; Uzzi and Gillespie, 2002). Examining the presence of such positive inter-industry FDI spillovers can thus be helpful to policy makers in follower countries when deciding whether to be open to FDI in service industries.

In this paper, we focus on the impact of foreign bank presence on the innovation of local firms in other industries in follower countries. Previously, scholars have investigated how foreign bank presence influences local banks' technology and efficiency (e.g., Claessens, Demirgüç-Kunt, and Huizinga, 2001; Lensink and Hermes, 2004). However, they have not examined the influence of foreign banks on local firms from a different industry. Drawing on prior studies of knowledge sourcing, we argue that foreign banks can enhance the innovation of local firms in other industries in two major ways. First, foreign banks, especially financial conglomerates that provide a broad range of services, may transfer knowledge directly (Muller and Zenker, 2001). For example, they may provide business-solution services, which can accelerate local firms' innovation by helping them diagnose the weaknesses of their business and integrate new technology and practices into their business (Bessant and Rush, 1995; Tether and Tajar, 2008). Second, foreign banks may serve as a matchmaker that facilitates local firms' access to knowledge in other firms (Bessant and Rush, 1995; Laursen, Masciarelli, and Prencipe, 2012; Uzzi and Gillespie, 2002).

To corroborate our argument that foreign banks transfer knowledge to local firms in other industries, we further examine whether the positive effects of foreign bank presence on local firms' innovation are weaker for local firms that have access to alternative sources of foreign knowledge and technology. The rationale is that different learning sources may either overlap in knowledge content or compete for limited decision makers' attention and organizational resources, thereby substituting one for the other to some extent (Cyert and March, 1963; Schwab, 2007). In this paper, we argue that if a local firm has foreign parent(s) or competes in the global market, it may have access to alternative sources of foreign knowledge, thereby reducing its

reliance on foreign banks for knowledge transfer (Aitken and Harrison, 1999; Branstetter, 2006; Liu and Buck, 2007; Salomon and Shaver, 2005; Wei and Liu, 2006).

We test our hypotheses using a sample of 6,197 firms across 22 transitional countries from Europe, the Baltic States, and the Caucasus. The analysis, as predicted, reveals that foreign bank presence positively influences local firms' innovation, and such positive influence is weaker when a local firm has foreign parent(s) or competes in the global market. With the theory and findings, this paper seeks to make three major contributions. First, the debate on whether follower countries should be open to FDI has not been settled. Although most prior studies focus on intra-industry FDI spillovers, some researchers argue that positive FDI spillovers may stem mainly from FDI in other industries (Blalock and Gertler, 2008; Blalock and Simon, 2009). However, investigation of inter-industry FDI spillovers has been limited to industries in the same supply chain, although a firm's value chain consists of other important service activities. Our paper contributes to the debate by being the first to provide evidence of positive FDI spillovers from foreign banks to local firms in other industries (including both service and manufacturing industries). We hope that our paper may motivate scholars to further explore inter-industry FDI spillovers from other types of foreign service firms such as marketing and research institutes. Practically speaking, our findings serve as additional evidence for policy makers in follower countries to use in evaluating their policies on foreign bank entry.

Second, by using firm-level data, we are able to test what types of local firms are likely to benefit from FDI spillovers of foreign banks. We find that the positive influence of foreign bank presence on local firms' innovation is weaker for firms that have foreign parent(s) or compete in the global market. Such findings can be useful for policy makers in follower countries to gauge the extent to which their economy can benefit from FDI by foreign banks. For example, a

follower country with a majority of firms not engaging in the global market might consider providing preferential policies to attract FDI by foreign banks, until most of its firms start competing in the global market. Conversely, managers of local firms that do not actively compete in the global market might consider developing more embedded relationships with foreign banks to facilitate knowledge transfer (Eapen, 2012; Uzzi, 1997; Uzzi and Gillespie, 2002).

Third, a widely accepted view in the banking literature specifies that banks can stimulate an economy's overall innovation by channeling financial resources from individual investors to firms more efficiently (Alfaro, Chanda, Kalemli-Ozcan, and Sayek, 2004; Beck, Levine, and Loayza, 2000; King and Levine, 1993; Schumpeter, 1934). In other words, banks can reduce transaction costs and thus increase the amount of financial capital available for firm investment. In the present study, although we find that foreign banks increase local firms' innovation, we find no evidence that foreign banks improve credit access for local firms, though such results are consistent with several prior studies (e.g., Detragiache, Tressel, and Gupta, 2008; Gormley, 2010, 2014; Sengupta, 2007). Instead, our paper proposes another mechanism—knowledge transfer, through which banks, especially foreign banks, can enhance local firms' innovation. As indirect evidence, we find that foreign bank presence increases the propensity of local firms to license foreign technology.

The rest of the paper is organized as follows. First, we review the literature on FDI spillovers in follower countries. We then develop theory and hypotheses concerning the impact of foreign banks on local firms' innovation. We next discuss our data, empirical model, and results. Finally, we conclude with a discussion of research and practical implications offered by our paper.

FDI SPILLOVERS IN FOLLOWER COUNTRIES

FDI spillovers, also called technological or knowledge spillovers, refer to the influence of FDI on local firms' performance in areas such as innovation (e.g., Branstetter, 2006; Liu *et al*., 2010; Wang and Wu, 2016), productivity (e.g., Aitken and Harrison, 1999; Blalock and Simon, 2009; Tian, 2007), and efficiency (e.g., Claessens *et al*., 2001; Denizer, 2000; Lensink and Hermes, 2004). This issue is important for most countries, especially follower countries that are technologically underdeveloped, because innovation and productivity are argued to be the main drivers of long-term economic growth (Helpman, 1992; Romer, 1990). There are three major arguments in the literature for positive FDI spillovers in follower countries. The first is the competition effect. Fiercer competition and greater threat to survival because of foreign competitors may motivate local firms to operate more efficiently and improve their competitive capacity by upgrading their knowledge base (Blomström and Kokko, 1998). The second is the learning effect. Through interacting with foreign firms or simply observing foreign firms' products and practices, local firms may be able to acquire advanced knowledge that is not available in the domestic market (Blomström and Kokko, 1998). The third is the employment effect. Foreign firms usually have an advanced knowledge base and initiate more on-the-job training programs for employees (Goncalves, 1986). Knowledge may thus be transferred from foreign firms to local firms through employee turnover.

However, there are also arguments for negative FDI spillovers in follower countries. The first is the market-stealing effect. As foreign firms usually possess better technology, managerial practices, and marketing tactics, local firms may be outcompeted and forced to downsize their operations. In this case, local firms may bear higher average costs and be reluctant to make capital and research and development (R&D) investments due to a lack of economies of scale

(Aitken and Harrison, 1999). The second is the skill-stealing effect. Skilled workers may be attracted to foreign firms that likely provide better salary and benefits, leaving local firms short of their talents (Girma *et al*., 2001). The third is the limited knowledge-transfer effect. The transfer of knowledge from FDI to local firms may be restrained by foreign firms to protect their competitive advantage. Therefore, local firms' learning may not be effective (Aitken and Harrison, 1999).

Both sides of the arguments sound logical, and in fact, studies provide inconclusive evidence on whether FDI spillovers are positive or negative. Using industry- or firm-level data, most of the literature focuses on FDI spillovers in the same industry sector. Although some studies find positive FDI spillovers (e.g., Blomström, 1986; Buckley *et al*., 2002; Claessens *et al*., 2001; Denizer, 2000; Kokko, 1994; Lensink and Hermes, 2004; Tian, 2007; Wang and Wu, 2016; Wei and Liu, 2006), others find negligible or negative spillovers (e.g., Aitken and Harrison, 1999; Djankov and Hoekman, 2000; Feinberg and Majumdar, 2001; Haddad and Harrison, 1993; Javorcik, 2004; Konings, 2001; Liu *et al*., 2010).

The mixed evidence cannot offer clear guidelines for policy makers to make decisions, inducing scholars to explore a more nuanced relation between FDI and local firms' performance. In particular, some scholars suggest that the learning effect associated with FDI spillovers can be enhanced when local firms have better opportunities and capabilities to learn from FDI (Zhang *et al*., 2010). For example, it is argued that local firms with greater absorptive capacity can benefit more from FDI presence because they are able to recognize and assimilate valuable knowledge through interacting with foreign firms or observing their products and practices (Blalock and Simon, 2009; Liu and Buck, 2007; Zhang *et al*., 2010). In addition, Eapen (2012) contends that foreign firms are more willing to interact with and transfer knowledge to local firms with

stronger ties. Moreover, Zhang *et al.* (2010) suggest there are greater learning opportunities for local firms when diversity increases in FDI countries of origin, because FDI from different home countries tends to apply heterogeneous strategies, practices, technology, and knowledge (McGahan and Victer, 2009).

In contrast, several studies suggest that positive inter-industry FDI spillovers are more likely to occur from downstream FDI to local suppliers (e.g., Blalock and and Gertler, 2008; Blalock and Simon, 2009; Javorcik, 2004; Wei and Liu, 2006). It is argued that foreign firms have greater incentives to transfer knowledge and technology regarding process management, quality control, inventory management, managerial practices, and employee training to their suppliers to secure production inputs of better quality on better terms. Moreover, higher requirement for product quality by FDI and competition to win contracts of downstream FDI among local suppliers may motivate local suppliers to improve efficiency and product quality (Chung, Mitchell, and Yeung, 2003). Although a few scholars suggest that knowledge can also be transferred from upstream FDI to downstream local firms because of the intermediate inputs of better technology and technical support, the evidence is mixed (e.g., Javorcik, 2004; Liu, 2008).

Prior studies of inter-industry FDI spillovers have limited their focus on FDI spillovers in the supply chain. However, a local firm's value-chain partners may include foreign service firms such as banks, software companies, consultancies, marketing agencies, research institutes, and accounting firms. Importantly, these foreign service firms may have both the incentives and capabilities to engage in knowledge transfer to local firms. First, local firms in other industries are (potential) partners, not competitors, of these foreign service firms. Knowledge transfer to local firms, therefore, does not constitute a threat to foreign service firms' competitive

advantages. On the contrary, foreign service firms can benefit from the growth of local firms that may increase the demand for their services. As foreign service firms and local firms develop a more embedded relationship, the willingness to transfer knowledge also tends to be stronger (Eapen, 2012; Uzzi, 1997; Uzzi and Gillespie, 2002). Second, firms, especially small- and medium-sized enterprises (SMEs) that generally dominate in follower countries, increasingly rely on external parties, especially knowledge-intensive business services (KIBS), for obtaining and developing new knowledge (Bessant and Rush, 1995; Edwards, Delbridge, and Munday, 2005; Hertog, 2000; Lee *et al.*, 2010; Muller and Zenker, 2001; Rothwell, 1991; Tether and Tajar, 2008). Foreign service firms may be able to provide knowledge for local firms directly if they possess relevant expertise (Bessant and Rush, 1995; Hertog, 2000; Muller and Zenker, 2001; Tether and Tajar, 2008) or indirectly if they introduce other knowledge providers to these local firms (Uzzi and Gillespie, 2002).

If knowledge transfer does occur between foreign service firms and local firms in other industries, empirical investigation into this type of inter-industry FDI spillover can be meaningful for policy makers in follower countries. In the following hypothesis development section, we draw from the literature on knowledge sourcing and develop a theory for how the presence of foreign banks influences the innovation of local firms in other industries. Studying FDI spillovers from foreign banks is important because although foreign banks increasingly participate in follower countries (Dages, Goldberg, and Kinney, 2000; Gormley, 2010), debate on whether foreign banks are beneficial to the local economy is ongoing (Dages *et al.*, 2000). Prior studies of FDI spillovers from foreign banks have focused only on intra-industry FDI spillovers, leaving potential inter-industry FDI spillovers unexamined.

THEORY AND HYPOTHESES

Inter-industry FDI spillovers from foreign banks

In this section, we theorize about how foreign banks influence innovation of local firms in other industries in follower countries. We follow Damanpour's (1991) definition of innovation as "adoption of an internally generated or purchased device, system, policy, program, process, product, or service that is new to the adopting organization" (Damanpour, 1991: 556). According to this definition, innovation can be previously adopted by other firms, as long as it is new to the focal firm. Compared to other definitions that focus on new-to-the-world innovation (e.g., Furman, Porter, and Stern, 2002), our definition may be more suitable in the context of follower countries. Most firms in follower countries lag behind in innovation and hence are incapable of developing new-to-the-world innovation (Acemoglu, Aghion, and Zilibotti, 2006; Ayyagari, Demirgüç-Kunt, and Maksimovic, 2011; Furman and Hayes, 2004). Nevertheless, these firms can still improve their productivity and competitive capacity by adopting new practices and technology that are effective, regardless of whether they are new to the world (Damanpour, 1991). The way we define innovation is aligned with the interest of policy makers in follower countries who are concerned about local firms' competitiveness and long-term economic growth (Helpman, 1992; Romer, 1990).

Our definition comprises both radical and incremental innovations that are classified based on the degree of change they make to the existing practices of an adopting firm (Dewar and Dutton, 1986). It is broad enough to include different types of innovation, including product or service innovation, process innovation, and business model innovation (Crossan and Apaydin, 2010), that build on different types of knowledge. Whereas many prior studies examine local firms' productivity as the outcome of FDI spillovers, we choose to study innovation because some scholars suggest that innovation is a more immediate outcome of knowledge transfer from

FDI (Branstetter, 2006; Liu and Buck, 2007). Knowledge about product design, marketing, and management, for example, may not be directly related to productivity, which is often measured as the amount of production output.

Innovation results from acquiring or developing new knowledge and then integrating it into the existing knowledge base (Grant, 1996; Kogut and Zander, 1992; Schumpeter, 1934). Given the important role of new knowledge in innovation, we draw from the literature on knowledge sourcing to theorize about how foreign banks affect local firms' access to new knowledge. The knowledge-sourcing literature stems from the view that knowledge is the most important resource for firms to establish sustainable competitive advantages in today's environments that are more and more dynamic and complex (Grant, 1996; Phelps, Heidl, and Wadhwa, 2012). Scholars suggest that the importance of knowledge applies not only to high-tech firms (Yli-Renko, Autio, and Sapienza, 2001) but also to low- and medium-tech firms (Tsai and Wang, 2009). Knowledge can be broadly classified into either explicit knowledge, which can be written down, or tacit knowledge, which cannot. It is argued that tacit knowledge contributes to firms' sustainable competitive advantages to a greater extent (Grant, 1996). When it is being transferred, knowledge can be embodied in a variety of forms, including products, policies, procedures, directives, routines, equipment, patents, and individuals.

The literature on knowledge sourcing suggests that because innovation requires a broad range of knowledge (Grant, 1996; Kogut and Zander, 1992), firms increasingly rely on external parties for obtaining and developing new knowledge (Chesbrough, 2003; Laursen *et al*., 2012; Phelps *et al*., 2012; Tsai and Wang, 2009). These external parties may be competitors, supply-chain partners such as suppliers and customers, universities, and service partners such as consultancies and private research institutes, which are also called KIBS. Knowledge transfer is

in essence a social process (Kogut and Zander, 1992). Put differently, knowledge can be transferred from these external parties to the recipient firm through social interactions, both contractual and non-contractual. In general, research points out that a more embedded relationship with external parties could facilitate knowledge transfer by increasing external parties' motivation to transfer knowledge of greater depth and breadth (Eapen, 2012; Laursen *et al.*, 2012; Uzzi and Gillespie, 2002; Yli-Renko *et al.*, 2001), creating opportunities for transferring tacit knowledge (Grant, 1996; Kogut and Zander, 1992), and increasing the recipient firm's ability to understand the knowledge and motivation to use the knowledge (Phelps *et al.*, 2012; Yli-Renko *et al.*, 2001). Prior studies posit that external knowledge acquisition can increase innovation by enriching the breadth and depth of knowledge available to firms and shortening the development cycles (Love, Roper, and Vahter, 2014; Yli-Renko *et al.*, 2001).

Three conclusions in the literature on knowledge sourcing are particularly relevant for this paper. First, external knowledge acquisition may contribute to innovation. Second, social interactions facilitate external knowledge sourcing. Third, knowledge can be sourced from service partners such as KIBS. Building on these three conclusions, we argue that through social interactions, foreign banks enrich the knowledge base of local firms in follower countries both directly and indirectly, which in turn enhances local firms' innovation.

The knowledge transfer can be direct when foreign banks are equipped with relevant knowledge. A primary function of banks is to transform individual investors' funds into business loans to firms. The survival of banks, as well as other financial intermediaries, rests on their competitive advantages in information and risk control over individual investors (Diamond, 1984; Schumpeter, 1934). As they need to evaluate firms' growth potential and monitor their ongoing risks, bankers are expected to have developed industry- and business-specific

knowledge through education, training, and work experience. In addition, a non-trivial number of foreign banks diversify their services and provide a more complete business solution package for firms, especially SMEs. For example, Deutsche Bank offers medical professionals a broad range of services including market research and competitor analysis, a profitability benchmarking tool for the customer's region and specialty, and advisory services on business management. BBVA Compass Bancshares provides market and competitor analysis for its clients (Forbes, 2018). DBS Bank cooperates with Singtel, the largest telecommunication provider in Singapore, to help SMEs build e-commerce business (Bain & Company, 2018). Credit Suisse in Poland specifically states that their specialized global industry groups provide in-depth industry knowledge for their clients. Each industry is covered by senior professionals with extensive sector-specific execution experience. They are leaders in innovating new and creative ideas for clients. If we open a bank website, for example CIBC and HSBS, we can also find a special page that provides insights from bank experts on helping their clients to implement innovation. A more specific example in a follower country is ING in the Czech Republic. It states on its website:

> Whether you are an institutional or corporate client, ING will help you move your business forward. You can expect a proactive and committed client approach. The Relationship manager is your single point of contact giving access to product specialists, industry experts and tailored solutions.[1]

These all suggest that in addition to financial knowledge, foreign banks may also possess technological, marketing, industry-specific, and managerial knowledge.

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[1] https://www.ingwholesalebanking.cz/en/home

It is reasonable to assume that foreign banks, which are usually owned by large financial conglomerates and multinational corporations, possess at least some knowledge different from or superior to that of local firms in follower countries. To serve their clients and partners from a variety of industries and countries, foreign banks' knowledge base tends to be broad and diversified, with the potential for combination and integration to generate new knowledge (Grant, 1996; Kogut and Zander, 1992). When foreign banks enter follower countries, there are incentives and opportunities for transferring their superior knowledge to local firms through contractual interactions, such as evaluating local firms' loan applications for innovation and providing them with business solution services, and non-contractual interactions, such as conferences and informal conversations (Laursen *et al*., 2012; Uzzi, 1997; Uzzi and Gillespie, 2002). In turn, local firms are able to identify opportunities or needs and, more importantly, develop innovation by integrating foreign banks' knowledge into their own knowledge base.

Foreign banks can enhance the knowledge base of local firms in follower countries indirectly even when they do not own the relevant knowledge. In this case, foreign banks serve as matchmakers mobilizing their existing networks and linking local firms to the knowledge owners (Uzzi and Gillespie, 2002). Local firms in follower countries, especially SMEs, suffer not only from inferior knowledge base but also from poor access to external knowledge because of ignorance and lack of relationships. Foreign banks are likely central in a business network as their clients and partners comprise firms in different sizes, industries, and countries (Mariolis and Jones, 1982). In other words, they have developed ties with a variety of firms and learned what types of knowledge are owned by those firms (Uzzi, 1997). When they realize that knowledge of firms with which they have ties is demanded by local firms in follower countries, foreign banks can be the middlemen making the knowledge transfer happen. In facts, banks such as HSBC

Bank, KBC Bank, and VietinBank have leveraged their network advantage and provided global business-matchmaking services for raw materials, final products, technology, and other forms of knowledge. Such matchmaking services are valuable to both knowledge providers and seekers in that it can reduce information and transaction costs, making previously impossible transactions possible.

Local firms can benefit from the global network resources of foreign banks that have entered follower countries through contractual interactions such as subscriptions to matchmaking services or non-contractual interactions such as friendship with bankers (Laursen *et al.*, 2012; Uzzi and Gillespie, 2002). Uzzi and Gillespie (2002) further discover that a more embedded relationship increases bankers' motivation to make referrals between two or more firms. The literature on knowledge sourcing also suggests that connecting with external parties around the world can stimulate new knowledge acquisition and development (Chesbrough, 2003; Laursen *et al.*, 2012; Phelps *et al.*, 2012). For example, new knowledge acquisition and development may result from access to foreign suppliers' superior knowledge of components and parts, understanding of foreign customers' needs and feedback, licenses of foreign technology, exposure to new managerial and marketing practices, and collaboration with foreign competitors and research institutes (Phelps *et al.*, 2012; Tsai and Wang, 2009; Yli-Renko *et al.*, 2001).

To sum up, through social interactions, foreign banks may transfer new knowledge directly to local firms and/or make referrals between local firms and other knowledge providers within their global networks. As a result, local firms are able to obtain a greater amount of new knowledge in greater depth and breadth within a shorter period of time. New knowledge in turn may be integrated into the existing knowledge base, resulting in innovation (Grant, 1996; Kogut and Zander, 1992; Schumpeter, 1934). We accordingly develop the following hypothesis:

Hypothesis 1: Foreign bank presence is positively related to innovation of a local firm in a follower country.

Boundary conditions: alternative sources of foreign knowledge

In the preceding section, we argue that foreign banks operating in a follower country may increase local firms' innovation by delivering new knowledge internalized by themselves or owned by their network partners. Such knowledge is foreign in nature because it is likely to be originally developed or present in the global market rather than in the domestic market and is inaccessible to at least some local firms in follower countries. Nevertheless, some local firms may have gained access to foreign knowledge by other means, two of which are discussed here.

First, some local firms are actually joint ventures partially invested in by one or more foreign firms. Scholars find that foreign parents transfer knowledge that has been previously acquired and assimilated to their joint venture for the sake of the joint venture's performance (Aitken and Harrison, 1999). It is also expected that foreign parents will introduce their network partners such as suppliers and KIBS to their joint venture if the required knowledge is possessed by these network partners and important for the performance of their joint venture. Consequently, these joint ventures are likely to receive foreign knowledge even without interacting with foreign banks in their country.

Second, local firms may compete in the global market through export or FDI. A slew of prior studies show that export is a major means of obtaining foreign knowledge, thereby enhancing local firms' innovation and productivity (e.g., Liu and Buck, 2007; Salomon and Shaver, 2005; Wei and Liu, 2006). As foreign buyers seek low-cost and better-quality components and products, it is a win–win situation when local suppliers undertake innovation to

improve productivity and product quality. This explains why export agents and foreign buyers may transfer knowledge to local firms directly or make referrals between these firms and their partners (World Bank, 1993). Accordingly, exporting firms are more likely than non-exporting firms to be exposed to foreign knowledge, all else being constant. Besides, local firms that compete in the global market through FDI likely have developed ties with foreign customers, suppliers, competitors, and service providers such as banks and other KIBS. As a result, these local firms have greater opportunities to be exposed to foreign knowledge about customer needs, components and parts, competitors' practices and innovation, and marketing and managerial practices, among other things (Branstetter, 2006).

We argue that when local firms in follower countries have access to alternative sources of foreign knowledge, their innovation may be less dependent on knowledge transfer from foreign banks in their country. Obtaining and processing information and knowledge involve costs. Because firms' resources and attention are limited, they tend to avoid extensive information search and overload (Simon, 1955). This suggests that if a source of knowledge satisfies a firm's needs, the firm is likely to attenuate its search for and processing of additional knowledge (Cyert and March, 1963). This is particularly true when different sources are likely to overlap in knowledge content (Schwab, 2007). In our research context, the access to foreign knowledge owners provided by matchmaking of foreign banks may be partly redundant if local firms have already gained access through foreign parents, export agents, or competition in the global market. Knowledge directly transferred by foreign banks may also be redundant if local firms can acquire similar knowledge from their foreign parents or foreign KIBS with which they have developed a relationship by participating in the global market.

Given that knowledge directly and indirectly provided by foreign banks may partially overlap with knowledge from other sources, the next question is whether local firms have a preference among knowledge sources. Logically, local firms prefer knowledge sources that are less costly to access. Acquisition of knowledge from foreign parents, export agents, and existing foreign partners in the global market is usually less costly and more readily accessible than acquiring knowledge from foreign banks through contractual interactions, such as purchasing business solutions and matchmaking services. The same is likely true for non-contractual interactions with foreign banks. Taken together, local firms that have foreign parent(s) or that compete in the global market may rely less on foreign banks' knowledge transfer because they may have access to alternative sources of foreign knowledge that is less costly. Formally stated:

Hypothesis 2: The positive relation between foreign bank presence and local firm innovation in a follower country is weaker if the local firm (a) has foreign parent(s) or (b) competes in the global market.

METHODS

Sample

To test the hypotheses, we used firm-level data obtained from the fifth-round Business Environment and Enterprise Performance Survey (BEEPS V), which was conducted jointly by the European Bank for Reconstruction and Development (EBRD) and the World Bank during 2013–2014. EBRD and World Bank devoted a lot of effort to guarantee the high quality of the survey data. First, to ensure that the sample was representative, the survey applied stratified random sampling. Specifically, all population units were first grouped within homogeneous groups (i.e., locality and sector) and then random samples were selected within each group. This method ensured that the estimates of our sample can truthfully predict population estimates. In

other words, our sample can well represent the locality and sector characteristics of the underlying population in these countries. Second, to ensure that reported information was accurate and valid, face-to-face interviews were conducted with the owner or top manager of each enterprise who was knowledgeable about the firm. Confidentiality of survey respondents and the sensitive information they provided were strongly enforced to ensure the greatest degree of survey accuracy, integrity, and confidence in the quality of the data. Last, cross-country differences were addressed carefully in the survey design. All survey questions were piloted before their launch to ensure that the questions were properly translated, worded, and understood in the context of each country's business environment and institutional context. Therefore, taken together, BEEPS V data provided us with detailed and valid firm-level information. The final sample covers 6,197 firms in non-financial industries across 22 transitional economies from Europe, the Baltic States, and the Caucasus.[2] In terms of national innovation, which is usually measured as international patents such as USPTO (Furman and Hayes, 2004; Furman *et al.*, 2002), these countries were way below the average of all countries in 2012. In the categorization of Furman and Hayes (2004), these countries are third tier innovator countries at the bottom (less than 30 patents per million persons). Therefore, these countries are follow countries.

Dependent variable

Data on local firms' innovation were obtained from the Innovation Module of BEEPS V. This version of BEEPS was the first to include this information, which covers four types of innovation: product, process, organizational, and marketing innovation. *Product Innovation* is a

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[2] In this paper, we dropped all firms that were 100% foreign owned because our focus is on examining the impact of foreign banks on local firms. The 22 sampled countries are: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Latvia, Lithuania, FYR Macedonia, Moldova, Montenegro, Poland, Romania, Serbia, Slovak Republic, Slovenia, and Ukraine. EBRD is currently supporting these countries that were formerly communist countries in the process of establishing private sectors.

binary variable that equals 1 if the focal firm introduced any new or significantly improved products or services and 0 otherwise. *Process Innovation* is a binary variable that equals 1 if the focal firm introduced any new or significantly improved methods for the production or supply of products and services and 0 otherwise. *Organizational Innovation* is a binary variable that equals 1 if the focal firm introduced any new or significantly improved organizational or management practices or structures and 0 otherwise. Finally, *Marketing Innovation* is a binary variable that equals 1 if a firm introduced any new or significantly improved marketing methods and 0 otherwise. In the main analysis, we combine these four innovation categories and use a binary dependent variable, *Innovation*, that equals 1 if the focal firm introduced at least one type of innovation and 0 otherwise.

Independent variables

To test Hypothesis 1, we need precise data on bank branches from which we can distinguish foreign versus domestic ownership. We thus used the second-round Banking Environment and Performance Survey (BEPS II) conducted jointly by EBRD and Tilburg University. Information on detailed geographical coordinates, as well as opening and closing dates, were collected for 59,333 branches operated by 676 banks across the same 22 countries for which we have firm information.[3] These data depict the banking landscape, especially for foreign bank presence. This is because the BEPS data can, for each branch, identify the belonging banks and foreign ownerships. The BEPS data end in 2012, which provides us with an ideal period to examine the causal link between foreign bank presence in 2012 and firm innovation in 2013–2014.

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[3] A team of consultants with extensive banking experience collected the data by either contacting banks or downloading data from bank websites. For more information, see Beck *et al*. (2018), Qi, De Haas, Ongena, and Straetmans (2018), and Qi and Ongena (2018).

We then matched each firm with bank branches in the same city (Beck, Degryse, De Haas, and Van Horen, 2018; Qi and Ongena, 2018). The underlying assumption is that a firm ensures access to all bank branches in the same city. We next constructed the *Foreign Bank Presence* variable to capture the percentage of foreign banks in the bank population in the same city. A higher value of *Foreign Bank Presence* means that a firm was surrounded by a greater number of foreign versus domestic banks.

To test Hypothesis 2a about whether the focal firm has foreign parent(s), we use *Foreign Firm*, a dummy variable that equals 1 if any of the firm's equities were foreign owned and 0 otherwise. To test Hypothesis 2b about whether the focal firm competes in the global market, we develop two measures using data available in BEEPS V. The first measure is *Global Competing Firm*, a dummy variable that equals 1 if a firm's main products or services were mostly sold in the global market and 0 otherwise. This measure captures whether the major market for the focal firm was global. The second measure is *Exporting Firm*, a binary variable that equals 1 if a firm was exporting its product or services to other countries and 0 otherwise. In follower countries where most firms are SMEs, export is a major way to compete in the global market. The three dummy variables were used together with *Innovation* to create interaction terms to test Hypotheses 2a and 2b.[4]

Control variables

A common set of control variables was also included in the main analysis (Beck *et al*., 2018; Qi and Ongena, 2018). *Firm Size* is an ordered-categorical variable (1–3) that was classified into

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[4] Our approach to test Hypothesis 2 requires creating interaction terms between Innovation and three other dummies—*Domestic Firm*, *Domestic Competing Firm*, and *No Exporting Firm*—which are exactly the opposite of *Foreign Firm*, *Global Competing Firm*, and *Exporting Firm*, respectively. Please see Model (2) for an explanation of the testing approach.

small (1–19), median (20–99), and large (100+) firms based on the number of permanent full-time employees. *Audited Firm* is a binary variable that equals 1 if a firm's annual financial statements were checked and certified by an external auditor and 0 otherwise. *Female Managed Firm* is a binary variable that equals 1 if the top manager of the firm was female and 0 otherwise. Firm ownership was also controlled, using three dummy variables indicating whether a firm was a *Sole Proprietorship Firm*, *Publicly Listed Firm*, or *Privatized State Firm* from a former state-owned enterprise. Finally, *Banking Competition* was measured using a Herfindahl–Hirschman index (HHI) in the city where the focal firm was located to control for the potential impact of banking market competition on firm innovation. A summary of all variable definitions and data sources is provided in Appendix 1.

Model

To test Hypothesis 1, we used the following ordinary least squares (OLS) Model (1):

$$Innovation_{ics} = \alpha_c + \alpha_s + \beta * Foreign\ Bank\ Presence_{ics} + \gamma X_{ics} + \varepsilon_{ics} \quad (1)$$

for firm *i* operating in country *c* in industry *s*. $Innovation_{ics}$ equals 1 if firm *i* conducted any type of innovation and 0 otherwise.[5] $Foreign\ Bank\ Presence_{ics}$ was measured as the percentage of foreign bank branches over the total number of all bank branches in the same city. X_{ics} represents a set of control variables. Country and sector fixed effects (α_c and α_s, respectively) were included to control for unobserved variation at the country and sector levels.

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[5] Although our dependent variable of interest is a binary variable, we used the OLS estimates instead of probit and logit models. The rationale lies in the fact that the marginal effects obtained from these parametric non-linear models for limited dependent variables (i.e., the binary variable in our case) are usually indistinguishable from the corresponding OLS regression coefficients, regardless of the distribution of regressors (Angrist and Pischke, 2008). In other words, OLS regressions can give the population an average treatment effect. Furthermore, using probit and logit models with interaction terms would further complicate the economic explanation of coefficient estimates without adding precision. Nevertheless, our results continue to hold when we use probit and logit models.

Last, error terms (ε_{ics}) were clustered at the locality*sector level to allow them to be correlated because of locality- and industry-specific unobserved factors.

Our theory further specifies that the positive impact of foreign banks on firm innovation is weaker for local firms that have access to other sources of foreign knowledge. Hypothesis 2 was tested with the following OLS Model (2):

$$Innovation_{ics} = \alpha_c + \alpha_s +$$

$$\beta_1 * Foreign\ Bank\ Presence_{ics} * Foreign\ Linked\ Firm_{ics} +$$

$$\beta_2 * Foreign\ Bank\ Presence_{ics} * Non\ Foreign\ Linked\ Firm_{ics} +$$

$$\beta_3 * Foreign\ Linked\ Firm_{ics} + \gamma X_{ics} + \varepsilon_{ics} \quad (2)$$

for firm i operating in country c in industry s. $Foreign\ Linked\ Firm_{ics}$ equals 1 if a firm had one or more foreign parents (or sold its main product mostly in the global market or engaged in export in separate models) and 0 otherwise. In contrast, $Non\ Foreign\ Linked\ Firm_{ics}$ equals 1 if a firm was fully domestically owned (or did not sell its main product mostly in the global market or did not export in separate models) and 0 otherwise. The structure where we include these two interaction terms resembles essentially the structure where we incorporate only one of these two dummies to interact with $Foreign\ Bank\ Presence_{ics}$ and then include $Foreign\ Bank\ Presence_{ics}$ as an independent variable (Chava, Oettl, Subramanian, and Subramanian, 2013; Infante and Piazza, 2014). The major advantage is that the coefficient estimates of the interactions will directly indicate whether foreign banks have significant impacts on the innovation of foreign-linked and non-foreign-linked firms separately. This approach is thus appropriate when theory predicts that the impact may hold only for one specific group of observations, which is the case in our paper. The same set of control variables were included, as

well as the country and sector fixed effects. Standard errors were also clustered at the locality*sector level.

RESULTS

Summary statistics

We start with a discussion of the summary statistics in Table 1. The first part focuses on firms' innovation activities. Forty-two percent of our firms engaged in at least one type of innovation. Among these firms, 26% engaged in product innovation and 20% in process innovation. Firms also engaged in soft innovations, including organizational innovation (21%) and marketing innovation (23%). In the second part of Table 1, we examine banking market characteristics. In the sampled countries, foreign ownership of banks was a key characteristic of the banking sector. Following privatization policies, the market share of foreign banks was high. More than 50% of bank branches, on average, were foreign owned in a city. Therefore, foreign banks played an important role in these countries, providing a perfect setting to examine their impact on local firms' innovation activities. Banking market competition was moderate, with an HHI index of 0.15.[6] Although foreign banks were an important player in these countries, foreign firms were rare. Less than 5% of firms had foreign ownership. Similarly, only 8% sold their main product mostly in the global market. However, about 28% either directly or indirectly exported their products abroad. It is important to note that most of the sampling firms were SMEs, with only 2% publicly listed in a stock exchange. Thirty-five percent of firms' annual financial reports were checked by an external auditor.

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[6] Based on the US Department of Justice, a market with an HHI of less than 0.1 is considered to be "well diversified", between 0.1 and 0.18 is "moderately concentrated", and 0.18 or greater is "highly concentrated".

[Insert Table 1 about here]

We next discuss the correlation matrix in Table 2. We can see that the share of foreign banks in the same city as a firm is positively and significantly related to the firm's innovation activity. This provides preliminary support for our theory. As these are preliminary correlations that do not properly control for other covariates, we test the hypotheses by running OLS Model (1) and (2).

[Insert Table 2 about here]

Variation across and within countries

Beyond the average values in Table 1, substantial variation exists across countries. Table 3 reports summary statistics for our main dependent and independent variables, *Foreign Bank Presence* and *Innovation*, across countries. We find that foreign banks were more common in countries such as Albania, Czech Republic, and Slovak Republic, where the share of foreign banks amounted to more than 80%. In contrast, foreign banks were rare in Azerbaijan, where the share was approximately 5%. Regarding innovations, firms in Belarus, Croatia, Czech Republic, and Romania were more active, where more than 60% of our sample firms engaged in at least one type of innovation. However, firms in Albania and Azerbaijan were less active in innovations.

[Insert Table 3 about here]

In addition to cross-country variation, our data show significant variation across firms within the same country. In Figure 1, each dot represents an individual firm in our sample. Panel A of this heatmap shows the percentage of foreign banks within the same city for each firm. Darker areas indicate a higher percentage of foreign banks. Panel B shows whether a firm carried

out any type of innovation, with darker areas indicating firms involved in innovations. Even though cross-country variation is more obvious, within-country variation is also significant for both foreign bank presence and firm innovation, which is key to our identification.

[Insert Figure 1 about here]

Main results

Our main empirical results are presented in Table 4. To create a benchmark, in column 1 we regress the firm's innovation on the set of control variables. We find that larger firms and audited firms are more likely to undertake innovation. The same applies to exporting firms. However, the results indicate that global competing firms are, on the contrary, less likely to engage in innovation. This may be because global competing firms are highly correlated with exporting firms, with a correlation coefficient of 0.498. Finally, we find that increased banking market competition fosters innovation.

Column 2 of Table 4 presents the results of Model (1) where we focus on the direct impact of foreign bank presence on firm innovation (Hypothesis 1). The coefficient of *Foreign Bank Presence* is positive and significant, meaning that with a larger share of foreign banks in the same city, firms are more likely to engage in innovation. Economically, if the share of foreign banks increases by 30% (approximately one standard deviation), a firm is 2.1% more likely engage in innovation. To determine the aggregate effect, consider the following back-of-the-envelope calculation. In 2015, according to the European Commission's "Enterprise and Industry SBA Factsheet 2016: Poland", there were 1.54 million SMEs in Poland.[7] According to

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[7] The BEEPS survey focused on SMEs. According to the European Commission's "Enterprise and Industry SBA Factsheet 2016: Poland", in 2015, SMEs in Poland accounted for 99.8 % of businesses in the Polish "non-financial business economy".

BEPS II, the current share of foreign banks in Poland is approximately 60%. If this percentage increases to 90%, there would be about 2.1% more firms engaging in innovation, that is, 32,340 firms in absolute value. Of course, this is only a conservative calculation that ignores the fact that with a greater foreign bank presence, the number of entrepreneurs may also increase.

Finally, columns 3–5 of Table 4 present the results of Model (2) where we interact *Foreign Bank Presence* with the six binary variables that capture whether a firm has access to alternative sources of foreign knowledge.[8] In column 3, we interact *Foreign Bank Presence* with *Foreign Firm* and *Domestic Firm*. The estimates indicate that the positive impact of foreign banks on firm innovation is statistically significant only for domestic firms. Next, in column 4 we interact *Foreign Bank Presence* with *Global Competing Firm* and *Domestic Competing Firm*. We find that the positive impact of foreign banks on innovation is significant only for firms that do not sell their main product mostly in the global market. Last, in column 5 we interact *Foreign Bank Presence* with *Exporting Firm* and *No Exporting Firm*. We find that the increased presence of foreign banks significantly benefits only firms that do not export. Taken together, these results provide support for Hypothesis 2 that the positive impact of foreign bank presence on innovation is weaker for firms that have access to alternative sources of foreign knowledge.

[Insert Table 4 about here]

Additional analysis

The results indicate that the presence of foreign banks can significantly foster local firms' innovation. Therefore, it is natural to ask: which type of innovation is more likely to be affected?

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[8] We did not conduct a full model analysis including all the interactions simultaneously in one regression because of perfect collinearity. Most of our sampling firms are domestic firms that compete mainly domestically without any exports.

To answer this question, in Table 5 we disaggregate innovation into four types of innovation: product, process, organizational, and marketing innovation. The results show that the positive impact of foreign banks is significant for product and organizational innovation, but not for process and marketing innovation. In other words, foreign banks are especially helpful at providing local firms with new knowledge about products or services and improvements in organizational or management practices. In terms of increasing production efficiency or introducing new marketing tools, foreign banks play a less important role.

From an economic perspective, if the share of foreign banks increases by 30% (approximately one standard deviation), a firm is 1.8% more likely to engage in product innovation and 1.4% more likely to engage in organizational innovation. Regarding the aggregate effect, we again take Poland as an example (with 1.54 million SMEs in 2015). If the share of foreign banks in Poland decreases from 60% (its current rate) to 30%, there would be 1.8% and 1.4% less firms engaging in product and organizational innovation, respectively. These percentages translate to 27,720 and 21,560 firms in absolute value, respectively.

[Insert Table 5 about here]

Robustness tests and alternative explanations

In Appendix 2, we replace country fixed effects and sector fixed effects with country*sector interacted fixed effects. This is done to further control for potential omitted variables that vary across both countries and sectors. For instance, the automotive industry in the Czech Republic is strong, ranking fifth in Europe with an annual output near 1.4 million units. Auto manufacturers in the Czech Republic include original Czech brands, such as Škoda and Tatra, and foreign brands, such as Hyundai, Peugeot, Citroen, and Toyota. In contrast, the automotive industry is

relatively weak in Slovenia with only small auto producers. Thus, we might need to control for such country*sector differences. Nevertheless, the results are consistent with our main results in Table 4.

One may argue that the impact of foreign banks on local firms' innovation may need a long time to materialize. In the main analysis, we use the foreign bank information in 2012 and examine its impact on firms' innovations during 2013–2014. In Appendix 3, instead of bank information in 2012, we use bank information in 2009 (5-year lag). The results show similar patterns to our main analysis, both statistically and economically. Therefore, this concern is mitigated.

In another robustness check, instead of focusing on the city level, we draw a 5- or 10-kilometer circle around the geo-coordinates of each firm and link the firm to the bank branches inside that circle (Beck *et al.*, 2018; Qi and Ongena, 2018). This is done to address the possibility that a firm or a bank branch locates near, but not within, the borders of a city. In this case, firms may visit bank branches in another city that is geographically closer. The results shown in Appendix 4 are mostly consistent with our main results.

One potential concern about identification in this paper is that our results may be driven by the presence of foreign firms. In cities where there were more foreign banks, there might also be more foreign firms. This view goes far back to Goldberg and Saunders (1981) who assert banks often pursue a "follow-the-customer" strategy in deciding their FDI location. If this is indeed the case in our sample, the findings may simply be the spillover result of foreign firms rather than foreign banks. Therefore, we examine the city-level correlation between share of foreign banks and share of foreign firms. Since our firm survey data is not able to give us a complete view on the presence of foreign firms, we seek to the BvD AMADEUS database,

which contains information on more than 21 million public and private firms across 34 European countries. We then match this complete firm information with our BEEPS data and end up with 123,665 firms operating in 883 cities across 19 of our sampling countries. The results are reported in Appendix 5. Specifically, after aggregating both foreign banks and firms at the city level, we regress city-level share of foreign firms on share of foreign banks while controlling for country fixed effects. Appendix 5 shows no significant link; that is, cities with more foreign banks do not necessarily have more foreign firms. The coefficient between city-level share of foreign banks and firms is only insignificantly equal to 0.018. In fact, recent scholars cast doubt on the follow-the-customer strategy as a major explanation for banks' location choice (Focarelli and Pozzolo, 2005). Prior studies reveal that for banks entering a new market, they not only have a motive to lend to the home country customer but also seek to provide financial services for local and third-country clients (e.g. Buch and Golder, 2001). At the same time, home-country firms may also seek "concierge" services from host-country banks (Berger, Dai, Ongena, and Smith, 2003). In addition, this strand of literature mostly focuses on the country level rather than the more micro city level. In other words, the link between foreign banks and foreign firms shown in the previous literature is more likely to be valid at the country level, but not necessarily at the city level. As a result, after controlling for country fixed effects, our analysis has already addressed this concern. In Appendix 2, we also specifically control for country and industry interacted fixed effects. This further mitigates our concern that foreign firms in some specific industries of a country may be correlated to foreign bank presence.

To further address potential concerns of omitted variable, including foreign FDI presence, we apply the methodology that was recently developed by Oster (2017) to explicitly assess the potential bias from unobservable omitted variables. This method has been applied in several

recent papers to understand how sensitive the main results are to omitted variables. Specifically, this test computes the amount of variation that the unobservable variables need to explain (relative to the variation explained by the control variables included in the estimations) to reduce the effect of interest to zero. This share is denoted as δ.

$$\delta = \frac{\beta_{Full}}{\beta_{Restrict} - \beta_{Full}} * \frac{R_{Full} - R_{Restrict}}{R_{Max} - R_{Full}}$$

where $\beta_{Restrict}$ is the coefficient on foreign bank presence from the model using a restricted set of controls, β_{Full} is the coefficient from the model using a full set of controls. The implementation of Oster's (2017) test requires specifying the value of R_{Max} which is the R^2 from a hypothetical regression that includes all observed and unobserved controls. Based on experimental evidence, Oster (2017) recommends setting $R_{Max} = 1.3R_{Full}$ where R_{Full} is the R^2 from a regression that includes the full set of control variables.

In our case, the restricted model is the one that only include foreign bank presence as the solo independent variable and the full model refers to the one that includes our full set of control variables and country and sector fixed effects. After calculation, δ equals 1.5, which are higher than the recommended robustness benchmark of 1 (Oster, 2017). In other words, the omitted unobservables need to be at least 1.5 times as important as the observables to completely reduce our coefficient of interest to zero. This is highly unlikely in that our regression specifications already include a large set of fixed effects and important determinants of a firm's innovation activities.

Although our theory proposes knowledge transfer for the positive relation between foreign bank presence and local firms' innovation, one may argue that the positive relation

results from foreign banks increasing the amount of credit available for firms to invest in innovation. Firms in countries with underdeveloped equity markets and weaker shareholder protection rely to a larger extent on bank financing to fund their investments (Booth, Aivazian, Demirgüç-Kunt, and Maksimovic, 2001; Giannetti, 2003). However, the inefficiency of domestic banks and lack of competition among banks may result in higher borrowing costs, which limit firms' access to bank credit. Foreign banks, however, may increase competition and improve efficiency in the local banking market, therefore increasing the total supply of credit (Gormley, 2010). In addition, domestic banks in many follower countries often rely on relationship lending—they lend only to established companies owned by well-connected individuals (Laeven, 2001; La Porta, Lopez-De-Silanes, and Zamarripa, 2003). As a result, smaller firms are passed over by domestic banks and face severe credit rationing. In contrast, foreign banks that use transactional lending may be more willing to fund promising projects even if they are not well connected with firms (Agénor, 2003). Foreign banks, therefore, may not only increase credit supply for existing firms but also help entrepreneurial firms by breaking down local barriers to entry (Rajan and Zingales, 2003).

There is a view in the literature, however, that the presence of foreign banks has a dark side and might not facilitate local firms' access to credit. First, theoretically, a competitive banking market (e.g., with more foreign banks) with asymmetric information may actually reduce firms' access to credit (Petersen and Rajan, 1995). Credit-constrained firms might be better off in markets with lower competition where lenders can internalize the benefits of assisting credit-constrained firms by securing a long-term business relationship. Second, the higher cost of acquiring information and screening domestic firms might force foreign banks to cream-skim. Consequently, foreign banks might lend only to the most profitable local firms, for

which credit access is often not an issue in the first place (Dell'Ariccia and Marquez, 2004; Giannetti and Ongena, 2009; Gormley, 2010; Sengupta, 2007). This would adversely affect new and smaller firms that often have higher risk and uncertain cash flows (Detragiache *et al*., 2008; Gormley, 2014).

Although scholars have not reached consensus about the net impact of foreign banks on local firms' credit access, we explicitly address this issue in our robustness tests. In columns 1 and 2 of Appendix 6, we investigate whether a larger share of foreign banks around a firm leads to better credit access. Credit access is measured by either *Financing Obstacle* or *Credit Constrained*.[9] The estimates present no significant link between foreign bank presence and credit access. In other words, a higher penetration of foreign banks does not significantly increase the availability of bank credit for local firms. Next, in column 3 and 4 we examine whether foreign banks benefit local firms by granting loans with more favorable conditions, such as lower collateral requirement or interest rate.[10] Again, there is no evidence that firms benefit from

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[9] The first measure, Financing Obstacle, follows Brown, Jappelli, and Pagano (2009) and Qi and Ongena (2018). This measure applies BEEPS V question K30, which asked about the degree to which access to finance, which includes availability and costs such as interest rates, fees, and collateral requirements, was an obstacle. Firms' responses are coded on a scale from 1 to 4, where higher values correspond to greater financing obstacles. This measure captures firms' perceptions, but as empirically established by Hainz and Nabokin (2013), this perception-based measure is "surprisingly precise". The second measure, Credit Constrained, follows Popov and Udell (2012) and Beck et al. (2018). Three questions in BEEPS V were combined to first distinguish between firms with and without demand for credit. Among the former group, we then identified firms that were credit constrained: those that either got rejected in their loan application or were discouraged from applying for a loan in the first place. Specifically, we started with question K16: "Did the establishment apply for any loans or lines of credit in the last fiscal year?" For firms that answered "No", we moved to question K17, which asks the main reason the establishment did not apply for any line of credit or loan. For firms that answered "Yes", question K18a subsequently asks: "In the last fiscal year, did this establishment apply for any new loans or new credit lines that were rejected?" We labeled firms as "unconstrained" if they answered "Yes" to K16 and "No" to K18a, and as "constrained" if they answered "Yes" to K18a or answered one of the following to question K17: "Interest rates are not favorable"; "Collateral requirements are too high"; "Size of loan and maturity are insufficient"; or "Did not think it would be approved". This combination allows us to distinguish between firms that did not apply for any loan because they did not need one and those that did not apply because they were discouraged.

[10] The BEEPS V also asked the borrowing firms to disclose the loan characteristics for their most recent line of credit or loan, including the annual nominal Interest Rate (in percent) and the original duration (in months). The borrowing firms also reported if the loan required Collateral. We focused on lines of credit or loans that were originated since the previous year by private banks (in contrast to state-owned banks). This was done to focus on

increased presence of foreign banks in terms of more favorable loan conditions. Therefore, it is fair to exclude the alternative explanation that foreign banks enhance local firms' innovation by improving credit access.

To provide additional evidence on our theory of knowledge transfer, we examine the impact of foreign bank presence on the licensing of *Foreign Technology*,[11] a form of knowledge acquisition. In follower countries, innovation usually involves imitation, as firms adopt existing products and processes from abroad and adapt them to local circumstances (Acemoglu *et al.*, 2006; Ayyagari *et al.*, 2011; Furman and Hayes, 2004). This is in contrast to leading countries that are close to the technological frontier, where innovation typically involves R&D as well as the invention of products and technologies that are new to the world. The results presented in Appendix 7 are consistent with the results in the main analysis, offering additional support for our theory of knowledge transfer.

CONCLUSION

In this paper, we theorize that foreign banks enhance the knowledge base of local firms in other industries in follower countries by providing knowledge both directly and indirectly, which in turn stimulates local firms' innovation. Foreign banks, especially those that are large and diversified, may possess advanced knowledge that often is not available in the domestic market (Muller and Zenker, 2001). Through social interactions such as purchasing foreign banks' business-solution services and building informal relationship, foreign banks' knowledge may be transferred to local firms. In addition, foreign banks usually play a central role in business

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loans that are most relevant to foreign banks.

[11] Foreign Technology is a binary variable that equals 1 if the focal firm used any technology licensed from a foreign-owned company (excluding office software) and 0 otherwise.

networks that comprise different types of knowledge. As such, they may make referrals between local firms and other knowledge providers with which they have ties through formal business-matchmaking services or informal referrals (Bessant and Rush, 1995; Laursen *et al.*, 2012; Uzzi and Gillespie, 2002).

We further contend that the impact of foreign bank presence may become less significant when local firms have access to alternative sources of foreign knowledge. The major reason is that under the constraints of limited resources and attention (Cyert and March, 1963; Simon, 1955), firms tend to rely on knowledge sources that are less costly to access, especially when knowledge from different sources overlaps (Schwab, 2007). In this paper, we suggest that local firms that have foreign parent(s) or compete in the global market have access to less costly sources of foreign knowledge that are valuable for innovation (Aitken and Harrison, 1999; Branstetter, 2006; Liu and Buck, 2007; Salomon and Shaver, 2005; Wei and Liu, 2006).

We test our theory using a sample of firms, mostly SMEs, in transitional economies in Europe, the Baltic States, and the Caucasus. To ensure the validity of our results, we perform robustness tests with different model specifications, longer lags between the dependent and independent variables, and alternative measures of foreign bank presence. We run additional tests to determine whether our results are driven by alternative explanations. We conclude that foreign bank presence can promote innovation of nearby local firms that do not have foreign parents, do not sell their main products mostly in the global market, or do not export their products or services. The types of innovation that benefit from foreign bank presence are product and organizational innovation. This positive impact, however, does not apply to local firms that have foreign parents, mainly compete in the global market, or engage in exports. In addition, our robustness tests provide evidence that the positive impact of foreign banks is likely through

knowledge transfer instead of alternative mechanisms such as improvement in local firm's credit access and spillovers from other types of FDI. We find evidence of a positive impact of foreign bank presence on local firms' licensing of foreign technology, a specific form of knowledge acquisition.

This paper is important theoretically and practically. Theoretically, although FDI spillovers have attracted substantial interest from scholars, few studies investigate inter-industry FDI spillovers from foreign service firms. One important condition needed for positive FDI spillovers to take place is the willingness of foreign firms to transfer knowledge, which may be a problem when FDI and local firms are competitors (i.e., intra-industry FDI) (Aitken and Harrison, 1999). However, as local firms in other industries are (potential) clients and partners of foreign service firms, foreign service firms' willingness to transfer knowledge to these local firms should not be an issue. Furthermore, many foreign service firms are equipped with knowledge and resources that can be important for local firms' innovations (Bessant and Rush, 1995; Hertog, 2000; Lee *et al.*, 2010; Muller and Zenker, 2001; Schumpeter, 1934; Tether and Tajar, 2008). These factors all suggest the plausibility of positive inter-industry FDI spillovers from foreign service firms. By focusing on foreign banks, a type of foreign service firms, we are the first to develop theory and present evidence of the positive impact of foreign service firms on the innovation of local firms in other industries.

We hope our study encourages future research into inter-industry FDI spillovers from foreign service firms. For instance, scholars can study FDI spillovers from other types of foreign firms such as marketing agencies and consultancies. Scholars can also look into conditions under which positive inter-industry FDI spillovers from foreign service firms can be strengthened. If the motivation to transfer knowledge is not an issue for foreign service firms, perhaps the ability

aspects of both foreign service firms and local firms, such as knowledge quality of foreign service firms and absorptive capacity of local firms, are more relevant. As social interaction is important for knowledge transfer (Grant, 1996; Kogut and Zander, 1992), scholars may also study how to facilitate social interactions between foreign service firms and local firms that come from different cultures and industries.

A second theoretical contribution our paper makes is to examine what types of local firms are likely to be influenced by foreign banks' knowledge transfer. Our results reveal that not every local firm benefits from foreign banks' knowledge transfer. Specifically, local firms that have foreign parents, sell their main product mostly in the global market, or export their products or services are not influenced by foreign bank presence in terms of their innovation rate. We argue that this is because these firms already have access to less costly sources of foreign knowledge. Given that the costs of accessing foreign knowledge may matter, it would be interesting to compare the costs of gaining access to different types of foreign service firms and different sources of foreign knowledge in a single study. In addition, scholars can explore other factors that may lead to a heterogeneous impact of foreign service firms on local firms, such as the absorptive capacity of local firms and ties with foreign service firms can be the candidates. In addition, our study suggests that knowledge transfer from foreign banks to local firms is effective at the city level. One natural follow-up question is: how far can local firms and foreign banks be located from each other for knowledge transfer to remain effective?

A third theoretical contribution our paper makes is to shed light on how banks influence innovation of firms in other industries. The dominant view in the banking literature is about banks' efficiency in allocating financial capital. Firm investment projects, especially those related to innovation, are risky and uncertain. Transaction and information costs would be

extremely high if each investor had to review each investment project of each firm before lending money. Scholars point out that the existence of banks is because of their competitive advantages in collecting information, evaluating investment projects, monitoring firms' operation, and diversifying risk. With banks, total transaction costs decreases and total supply of credit increases (Alfaro *et al*., 2004; Beck *et al*., 2000; King and Levine, 1993; Schumpeter, 1934). However, this view may not apply to foreign banks that are usually late entrants in follower countries. Although we find that foreign banks raise the innovation of local firms in other industries, we do not find that they affect the access to credit for these firms. In contrast, we propose that foreign banks transfer knowledge to local firms, thereby enhancing their innovation. Our theory of knowledge transfer receives support in a sample of firms in transitional economies in Europe, the Baltic States, and the Caucasus. Accordingly, our study may inspire scholars to reexamine and redefine the role of banks in the innovation of firms in other industries.

Nevertheless, this paper has a few limitations that could be addressed by future research. First, our analysis shows that product and organizational innovation increase with increased foreign bank presence, whereas process and marketing innovation do not. Our theory does not explain such results. Future research might further explore this issue. Second, our definition of innovation comprises both new-to-the-world innovation and imitation of existing innovation. It would be interesting to examine which type of innovation is enhanced by foreign banks to a greater extent. Third, because we use survey data collected by third parties, we cannot directly measure the knowledge transfer processes. What we do instead is examine one form of knowledge acquisition—licensing of foreign technology. Future research could design a survey

that directly measures the knowledge transfer processes to provide stronger evidence on our theory of knowledge transfer.

Our paper has policy and managerial implications. Most studies of foreign banks examine their impact on local banks' efficiency and overall credit supply, but the evidence is inconclusive. This paper is important in that it shifts the attention of policy makers from intra-industry to inter-industry FDI spillovers—it presents a new perspective for policy makers to assess the impact of foreign banks' entry. Our findings on the types of local firms that benefit most from foreign banks' knowledge transfer are particularly useful for policy makers assessing the impact of foreign banks' entry. For example, if export is not common for local firms, this economy may benefit more from foreign banks' entry. Managers can also obtain insights into the knowledge benefits of interacting with foreign banks. If their firms lack access to foreign knowledge, developing more embedded relationships with foreign banks could be an effective way to upgrade their firm's knowledge base (Uzzi, 1997; Uzzi and Gillespie, 2002). If their firms have access to multiple sources of foreign knowledge, they may need to evaluate whether the costs of interacting with foreign banks are higher or lower than gaining access to other knowledge sources.

Looking to the future, it is likely that foreign banks will maintain or increase their presence in other countries under the globalization trend. By demonstrating the knowledge benefits of foreign banks, our study may help policy makers and managers design their policies and strategies.

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Table 1 Summary statistics

Variable	Obs.	Mean	Std.	Min.	Max.
Innovation Activity					
Innovation	6138	0.421	0.494	0	1
Product Innovation	6138	0.263	0.440	0	1
Process Innovation	6138	0.199	0.400	0	1
Organizational Innovation	6138	0.208	0.406	0	1
Marketing Innovation	6138	0.231	0.421	0	1
Banking Market					
Foreign Bank Presence w/i city	6197	0.532	0.308	0	1
Banking Competition w/i city	6197	0.143	0.170	0	1
Firm Characteristics					
Foreign Firm	6197	0.048	0.214	0	1
Exporting Firm	6197	0.267	0.442	0	1
Global Competing Firm	6197	0.083	0.276	0	1
Firm Size	6197	1.509	0.684	1	3
Audited Firm	6197	0.347	0.476	0	1
Female Managed Firm	6197	0.215	0.411	0	1
Sole Proprietorship Firm	6197	0.114	0.318	0	1
Publicly Listed Firm	6197	0.021	0.145	0	1
Privatized State Firm	6197	0.112	0.315	0	1

Table 2 Correlation matrix

Variable		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Innovation															
2	Product Innovation	0.700														
3	Process Innovation	0.586	0.487													
4	Organizational Innovation	0.601	0.375	0.463												
5	Marketing Innovation	0.642	0.379	0.384	0.545											
6	Foreign Bank Presence w/i city	0.066	0.064	0.021	0.047	0.035										
7	Banking Competition w/i city	0.015	0.019	0.022	0.019	0.010	0.111									
8	Foreign Firm	0.065	0.052	0.054	0.062	0.057	-0.017	-0.006								
9	Global Competing Firm	0.073	0.059	0.086	0.086	0.030	0.007	0.044	0.106							
10	Exporting Firm	0.197	0.199	0.165	0.158	0.114	0.006	0.017	0.151	0.500						
11	Firm Size	0.138	0.103	0.125	0.152	0.118	-0.042	0.010	0.120	0.180	0.236					
12	Audited Firm	0.127	0.090	0.114	0.110	0.105	0.007	0.020	0.088	0.076	0.120	0.270				
13	Female Managed Firm	-0.009	-0.021	-0.006	-0.004	0.008	0.035	0.052	-0.040	-0.025	-0.077	-0.099	-0.065			
14	Sole Proprietorship Firm	-0.028	-0.032	-0.021	-0.040	-0.024	-0.133	0.018	-0.078	-0.060	-0.057	-0.125	-0.086	0.058		
15	Publicly Listed Firm	-0.027	-0.025	-0.018	-0.007	-0.002	-0.047	-0.022	0.051	-0.000	0.014	0.115	0.096	-0.045	-0.054	
16	Privatized State Firm	0.003	0.001	0.007	0.017	-0.023	-0.058	0.009	0.034	0.036	0.055	0.224	0.127	-0.024	-0.080	0.204

Table 3 Variation across countries

Country	Foreign Bank Presence w/i city	Innovation
Albania	79.10%	14.23%
Armenia	61.34%	23.13%
Azerbaijan	5.80%	7.57%
Belarus	30.83%	65.16%
Bosnia and Herzegovina	56.58%	51.61%
Bulgaria	69.79%	50.46%
Croatia	65.53%	63.19%
Czech Republic	77.04%	60.11%
Estonia	61.66%	33.93%
Georgia	57.50%	18.52%
Hungary	61.52%	31.72%
Latvia	67.85%	31.60%
Lithuania	52.16%	43.37%
FYR Macedonia	64.86%	54.38%
Moldova	34.25%	44.81%
Montenegro	61.76%	26.67%
Poland	60.57%	51.79%
Romania	64.83%	69.14%
Serbia	59.67%	52.31%
Slovak Republic	78.05%	32.87%
Slovenia	30.13%	49.31%
Ukraine	28.05%	30.60%

Table 4 Impact of foreign bank presence on firm innovation

Dependent variable	Innovation				
	1	2	3	4	5
Foreign Bank Presence		0.071			
		(0.025)			
Foreign Bank Presence*Foreign Firm			0.091		
			(0.092)		
Foreign Bank Presence*Domestic Firm			0.069		
			(0.026)		
Foreign Bank Presence*Global Competing Firm				0.035	
				(0.065)	
Foreign Bank Presence*Domestic Competing Firm				0.076	
				(0.026)	
Foreign Bank Presence*Exporting Firm					0.066
					(0.040)
Foreign Bank Presence*No Exporting Firm					0.073
					(0.029)
Foreign Firm	0.029	0.031	0.020	0.031	0.031
	(0.028)	(0.028)	(0.055)	(0.028)	(0.028)
Global Competing Firm	-0.098	-0.096	-0.096	-0.074	-0.095
	(0.025)	(0.026)	(0.026)	(0.043)	(0.026)
Exporting Firm	0.157	0.157	0.157	0.157	0.161
	(0.017)	(0.017)	(0.017)	(0.017)	(0.030)
Firm Size	0.055	0.054	0.054	0.054	0.054
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Audited Firm	0.087	0.087	0.087	0.086	0.087
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Female Managed Firm	-0.005	-0.007	-0.007	-0.007	-0.007
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Sole Proprietorship Firm	-0.013	-0.009	-0.010	-0.009	-0.009
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
Publicly Listed Firm	-0.051	-0.052	-0.053	-0.053	-0.052
	(0.037)	(0.037)	(0.037)	(0.037)	(0.037)
Privatized State Firm	-0.022	-0.021	-0.021	-0.021	-0.021
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Banking Competition	-0.063	-0.078	-0.078	-0.077	-0.078
	(0.036)	(0.036)	(0.036)	(0.037)	(0.036)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes
Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.170	0.171	0.171	0.171	0.171
N	6,138	6,138	6,138	6,138	6,138

Coefficients are listed in the first row, robust locality*sector clustered standard errors appear in (parentheses).

Table 5 Impact of foreign bank presence on firm innovation types

Dependent variable	Innovation in:			
	Product	Process	Organizational	Marketing
	1	2	3	4
Foreign Bank Presence	0.059	0.021	0.047	0.035
	(0.024)	(0.022)	(0.021)	(0.023)
Foreign Firm	0.016	0.010	0.025	0.034
	(0.029)	(0.025)	(0.027)	(0.027)
Global Competing Firm	-0.118	-0.029	-0.011	-0.068
	(0.025)	(0.024)	(0.024)	(0.023)
Exporting Firm	0.155	0.097	0.104	0.090
	(0.016)	(0.015)	(0.015)	(0.016)
Firm Size	0.028	0.038	0.065	0.051
	(0.009)	(0.009)	(0.009)	(0.009)
Audited Firm	0.055	0.062	0.052	0.070
	(0.013)	(0.013)	(0.012)	(0.013)
Female Managed Firm	-0.001	0.004	0.001	-0.005
	(0.013)	(0.013)	(0.013)	(0.014)
Sole Proprietorship Firm	-0.008	-0.003	-0.014	-0.014
	(0.017)	(0.016)	(0.015)	(0.017)
Publicly Listed Firm	-0.057	-0.032	-0.017	0.030
	(0.032)	(0.032)	(0.033)	(0.038)
Privatized State Firm	-0.028	-0.022	-0.002	-0.053
	(0.017)	(0.016)	(0.017)	(0.017)
Banking Competition	-0.020	-0.031	-0.042	-0.060
	(0.034)	(0.032)	(0.030)	(0.032)
Country Fixed Effects	Yes	Yes	Yes	Yes
Sector Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.128	0.113	0.129	0.119
N	6,138	6,138	6,138	6,138

Coefficients are listed in the first row, robust locality*sector clustered standard errors appear in (parentheses).
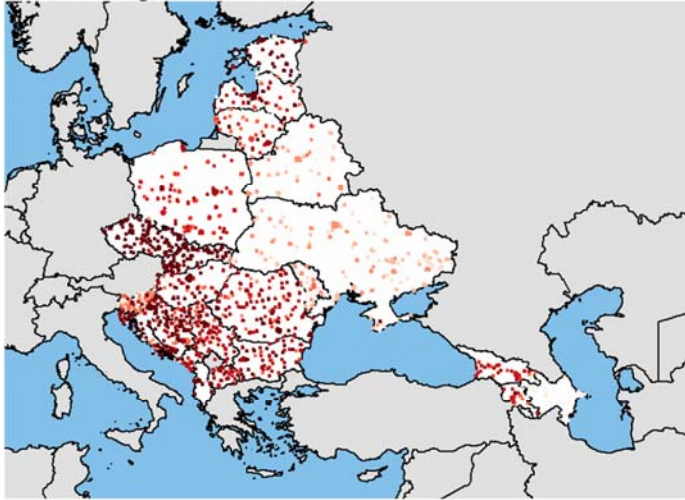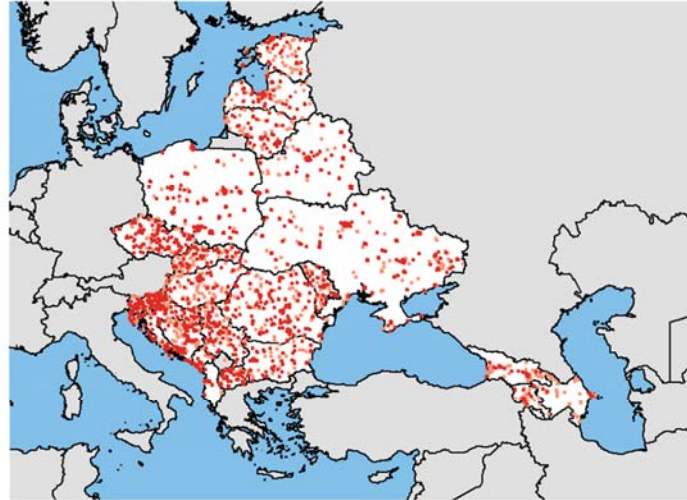
Figure 1 Heatmap of foreign bank presence and firm innovation

Panel A of this heatmap reports the percentage of foreign banks within the same city of each firm in the sample. Darker red indicates a higher percentage of foreign banks. Panel B shows whether a firm conducts any innovation. Darker red indicates the firm conduct at least one type of innovation.

Appendix 1 Variable definitions and sources

| Variable	Definitions	Sources
Innovation Activity		
Innovation	dummy =1 if a firm introduced at least one type of innovation	BEEPS V
Product Innovation	dummy =1 if a firm introduced new or significantly improved products, services	BEEPS V
Process Innovation	dummy =1 if a firm introduced new or significantly improved methods for production	BEEPS V
Organizational Innovation	dummy =1 if a firm introduced new or significantly improved organizational or management practices	BEEPS V
Marketing Innovation	dummy =1 if a firm introduced new or significantly improved marketing practices	BEEPS V
Banking Market		
Foreign Bank Presence w/i city	share of foreign bank branches within the same city or town of the firm	BEPS II
Banking Competition w/i city	Herfindahl-Hirschmann Index of banks within the same city or town of the firm	BEPS II
Firm Characteristics		
Foreign Firm	dummy = 1 if a firm has any foreign ownership	BEEPS V
Exporting Firm	dummy = 1 if the firm directly or indirectly export its product or services abroad	BEEPS V
Global Competing Firm	dummy = 1 if the firm's main products or services are mainly sold on the international market	BEEPS V
Firm Size	indicator for firm size based on number of employees in the last fiscal year: small (1-19), median (20-99), large (100+)	BEEPS V
Audited Firm	dummy = 1 if a firm had its annual financial statements checked and certified by an external auditor	BEEPS V
Female Managed Firm	dummy = 1 if the top manager of a firm is female	BEEPS V
Sole Proprietorship Firm	dummy = 1 if a firm is a sole proprietorship	BEEPS V
Publicly Listed Firm	dummy = 1 if a firm is publicly listed	BEEPS V
Privatized State Firm	dummy = 1 if a firm is privatized from state-owned enterprise	BEEPS V

BEEPS V is the fifth wave of the Business Environment and Enterprise Performance Survey (BEEPS).

BEPS II is the second round of the Banking Environment and Performance Survey (BEPS).

Appendix 2 Robustness with country*sector fixed effects

Dependent variable	Innovation			
	1	2	3	4
Foreign Bank Presence	0.072			
	(0.026)			
Foreign Bank Presence*Foreign Firm		0.070		
		(0.095)		
Foreign Bank Presence*Domestic Firm		0.072		
		(0.026)		
Foreign Bank Presence*Global Competing Firm			0.049	
			(0.065)	
Foreign Bank Presence*Domestic Competing Firm			0.075	
			(0.027)	
Foreign Bank Presence*Exporting Firm				0.066
				(0.041)
Foreign Bank Presence*No Exporting Firm				0.075
				(0.029)
Foreign Firm	0.019	0.020	0.019	0.019
	(0.029)	(0.056)	(0.029)	(0.029)
Global Competing Firm	-0.102	-0.102	-0.088	-0.102
	(0.026)	(0.026)	(0.044)	(0.026)
Exporting Firm	0.153	0.153	0.153	0.158
	(0.017)	(0.017)	(0.017)	(0.031)
Firm Size	0.058	0.058	0.058	0.058
	(0.010)	(0.010)	(0.010)	(0.010)
Audited Firm	0.086	0.086	0.086	0.086
	(0.015)	(0.015)	(0.015)	(0.015)
Female Managed Firm	-0.008	-0.008	-0.008	-0.008
	(0.016)	(0.016)	(0.016)	(0.016)
Sole Proprietorship Firm	-0.007	-0.007	-0.007	-0.007
	(0.020)	(0.020)	(0.020)	(0.020)
Publicly Listed Firm	-0.057	-0.056	-0.057	-0.056
	(0.038)	(0.038)	(0.038)	(0.038)
Privatized State Firm	-0.017	-0.017	-0.017	-0.017
	(0.020)	(0.020)	(0.020)	(0.020)
Banking Competition	-0.079	-0.079	-0.079	-0.079
	(0.037)	(0.037)	(0.037)	(0.037)
Country*Sector Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.193	0.193	0.193	0.193
N	6,138	6,138	6,138	6,138

Coefficients are listed in the first row, robust locality*sector clustered standard errors appear in (parentheses).

Appendix 3 Robustness with 2009 bank branches

Dependent variable	Innovation			
	1	2	3	4
Foreign Bank Presence	0.073			
	(0.025)			
Foreign Bank Presence*Foreign Firm		0.095		
		(0.092)		
Foreign Bank Presence*Domestic Firm		0.072		
		(0.026)		
Foreign Bank Presence*Global Competing Firm			0.046	
			(0.065)	
Foreign Bank Presence*Domestic Competing Firm			0.077	
			(0.026)	
Foreign Bank Presence*Exporting Firm				0.077
				(0.040)
Foreign Bank Presence*No Exporting Firm				0.071
				(0.028)
Foreign Firm	0.031	0.019	0.031	0.031
	(0.028)	(0.055)	(0.028)	(0.028)
Global Competing Firm	-0.096	-0.096	-0.079	-0.096
	(0.026)	(0.026)	(0.043)	(0.026)
Exporting Firm	0.157	0.157	0.157	0.154
	(0.017)	(0.017)	(0.017)	(0.030)
Firm Size	0.054	0.054	0.054	0.054
	(0.010)	(0.010)	(0.010)	(0.010)
Audited Firm	0.087	0.087	0.087	0.087
	(0.015)	(0.015)	(0.015)	(0.015)
Female Managed Firm	-0.007	-0.007	-0.007	-0.007
	(0.015)	(0.015)	(0.015)	(0.015)
Sole Proprietorship Firm	-0.009	-0.009	-0.009	-0.009
	(0.019)	(0.019)	(0.019)	(0.019)
Publicly Listed Firm	-0.053	-0.053	-0.053	-0.053
	(0.037)	(0.037)	(0.037)	(0.037)
Privatized State Firm	-0.021	-0.021	-0.021	-0.021
	(0.020)	(0.020)	(0.020)	(0.020)
Banking Competition	-0.081	-0.081	-0.080	-0.081
	(0.036)	(0.036)	(0.036)	(0.036)
Country*Sector Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.171	0.171	0.171	0.171
N	6,138	6,138	6,138	6,138

Coefficients are listed in the first row, robust locality*sector clustered standard errors appear in (parentheses).

Appendix 4 Robustness with firms and bank branches matched by circle with a radius of 5km or 10km

Dependent variable	Innovation							
	5km	10km	5km	10km	5km	10km	5km	10km
	1	2	3	4	5	6	7	8
Foreign Bank Presence	0.049	0.084						
	(0.028)	(0.038)						
Foreign Bank Presence*Foreign Firm			0.027	0.014				
			(0.092)	(0.111)				
Foreign Bank Presence*Domestic Firm			0.060	0.087				
			(0.028)	(0.038)				
Foreign Bank Presence*Global Competing Firm					-0.012	-0.031		
					(0.067)	(0.078)		
Foreign Bank Presence*Domestic Competing Firm					0.067	0.100		
					(0.028)	(0.039)		
Foreign Bank Presence*Exporting Firm							0.078	0.044
							(0.042)	(0.055)
Foreign Bank Presence*No Exporting Firm							0.049	0.101
							(0.030)	(0.041)
Foreign Firm	0.031	0.030	0.039	0.073	0.021	0.030	0.021	0.029
	(0.028)	(0.028)	(0.060)	(0.070)	(0.029)	(0.028)	(0.029)	(0.028)
Global Competing Firm	-0.097	-0.096	-0.105	-0.096	-0.058	-0.015	-0.106	-0.095
	(0.025)	(0.026)	(0.026)	(0.026)	(0.046)	(0.053)	(0.026)	(0.025)
Exporting Firm	0.156	0.157	0.158	0.156	0.158	0.157	0.142	0.191
	(0.017)	(0.017)	(0.016)	(0.017)	(0.016)	(0.017)	(0.030)	(0.037)
Firm Size	0.054	0.054	0.032	0.054	0.032	0.053	0.032	0.054
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Audited Firm	0.086	0.087	0.068	0.087	0.068	0.087	0.068	0.087
	(0.015)	(0.015)	(0.014)	(0.015)	(0.014)	(0.015)	(0.014)	(0.015)
Female Managed Firm	-0.006	-0.007	-0.011	-0.007	-0.010	-0.007	-0.011	-0.007
	(0.015)	(0.015)	(0.014)	(0.015)	(0.014)	(0.015)	(0.014)	(0.015)
Sole Proprietorship Firm	-0.011	-0.011	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
Publicly Listed Firm	-0.052	-0.052	-0.073	-0.052	-0.073	-0.051	-0.074	-0.051
	(0.037)	(0.037)	(0.034)	(0.037)	(0.035)	(0.037)	(0.035)	(0.037)
Privatized State Firm	-0.022	-0.021	-0.026	-0.021	-0.025	-0.020	-0.026	-0.020
	(0.020)	(0.020)	(0.019)	(0.020)	(0.019)	(0.020)	(0.019)	(0.020)
Banking Competition	-0.088	-0.083	-0.058	-0.083	-0.057	-0.082	-0.059	-0.082
	(0.036)	(0.042)	(0.034)	(0.042)	(0.034)	(0.042)	(0.034)	(0.042)
Country*Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.171	0.171	0.143	0.171	0.143	0.171	0.143	0.171
N	6,138	6,138	6,138	6,138	6,138	6,138	6,138	6,138

Coefficients are listed in the first row, robust locality*sector clustered standard errors appear in (parentheses).

Appendix 5 Robustness with city level link between foreign banks and foreign firms

Dependent variable	Share of Foreign Firms: BvD AMADEUS Sample
Foreign Bank Presence	0.018
	(0.026)
Country Fixed Effects	Yes
R-squared	0.347
N of countries	19
N of cities	883
N of firms	120,665

Coefficients are listed in the first row, robust standard errors appear in (parentheses).

Appendix 6 Impact of foreign bank presence on firm financing

Dependent variable	Financing Obstacle	Credit Constrained	Collateral	Interest Rate
	1	2	3	4
Foreign Bank Presence	-0.094	-0.024	-0.040	-0.210
	(0.060)	(0.036)	(0.029)	(0.524)
Foreign Firm	-0.130	-0.014	-0.019	-0.435
	(0.071)	(0.034)	(0.034)	(0.637)
Global Competing Firm	-0.014	0.102	-0.058	-0.963
	(0.064)	(0.032)	(0.032)	(0.643)
Exporting Firm	0.104	-0.110	0.028	-0.139
	(0.042)	(0.022)	(0.021)	(0.413)
Firm Size	-0.047	-0.081	0.048	-0.878
	(0.023)	(0.013)	(0.012)	(0.290)
Audited Firm	0.036	-0.112	0.030	-0.061
	(0.035)	(0.019)	(0.019)	(0.390)
Female Managed Firm	-0.011	0.022	0.009	0.461
	(0.037)	(0.021)	(0.021)	(0.479)
Sole Proprietorship Firm	0.047	-0.027	-0.034	0.885
	(0.050)	(0.031)	(0.032)	(0.693)
Publicly Listed Firm	0.111	-0.046	0.046	1.235
	(0.115)	(0.057)	(0.056)	(0.966)
Privatized State Firm	-0.050	0.008	-0.046	-0.384
	(0.051)	(0.027)	(0.028)	(0.563)
Banking Competition	0.207	0.005	-0.039	-1.861
	(0.089)	(0.048)	(0.051)	(0.616)
Loan Duration			0.001	-0.003
			(0.000)	(0.005)
Loan Collateral				-0.194
				(0.385)
Country Fixed Effects	Yes	Yes	Yes	Yes
Sector Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.056	0.116	0.092	0.386
N	6,197	3,045	2,176	1,796

Coefficients are listed in the first row, robust locality*sector clustered standard errors appear in (parentheses).

Appendix 7 Robustness with firm usage of foreign technology

Dependent variable	Foreign Technology			
	1	2	3	4
Foreign Bank Presence	0.037			
	(0.017)			
Foreign Bank Presence*Foreign Firm		0.049		
		(0.085)		
Foreign Bank Presence*Domestic Firm		0.036		
		(0.018)		
Foreign Bank Presence*Global Competing Firm			0.023	
			(0.051)	
Foreign Bank Presence*Domestic Competing Firm			0.039	
			(0.018)	
Foreign Bank Presence*Exporting Firm				0.012
				(0.033)
Foreign Bank Presence*No Exporting Firm				0.049
				(0.019)
Foreign Firm	0.128	0.121	0.128	0.127
	(0.027)	(0.052)	(0.027)	(0.027)
Global Competing Firm	-0.035	-0.035	-0.026	-0.034
	(0.022)	(0.022)	(0.037)	(0.021)
Exporting Firm	0.078	0.078	0.078	0.098
	(0.013)	(0.013)	(0.013)	(0.023)
Firm Size	0.034	0.034	0.034	0.033
	(0.008)	(0.008)	(0.008)	(0.008)
Audited Firm	0.068	0.068	0.068	0.068
	(0.012)	(0.012)	(0.012)	(0.012)
Female Managed Firm	-0.014	-0.014	-0.014	-0.014
	(0.010)	(0.010)	(0.010)	(0.010)
Sole Proprietorship Firm	-0.017	-0.017	-0.017	-0.017
	(0.014)	(0.014)	(0.014)	(0.014)
Publicly Listed Firm	-0.023	-0.023	-0.023	-0.022
	(0.038)	(0.038)	(0.038)	(0.037)
Privatized State Firm	-0.034	-0.034	-0.034	-0.034
	(0.016)	(0.016)	(0.016)	(0.016)
Banking Competition	-0.063	-0.062	-0.062	-0.062
	(0.023)	(0.023)	(0.023)	(0.023)
Country*Sector Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.073	0.073	0.073	0.073
N	6,197	6,197	6,197	6,197

Coefficients are listed in the first row, robust locality*sector clustered standard errors appear in (parentheses).