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Close competitors? On the causes and consequences of bilateral competition between banks

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Abstract

We interview 361 European bank CEOs to identify their banks' main competitors. We then provide evidence on the drivers of bilateral bank competition, construct a novel competition measure at the locality level, and assess how well it explains variation in firms' credit constraints. We find that banks identify another bank as a main competitor in small-business lending when their branch networks overlap, when both are foreign-owned or relationship-oriented, or when the potential competitor has fewer hierarchical layers. Intense bilateral bank competition increases local credit constraints, especially for small firms, as competition may impede the formation of lending relationships.

Keywords: Bilateral bank competition, multimarket contact, credit constraints

JEL Classification Number: D22, D40, F36, G21

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1 Introduction

The wave of financial deregulation and liberalisation in the decades leading up to the global financial crisis has had a profound (and lasting) effect on banking sectors across the world. In emerging markets especially, the entry of foreign banking groups has made domestic banking sectors more competitive (Claessens, Demirgüç-Kunt and Huizinga, 2001) and more diverse in terms of bank ownership, organisational structure and lending techniques.

Importantly, these developments did not play out evenly within countries but instead resulted in a variegated pattern of bank branches across towns and cities. Localities continue to differ in terms of the number of bank branches present as well as the size, ownership and organisational complexity of the banks these branches belong to. The ability of firms to borrow remains strongly dependent on this local bank-branch variation.[1]

This paper asks to what extent the intensity of bank competition at the local level has a structural impact on small firms' credit constraints. We break new ground by culling hitherto unavailable information on inter-bank competition from 361 face-to-face interviews with the "ultimate bank insiders": their CEOs. This allows us to create a new competition metric that accounts for the fact that the intensity of competition varies significantly across bank pairs.

Our focus is on emerging Europe, a region with substantial variation in local banking competition – both between and within countries. The business landscape also remains heavily dominated by small and medium-sized enterprises (SMEs), which, in the absence of well-developed capital markets, remain dependent on banks for their external funding. This makes the region an ideal testing ground for our purposes.

As the extant literature is largely silent about how banks identify competitors, we start by asking a simple question: Why does bank A regard bank B as a close competitor but not bank C? We use our unique data to gauge which characteristics make a bank more likely to be identified as a key competitor by other banks.

In a second empirical step we then analyse whether such bilateral competition affects credit outcomes at the grassroots level. We conjecture that even if two localities (say, villages or cities) contain the same number of banks with the same market shares, the intensity of local bank competition may still differ between these two localities. If more bank pairs actively compete with each other for certain types of clients, then local competition will be more intense. We therefore ask whether firms that are located near bilaterally competing banks are less or more credit constrained compared with similar firms in localities where banks compete to a lesser extent.

To answer this question we link our data on banks' perceptions of their key competitors to newly collected and comprehensive information about the geographical location of bank branch networks across emerging Europe. We match this information with firm-level data from the fifth round of the European Bank for Reconstruction and Development (EBRD)–World Bank Business Environment and Enterprise Performance Survey (abbreviated as BEEPS V). These combined data allow us to paint a detailed picture of the type of banks that surround each individual firm and to identify, at the local level, the impact of bilateral competition on firms' credit constraints. The richness of our data also allows us to control for a battery of firm, bank and locality covariates.

To preview our results, we find that banks are more likely to identify other banks as key competitors when their branch networks overlap more at the extensive and intensive margins

[1] See, for instance, Canales and Nanda (2012) for evidence from Mexico, and Popov and Udell (2012) and Beck, Degryse, De Haas and Van Horen (2018) for evidence from emerging Europe.

and when the potential competitor has fewer hierarchical layers or is foreign-owned. In the market for SME lending (but not in the corporate lending market) relationship lenders also compete more intensively with each other than transaction lenders do. We then show that more intense bilateral bank competition at the locality level actually increases small firms' credit constraints. We interpret these striking findings to indicate that local bank competition can impede the formation of long-term lending relationships with such firms.

Our paper contributes to three main strands of the literature. First, we add to the work on the relation between bank competition and credit availability. This literature has long been characterised by two opposing views.

On the one hand, there is theory – the market-efficiency view, cf. Pagano (1993) – as well as evidence to suggest that bank competition alleviates credit constraints as more loans become available at better terms.[2] This in turn positively influences local economic growth (Guiso, Sapienza and Zingales, 2004; Benfratello, Schiantarelli and Sembenelli, 2008; Amore, Schneider and Žaldokas, 2013).

On the other hand, other contributions suggest that *less* bank competition may benefit firms, especially more opaque ones, as market power allows banks to forge long-term lending relationships (Petersen and Rajan, 1994; Berger and Udell, 1995; Ongena and Smith, 2001). Petersen and Rajan (1995) show theoretically how, in a concentrated banking market, lenders subsidise early loans by extracting rents from later ones. Banks will only be willing to assist firms in the beginning of a relationship if these firms can credibly commit to not leaving the bank in the future. This will be impossible in highly competitive markets, thus ruling out the intertemporal smoothing of interest rates that is needed to give opaque borrowers a chance.

A small branch of this literature suggests that even in a relationship-lending setting more competition may ease access to credit (Booth and Thakor, 2000). If competition incentivises banks to invest more in generating "soft" (that is, non-codified) information about borrowers, then it may benefit small and opaque firms in particular (Dell'Ariccia and Marquez, 2004; Hauswald and Marquez, 2006). Empirically, Elsas (2005) and Degryse and Ongena (2007) find that firms indeed enjoy stronger credit relationships in more competitive markets.

Some attempts have been made to reconcile both opposing views. Bonacorsi di Patti and Dell'Ariccia (2004) use Italian data to show that while bank market power boosts firm creation, in particular in opaque industries, additional market power starts to have a negative impact on firm creation at some point. Likewise, Cetorelli and Gambera (2001) – in a cross-country, industry-level dataset – show that bank concentration promotes the growth of sectors that depend on external finance. Yet, *overall* there is a negative association between banking-industry concentration and economic growth.

Most of these studies use single-country datasets, employ relatively crude measures of bank competition or concentration (such as a Herfindahl-Hirschman Index, HHI) or follow a reduced-form approach where local financial deregulation is linked directly to outcomes such as business formation (that is, without measuring the intermediate step of inter-bank competition). Our contribution is to ask bank CEOs to reveal their closest competitors in different market segments and to use this information to create a new measure of the intensity of bank competition as perceived by banks themselves. We then horse race this new competition metric at the locality level (and across 20 countries) against more conventional measures. We show that our bilateral bank competition measure has substantial explanatory

[2] See Beck, Demirgüç-Kunt and Maksimovic (2004), Black and Strahan (2002), Carbó-Valverde, Rodriguez-Fernandez and Udell (2009), Cetorelli and Strahan (2006), and Jayaratne and Strahan (1996).

power over and beyond a regular HHI. Both measures, however, point in the same direction: local competition can be harmful to small firms' access to credit.

Second, we contribute to the literature on multimarket contact in banking. Banks that compete in multiple markets may fear that aggressive competition in one area may lead to retaliation elsewhere, thus making them cautious to compete (Heggestad and Rhoades, 1978).[3] However, if inter-bank collusion and mutual forbearance (Edwards, 1955) is difficult to achieve in practice, then multimarket contact may well result in more intense competition (Solomon, 1970; Park and Pennacchi, 2009). Mester (1987) shows that when high bank concentration is accompanied by multimarket contact, banks behave more competitively compared with a situation without multimarket contact.

Our contribution here is threefold. First, we use our cross-country data on the geographical location of bank branches to construct multimarket contact measures at both the intensive and extensive margins. Second, we improve on previous studies by linking these measures to our direct (interview-based) measures of inter-bank rivalry. Much of the previous literature has been plagued by the difficulty of deriving adequate proxies for the unobservable degree of rivalry in local credit markets and authors have typically resorted to indirect proxies such as the stability of dominant banks' market shares or their profit levels. Third, to the best of our knowledge, we are the first to then use these multimarket contact measures and the related bilateral competition variables to explain local variation in credit constraints.

Third, we contribute to a growing literature on the relation between the type of banks that operate locally and firms' access to credit. Berger, Miller, Petersen, Rajan and Stein (2005) find for the United States that decentralised banks, whose branches have greater lending autonomy and collect more soft information, lend more to nearby small firms. Using Mexican data, Canales and Nanda (2012) show that this willingness of decentralised banks to lend to small firms can be conditional on local banking competition. If the local market is uncompetitive, decentralised banks may actually abuse their market power and restrict credit. Relatedly, Presbitero and Zazzaro (2011) find for Italy that when local markets are dominated by decentralised banks, stronger inter-bank competition promotes relationship lending.

While we also investigate how bank organisation shapes banking competition, we take a different empirical approach. Rather than using interactions between concentration measures and local proxies for bank hierarchy, we measure directly how bank hierarchy, size and ownership affect competition at the bank-pair level. We then assess how such enhanced measures of local competition intensity affect firms' access to credit.

A few related papers focus, like us, on emerging Europe. Popov and Udell (2012) show how, during the global financial crisis, firms in localities with financially weaker foreign banks had greater difficulty in accessing credit. Ongena, Popov and Udell (2013) find that such foreign banks have looser lending standards when regulation in their home country is stricter. Lastly, Beck, Degryse, De Haas and Van Horen (2018) show that the local presence of relationship lenders eases firms' access to credit during an economic downturn. Our contribution is to assess how bilateral inter-bank rivalry affects firms' access to credit in localities throughout emerging Europe.

We proceed as follows. The next section describes the different data sources we combine, after which section 3 presents our methodology. Sections 4 and 5 then discuss our empirical results and several robustness tests, respectively. Section 6 concludes.

[3] See Bernheim and Whinston (1990) for a theoretical discussion of how multimarket contact leads to collusion and Evans and Kessides (1994) for evidence from the US airline industry.

2 Data

In this section we introduce the data components we combine to determine the drivers of bilateral bank competition and to subsequently gauge the impact of bank competition on firms' credit constraints. Our identification rests on joining three key pieces of information: data on the intensity of bilateral bank competition; data on the bank branches that surround individual firms; and data on these firms' credit constraints.

2.1 Bank variables

We create bank variables at the bank level, bank-pair level and locality level. Table 1 and Appendix Table A1 provide summary statistics and definitions, respectively, while Appendix Table A2 provides a correlation matrix. Throughout the paper we define bank *i* in pair *ij* as the bank that perceives bank *j* as a core competitor or not.

2.1.1 Bank-level variables

We start by measuring for each bank the average number of branches (from *all* banks in country *k* except for bank *i* itself) within a circle with a 5 km radius around a branch of bank *i*. We call this variable *Local branch density* and use it as a control throughout our analysis. In addition, for each potential competitor bank *j* we determine its *Capitalisation* (equity over total assets, 2011), use of *Wholesale* funding (loans over customer deposits, 2011) and its net *Interest margin* in 2011.[4] We expect that banks that are better capitalised, that have easier access to wholesale funding, and that operate with a tighter interest margin are more likely to be perceived as key competitors.

2.1.2 Bank-pair level variables

We generate for each country a set of all possible bank pairs. This yields almost 15,000 bank-pair observations (two banks yield two pairs as bank *i* can identify bank *j* as a competitor and vice versa). We then create for each bank pair *ij* in country *k* an indicator of whether bank *i* regards bank *j* as one of its three main competitors as well as an indicator of whether, conversely, bank *j* regards bank *i* as a key competitor (*Reciprocal competition*). We construct separate variables for competition in lending to SMEs (<250 employees) and to corporate firms (≥250 employees).

To create these variables, we turn to the second Banking Environment and Performance Survey (known as BEPS II) undertaken by the EBRD and Tilburg University.[5] As part of BEPS II a common questionnaire in either English or the local language was administered during a face-to-face interview with 361 bank CEOs. The interviews were carried out by a specialised team of senior financial consultants, each with considerable first-hand banking experience. The interviewed banks represent 61.8 per cent of all bank assets in our country sample.

Banks were asked to divulge the identity of their three main competitors for SME lending, lending to corporate clients, retail lending and retail deposits.

We asked: "We would now like to ask you a perhaps somewhat sensitive question. We would like to reiterate that your responses will be treated as highly confidential and will only be

[4] Only 5 per cent of all banks in our sample are currently state-owned. We investigated the role of state ownership but did not find any statistically significant evidence that state-owned domestic banks were perceived differently from privately owned domestic banks.

[5] https://www.ebrd.com/what-we-do/economics/data/banking-environment-and-performance-survey.html.

used in an aggregate and anonymized format. […] What are the names of your three main bank competitors (in order of decreasing importance) in each of the following market segments (SME credit, large enterprise credit, retail credit, retail deposit)."

The summary statistics in Table 1 show that in 6 per cent of all the bank pairs in our dataset, a bank identifies the other bank as a close competitor. This holds for both the SME and the corporate segment.

As potential determinants of bilateral competition, we first create two geographic multimarket contact measures: *Intensive branch overlap* and *Extensive branch overlap*. Around each branch of bank *i* we draw a circle with a 5 km radius and then count the number of branches of bank *j* within that circle. We calculate an average value for bank *i* and define this as the intensive branch overlap between bank *i* and bank *j*. The average bank in our data set is surrounded by just over four branches of any other bank in that country. We also measure the proportion of branches of bank *i* that have at least one branch of bank *j* within a 5 km circle. We define this ratio as the extensive branch overlap. For the average bank pair, about half of all branches of bank *i* are surrounded by at least one branch of bank *j*.

Next, we create variables to characterise the bank types in each pair. An advantage of our survey data is that we can measure a number of distinct bank characteristics. Earlier literature has often used proxy measures or assumptions to categorise banks. For instance, in the models of Park and Pennacchi (2009) large multimarket banks are assumed to use standardised lending techniques, set interest rates uniformly across markets, and have access to wholesale funding. We disentangle these and related bank characteristics (size, ownership, funding structure, lending technique and hierarchy) empirically and see which ones matter most in terms of fuelling competition. This is useful because some of the "bank stereotypes" used in earlier work – such as that only small and domestic banks are relationship lenders that can serve SMEs – are increasingly being questioned (Berger and Udell, 2006).

We first categorise banks as *Small* or *Large* depending on whether their number of branches is below or above the median in country *k*. The existing literature suggests that small banks have a comparative advantage in lending to small and informationally opaque firms while large banks have a comparative advantage in lending to large and more transparent firms (Cole, Goldberg and White, 2004; Berger et al., 2005).

We also classify each bank as either *Foreign* (at least half of its equity is in foreign hands) or *Domestic* to analyse whether banks themselves perceive certain types of ownership as more threatening than others. A substantial literature has developed on banks' comparative advantages in lending to certain clients and our data allow us to test some of the conjectures put forward in this literature in a novel way.

Some earlier contributions put forward the idea that domestic banks possess a comparative advantage in reducing information asymmetries vis-à-vis local firms (Mian, 2006). In this view, domestic banks tend to have a deep understanding of local businesses and base their lending decisions on "soft" qualitative information on these firms (Berger and Udell, 1995, 2002; Petersen and Rajan, 2002).

In contrast, foreign banks may have difficulties in processing soft information and therefore grant loans on a transaction-by-transaction basis using standardised decision methodologies (Berger, Klapper and Udell, 2001).

Yet, more recent contributions argue that foreign banks may successfully apply transaction technologies that use hard information, such as credit scoring, to lend to SMEs without the need to develop relationships to extract soft information (Berger and Udell, 2006).

Using these variables we create bank-pair variables that indicate whether both banks are small (*Small i – Small j*) or large (*Large i –bank j*). This is the case in 13 and 36 per cent of the bank pairs, respectively. All other pairs are mixed-size combinations. We follow the same procedure for bank ownership: *Foreign i – Foreign j* and *Domestic i – Domestic j*. In about a third (fifth) of all bank pairs both banks are foreign (domestic). The other bank pairs are of opposing ownership type.

Next, we create a variable that indicates whether bank *j* is a relatively efficient lender to SMEs in comparison to bank *i* (we create an analogous variable for lending to large firms). In particular, we measure whether at bank *j* loan applications have to proceed through fewer hierarchical levels than in bank *i*. We use BEPS II question 4: "For first-time SME customers, how many hierarchical layers are typically involved in making a lending decision? By hierarchical layer we mean an organisational hurdle that needs to be crossed in order to get a loan approved. That is, in each decision-making layer there is at least one person that can veto a loan application."

The existing literature suggests that decentralised banks deal more effectively with soft information while centralised, hierarchical banks use hard information that is easy to transmit across hierarchical levels. Less hierarchical banks then have a comparative advantage with respect to lending to information-intensive borrowers (Berger and Udell, 2002; Stein, 2002).

There exists substantial variation between banks in their hierarchical efficiency. At some banks, SME loan applications only need to pass one decision stage whereas at others this can be as many as seven. Variation across countries is substantial too and ranges from an average of 1.9 hierarchical layers involved in SME loan approvals in the Czech Republic to 3.4 in Albania. We define *Hierarchical efficiency* as a dummy that is 1 if applications have to proceed through fewer hierarchical levels in bank *j* than in bank *i*. In about a third of all bank pairs the potential competitor *j* has fewer hierarchical approval levels than bank *i*. We expect that especially for SME lending, bank *i* will regard bank *j* as a core competitor if bank *j* is able to process loan applications through fewer hierarchical layers than bank *i* itself.

Next, we distinguish between banks on the basis of their main lending technology. Earlier work shows that relationship lending – repeatedly interacting with clients to obtain and exploit proprietary borrower information (Boot, 2000) – enables banks to learn about borrowers' creditworthiness and to adapt lending terms accordingly (Rajan, 1992; von Thadden, 1995; Boot, 2000). In contrast, transaction-based lending relies more on the collection and processing of hard information about relatively transparent borrowers.

We follow Beck, Degryse, De Haas and Van Horen (2018) and use BEPS II question 6, which asked CEOs to rate on a five-point scale the importance (frequency of use) of the following techniques when dealing with SMEs: relationship lending; fundamental and cash-flow analysis; business collateral; and personal collateral (personal assets pledged by the entrepreneur). Although, as expected, almost all banks find building a relationship (knowledge of the client) of some importance to their lending, about 60 per cent of the banks in the sample find building a relationship "very important", while the rest considers it only "important" or "neither important nor unimportant". A similar question was asked about banks' lending techniques for large corporate clients.

We categorise the banks that think that "building a client relationship" as very important as relationship lenders and all banks that consider "fundamental and cash-flow analysis" to be very important as transaction lenders.[6] Using this information, we create dummies for each

[6] Interestingly, among both domestic and foreign banks in our dataset there are large proportions of banks that identify themselves as relationship lenders. While 45 per cent of the domestic banks see themselves as

bank pair that indicate whether both are relationship lenders (*Relation i – Relation j*) or transaction lenders (*Transaction i – Transaction j*).[7] In the market for SME lending, 45 (12) per cent of the bank pairs consist of two relationship (transaction) lenders. The other pairs consist of banks with different lending techniques.

Lastly, a separate variable – *Customer overlap* – indicates whether *both* banks lend to SMEs (or to large firms). This is the case in 86 (80) per cent of our bank pairs.

2.1.3 Locality-level bank variables

After identifying the individual bank branches that surround each sample firm (see section 2.2. below), we create variables that measure key characteristics of these banks at the locality level. All of these locality-level bank variables are averages weighted by the number of branches that each bank operates in the locality.

The main variable here is *Bilateral competition*, the number of bank pairs where bank *i* perceived bank *j* as one of its three main competitors in SME (large firm) lending divided by the total number of possible bank *i*-bank *j* pairs in the locality. On average 30 (25) per cent of the branch pairs in a locality consist of banks that identify each other (at least in one direction) as a key competitor in the SME (large firm) market. Yet, variation is substantial as this percentage varies between 0 and 100 per cent.

Chart 1 shows a heat map of the intensity of local bank competition for SMEs in all localities where at least one BEEPS firm is based. Darker colors indicate a higher proportion of branch pairs owned by competing banks. There is substantial variation both between and *within* countries. The latter is the cross-locality variation that we exploit to test whether bank competition alleviates credit constraints.

We also create several other locality-level bank and concentration/competition measures. *Capitalisation* measures the average equity/assets ratio of the banks in a locality (as in Popov and Udell, 2012). *HHI*, is a Herfindahl-Hirschman Index as a measure of bank concentration where market shares are expressed as the number of branches in a locality.[8] We also calculate a local Lerner (1934) index.[9] We use annual bank-level data to estimate a translog cost function and calculate the marginal costs equation by taking its derivative. We then calculate the Lerner index for each bank and take a branch-weighted average for each locality. Higher values indicate higher markups and thus lower competition.

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relationship banks, this percentage is higher among foreign banks (64 per cent). At first sight, this goes somewhat against the common wisdom that portrays foreign banks as transaction lenders (for instance, Mian, 2006; and Beck, Ioannidou and Schäfer, 2016) in particular when foreign banks focus on a niche of large blue-chip companies. However, the role of foreign banks in our broad country sample is much more extensive and balanced than in some of the developing countries the earlier literature has focused on.

[7] Beck, Degryse, De Haas and Van Horen (2018) use credit registry data to show that when CEOs consider relationship lending to be very important, according to BEPS II, this is indeed reflected in the lending practices of their bank.

[8] We define the HHI as $\sum_{k=1}^{K_i}\left(\#branch_k / \sum_{k=1}^{K_i} \#branch_k\right)^2$ where K_i is the number of banks in locality *i* where a BEEPS firm is located. Instead of using deposit or credit market shares to calculate the HHI, we follow Degryse and Ongena (2007) and use branch market shares as a neutral benchmark for the local importance of a bank. Concentration is a measure of market structure rather than market conduct. Yet, the structure-conduct-performance paradigm suggests that concentration ratios are a good (inverse) proxy for market competitiveness (Bain, 1951) and measures like the HHI have therefore been widely used as an inverse competition measure in banking research. However, Claessens and Laeven (2004) do not find evidence for the expected inverse relationship between concentration and competition.

[9] We rely on the original Lerner index. For a discussion see Koetter, Kolari and Spierdijk (2012).

Lastly, *Bank density* measures the number of banks per square km within a 5 km radius around the firm. *Branch density* does the same for the number of bank branches. We note that in Appendix Table A2 *Bilateral competition* is negatively correlated with *Branch density*. This is not entirely surprising. Indeed, in many countries there are a number of "key banks" that are present in most localities and these banks often directly compete which each other. Now, in some localities, in particular in larger cities, there are also other smaller banks present. What the negative correlation between *Bilateral competition* and *Branch density* shows is that when more and more banks are added to the key bank set, density increases but competition does not increase as much.[10] In fact, if the smaller banks that are added to the key bank set compete less with each other (and with those banks), then *Bilateral competition* increases only slowly (if at all) because the numerator does not increase as much as the number of bank pairs in the denominator. This may yield a negative correlation between competition and density.

In other words, while branch density may be a good measure of the depth of the local banking sector, it may not be the best proxy for local competition. It overestimates actual competition by assuming that each additional bank that is added locally competes as intensively as the omnipresent key banks. But in fact, what our unique data suggest is that these smaller banks are often niche players that are relatively rarely identified as competitors by key banks and that rarely identify those key banks as their main competitors.

2.2 Bank branch networks

A crucial step in our data construction is to collect information on the bank branches in the vicinity of each firm. This information was collected as part of BEPS II. A team of consultants with extensive banking experience was hired to hand-collect these data. Information was gathered by either directly contacting the banks or by downloading data from bank websites and subsequently double-checking them with the bank. In some countries the central bank was able to provide current as well as historical geo-coordinates for all bank branches. We cross-check all data with the (more limited) information available in the SNL Financial database. Our data provide us with a near complete picture of the branching landscape in 2011, the year before the firm survey took place. The firm and branch data thus match closely in terms of timing.

Our dataset contains the geo-coordinates of 56,488 branches operated by 692 banks in 20 countries (that is, including the branches of 361 banks whose CEOs were interviewed as part of BEPS II). These banks represent 77.1 per cent of all bank assets in these 20 countries.[11] We merge this information with two other datasets: Bureau Van Dijk's BankScope, to get balance sheet and income statement data for each of these banks, and the Claessens and Van Horen (2014) database on bank ownership. Appendix Table A3 gives an overview of the number of banks and branches by country as well as several basic characteristics of these countries and their banking systems.

We connect the firm and branch data in two ways. First, we make sure that the names of localities (cities and towns) are spelled consistently in both datasets and then match firms and branches by locality. For instance, we link all BEEPS firms in the Czech city of Brno to all bank branches in Brno.[12] The (plausible) assumption is that a firm has access to all branches

[10] All the main estimates we report below are qualitatively unaffected if we exclude 25, 50 and 75 per cent of all cities, by their number of branches (few to many).
[11] Unweighted country average. Total bank assets as taken from BankScope.
[12] Only very few firms are based in a locality without any bank branches. We link these firms to the branches in the nearest locality. Excluding them from the analysis does not affect any of our results.

in the locality where it is incorporated. Second, we draw circles with a radius of 5 or 10 km around the geo-coordinates of each firm and link the firm to only those branches inside that circle.[13] On average, a locality in our dataset contains 21 bank branches whereas a circle with a 5 (10) km radius contains 18 (30) branches. This reflects that most of the localities in our dataset are relatively large towns and cities. For instance, the second largest city of the Czech Republic, Brno, covers an area of 230 km^2. This exceeds the surface of a 5 km circle (79 km^2) but is smaller than the surface of a 10 km circle (314 km^2). Consequently, the typical number of branches in our localities lies somewhere between that of a 5 km circle and that of a 10 km circle. In our analysis we use the locality variables but all results hold when using the alternative (circle) measures of spatial firm-bank closeness (see section 5 for related robustness tests).

2.3 Firm data: credit constraints and covariates

Recall that we use the fifth round of the EBRD-World Bank Business Environment and Enterprise Performance Survey (BEEPS), conducted in 2012, to measure credit constraints among almost 8,000 firms across 20 countries in central and eastern Europe and the Caucasus. Appendix Table A3 provides a country list and Chart 1 depicts the localities where the BEEPS V firms are located.

As part of BEEPS V, face-to-face interviews were held with the owner or main manager of each firm. The purpose of the survey was to gauge the extent to which different features of the business environment (including access to finance) posed obstacles to firms' operations. The survey also records a large number of firm characteristics including, importantly, its geographical location. Firms were selected using random sampling with three stratification levels to ensure representativeness across industry, firm size and region. Due to stratification the sample includes firms from all main non-agricultural sectors, allowing us to use sector fixed effects in our regression framework.

By combining answers to various questions, we first distinguish between firms that needed a loan and those that did not have a demand for credit. About half of all firm managers indicated that during the past year they were in need of a bank loan (Table 1). Among the former, we then identify firms that were credit constrained: those that were either discouraged from applying for a loan or were rejected when they applied (Cox and Jappelli, 1993; Duca and Rosenthal, 1993).[14] In particular, we follow Popov and Udell (2012) and use BEEPS question K16: "Did the establishment apply for any loans or lines of credit in the last fiscal year?" For firms that answered "No", we move to question K17, which asks: "What was the main reason the establishment did not apply for any line of credit or loan in the last fiscal year". 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 classify firms that answered "No need for a loan" to K17 as unconstrained, and as credit constrained if they either answered "Yes" to K18a or answered "Interest rates are not favourable"; "Collateral requirements are too high"; "Size of loan and maturity are insufficient"; or "Did not think it would be approved" to K17. This strategy allows us to

[13] According to the president of the Italian Bankers' Association, "the banker's rule of thumb is to never lend to a client located more than three miles from his office" (quoted in Guiso, Sapienza and Zingales, 2004). The extant empirical evidence from Belgium, the United States and Italy, for example, is consistent with this "rule" (Petersen and Rajan, 2002; Degryse and Ongena, 2005; Alessandrini, Presbitero and Alberto Zazzaro, 2009).

[14] Several recent papers use firm-survey data and rely on self-reported credit constraints (Beck, Demirgüc-Kunt and Maksimovic, 2005) or combine information on actual financing patterns with demand for external finance (for example, Brown, Ongena, Popov and Yeşin, 2011; Popov and Udell, 2012). Our paper falls into the latter category.

differentiate between firms that did not apply for a loan because they did not need one and those that did not apply because they were discouraged (but actually needed a loan).

The summary statistics in Table 1 indicate that 37 per cent of the firms were credit constrained in 2012. Behind this average lies substantial variation across and within countries. For instance, while in Slovenia only 27.3 per cent of all firms were credit constrained, this percentage was substantially higher, at 58.9 per cent, in Ukraine.

We also use BEEPS V to create firm-level dummy variables that we include as covariates throughout our empirical analysis. These are firm size (*Large firm* – distinguishing between firms with fewer or more than 100 employees); whether a firm is publicly listed (*Public firm*); is a sole *Proprietorship*; is an *Exporter*; whether a firm's financial statements are *Audited* by an external auditor; and whether it has above-median age (*Mature firm*). We expect that larger, publicly listed, older, exporting and audited firms – all transparency proxies that should be inversely related to information asymmetries – face fewer credit constraints.

3 Methodology

3.1 Determinants of bilateral bank competition

In the first step of our analysis, we use our bank-pair data to gauge to what extent multimarket contact and other bank characteristics explain who banks identify as their main competitors. Consider the following specification of a sample-weighted probit model:

$$Competitor_{ijk} = \alpha_1 + \beta_1 Overlap_{ijk} + \beta_2 B_{ik} + \beta_3 BB_{jk} + \beta_4 P_{ijk} + \varphi_k + \epsilon_{ijk} \quad (1)$$

where subscripts *i* and *j* denote the banks in pair *ij* and *k* indicates the country. *Competitor* is a dummy variable that indicates whether bank *i* regards bank *j* as one of its three main competitors. We correct for the fact that in countries with more banks the "base" probability that any particular bank is identified as a key competitor is lower for all banks in that country by weighing the dependent variable by the number of banks in each country. *Overlap* includes our two multimarket contact measures: *Intensive branch overlap* and *Extensive branch overlap*. *B* (*BB*) is a matrix of bank *i* (*j*) variables including *Local branch density*, *Foreign*, *Capitalisation*, *Wholesale* and *Interest margin*. *P* is a matrix of bank-pair variables and includes dummies that are one if both banks are small, large, domestic or foreign; a *Reciprocal competition* dummy variable that is 1 if the two banks identify each other as a main competitor; a *Customer overlap* dummy that is 1 if both banks lend to SMEs; and our *Hierarchical efficiency* measure. φ_k is a vector of country fixed effects and ϵ_{ijk} is the error term. Robust standard errors are clustered by country.

3.2 Local bank competition and access to credit

In the second step of our empirical analysis, we estimate the relation between the share of actively competing banks in the vicinity of a firm and the probability that the firm is credit constrained. This empirical strategy relies on the location of banks and enterprises being independent of each other. Following Berger, Miller, Petersen, Rajan and Stein (2005), we assume that the banking landscape near firms imposes an exogenous geographical limitation on the banks that firms have access to. We estimate the following baseline model:

$$Y_{ijkl} = \beta_1 X_{ijkl} + \beta_2 L_{jk} + \beta_3 BilateralCompetition_{jk} + \beta_4 D_k + \beta_5 D_l + \varepsilon_{ijkl} \quad (2)$$

where Y_{ijkl} is a dummy variable equal to 1 if firm *i* in locality *j* of country *k* in industry *l* is credit constrained (rejected or discouraged, see section 2.3) and 0 otherwise. X_{ijkl} is a matrix of firm covariates to control for observable firm-level heterogeneity: *Large firm*, *Public firm*; *Proprietorship*; *Private at start*; *Exporter*; *Audited firm* and *Mature firm*. L_{jk} is a matrix of bank characteristics in locality *j* of country *k*, in particular bank solvency (*Capitalisation*). We further saturate the model with country and industry fixed effects, D_k and D_l, with the latter defined at the ISIC Rev 3.1 2-digit level, to absorb all (un)observable variation at these aggregation levels.

Our main independent variable of interest is *Bilateral competition*$_{jk}$, the share of bank branches in locality *j* of country *k* that belong to banks that have identified another bank in

the locality as a core competitor. We are interested in $\beta_{3,}$ which can be interpreted as the impact of the intensity of local bank competition on firms' credit constraints.

We create two main versions of *Bilateral competition*$_{jk}$. First, we use all the information we have on bilateral competition in a locality. For instance, suppose three banks are located in a town. Each of these banks then forms a pair with the two, meaning there are six bank pairs in total. For each of these we can in principle determine whether bank *i* identifies bank *j* as a key competitor. However, because not all banks were surveyed as part of BEPS II, we may only have information on the competitor perceptions for two out of three banks. Our first bilateral competition measure then takes the proportion of the four bank pairs formed by these two surveyed banks in which bank *i* identified bank *j* as a main competitor (the latter may have participated in BEPS II or not). In the second version, *Bilateral competition: augmented*, we use our data to estimate a probit model in which we predict for all banks (whether we observe their competitor choice or not) whom they regard as their key competitors.[15] We then use these predicted values as our bilateral competition variable (while bootstrapping the standard errors). We also calculate versions of *Bilateral competition: augmented* where we weigh with the number of branches of either bank *i* ("perceiver") or bank *j* ("perceived").

[15] This prediction is based on column 2 of Table 2 but we obtain very similar results when using any of the other specifications in this table. We focus on the more parsimonious model because it uses relatively easily observable variables and is therefore straightforward to implement and replicate in other contexts.

4 Results

4.1 Determinants of bilateral bank competition

Table 2 presents our results on the determinants of whether a bank is perceived as a major competitor by other banks or not. We limit ourselves here to inter-bank competition in the market for SME lending. In column (1) we show our most parsimonious specification that focuses on the impact of multimarket contact on competition. We then add explanatory variables in the subsequent columns. All columns present probit regressions except for column (10) which shows a conditional logit model with bank *i* fixed effects. The tabulated values represent marginal effects except for column (10).

Several bank and bank-pair characteristics are strong and robust determinants of bank competitor status across all specifications. First, we find – contrary to the mutual-forbearance hypothesis but in line with Mester (1987) – that multimarket contact has a substantial and statistically significant positive impact on the likelihood that a bank is perceived as a competitor. This holds both for branch overlap at the extensive and intensive margin. Recall that in all regressions we control for the overall number of branches that surround the average bank *i* branch (*Local branch density*). Based on column (1) of Table 2, our results imply that a one standard deviation increase in (log) intensive branch overlap is accompanied by a 4.2 per cent higher likelihood of bank *i* identifying bank *j* as a main competitor. This number is also 4.4 per cent for a standard deviation increase in the extensive branch overlap. This finding is very robust and also holds in column (10) where we include bank *i* fixed effects. Here we compare all bank pairs that bank *i* forms to gauge whether it identifies banks with more branch overlap more often as competitors. This turns out to be the case.

Second, we find that bank size – in and of itself – has no first-order impact on whether banks perceive each other as core competitors in the market for SME lending. Compared with mixed-size bank pairs, we do not find that small banks are more likely to regard other small banks as key competitors. The same holds for large banks, although in some specifications there is a marginally significant positive coefficient for the *Large i – Large j* variable, suggesting that competition for SME clients may in fact be slightly tighter among large banks. This result is not robust, however, to the inclusion of bank *i* fixed effects in column (10). Moreover, the results in column (4) suggest that the weak effect of size is in fact driven by a bank's use of wholesale funding. It is the access of (larger) banks to wholesale funding that makes them more serious competitors rather than their size per se. In short, the market for SME lending does not seem to be primarily segmented by bank size.

Interestingly, we find a much more robust role for bank ownership. In particular, foreign banks identify other foreign banks as key competitors in the SME market and this holds when controlling for bank size. The *Foreign i-Foreign j* dummy variable remains precisely estimated, and actually increases in size, when controlling for a number of bank balance sheet characteristics in column (4). This suggests that foreign banks regard each other as important competitors not just because of their balance sheet (and easy access to wholesale funding) but because of their ownership structure per se (and the related benefits such as access to stronger risk management and other organizational strengths). In contrast, domestic banks are less likely to be regarded as close competitors, although the related coefficient is only statistically significant in column (10) where we include bank *i* fixed effects.

In columns (5) to (10), we add a number of other important bilateral bank variables. First note that in all cases the results for foreign ownership continue to hold. But even when controlling for bank size and bank ownership, the additional variables show that there are further

important drivers of bilateral bank competition. In particular, in column (5) we show that competition is typically a reciprocal process. A bank is 2.8 per cent more likely to identify another bank as a competitor if that other bank in turn points out the bank as a competitor. In column (6) we include a control dummy variable that is 1 if both banks have indicated that they are active lenders in the SME segment. We do this because a small number of banks mentioned they were not active in the SME segment. As expected, the estimated coefficient for this variable is statistically significant and positive.

Perhaps more interestingly, in column (7) we add our *Hierarchical efficiency* variable. As expected the coefficient is positive, meaning that if the potential competitor bank operates relatively streamlined SME loan-application procedures, it is perceived to be a more formidable competitor (this holds even when controlling for bank size and branch overlap). If bank *j* has less approval layers than bank *i*, this increases the chance that the less efficient bank *i* regards the more efficient bank *j* as a competitor by 3.5 per cent.

In column (8), we add two variables to distinguish between banks with different types of lending techniques. In particular, we include dummies that are 1 if both banks identify as transaction lenders or both as relationship lenders. We find that while relationship lenders are more likely to compete with each other for SME clients, transaction lenders are less likely to compete with each other for such clients. When both banks are relationship (transaction) lenders, the probability that they regard each other as a main competitor is 2.8 per cent higher (3.2 per cent lower) than when bank pairs use different lending techniques. This result is in line with earlier studies that suggest that relationship lending techniques are more appropriate when lending to relatively opaque SME clients.[16] We show that by using such techniques banks indeed become more credible competitors in the market for SME lending. An important question is whether this competition among relationship lenders also affects access to credit for SMEs, a question to which we return in section 4.2.

Lastly, in columns (9) and (10), we add the variables on lending techniques and hierarchical levels (as well as the size and ownership variables). We find that both variables continue to be empirically relevant. This implies that conditional on certain lending techniques being used, a bank is more likely to be considered an important competitor if that bank operates with fewer hierarchical layers. That is, lending efficiency matters for both relationship and transaction lenders.

In Table 3 we show analogous regression specifications for lending to corporate firms (defined as companies with at least 250 employees). We now use information about which banks are identified as the main competitors in the corporate rather than the SME segment. We find that the determinants of bilateral banking competition are very similar in both markets, with two important exceptions. First, in corporate lending there is no evidence that the number of hierarchical layers has any impact on being perceived as a key competitor. This reflects that the between-bank variation in the number of hierarchical layers involved in corporate lending is smaller when compared with SME lending. Moreover, information on large clients tends to be less "soft" and therefore more easily transferable across hierarchical layers within a bank.

Second, relationship lenders do not see each other as strong competitors when lending to corporate clients. This again indicates that relationship lending is mostly used to reach out to SME rather than corporate clients.

[16] See Kysucky and Norden (2016) for a recent overview of this literature.

4.2 Bilateral bank competition and firms' credit constraints

In Table 4 we move on to our regression framework at the firm level. We aim to establish whether more intense bilateral competition among the banks that surround a firm facilitates this firm's access to credit. We are particularly interested to find out whether our *Bilateral competition* measure has anything to say about local competitive conditions over and above the effect of "traditional" concentration and competition measures such as the *HHI*, *Branch* and *Bank density* measures and the *Lerner index*.

The dependent variable is *Credit constrained* and the first four columns include our measure of locality-level bilateral bank competition while controlling for a battery of firm covariates as well as industry and country fixed effects. Throughout this and all other firm-level tables, we also control for *Capitalisation*, which measures the average equity/assets ratio of all banks in a locality. Popov and Udell (2012) found for the same region that during the early stages of the global financial crisis, firms were more likely to be credit constrained in localities where (foreign) banks were less well capitalised. We also find in most specifications the expected negative coefficient between bank capitalisation and credit constraints but the effect is never precisely estimated. This suggests that several years after the crisis, when most banks had had the chance to recapitalise, between-locality variation in balance-sheet strength was no longer a first-order determinant of local access to credit.

Column (1) includes the basic *Bilateral competition* measure whereas columns (2) to (4) use the variants where we use predicted values for bilateral bank competition based on column (2) of Table 2. We find a strong, statistically significant and positive relationship between bilateral bank competition at the locality level, using any of our new metrics, and the likelihood that SMEs are credit constrained.

Next, in columns (5) to (8) we use more traditional competition metrics at the locality level: the *HHI* (column 5), *Branch density* (column 6), *bank density* (column 7) and a *Lerner index* (column 8). We find that, when included on their own, the *HHI* and the *Lerner index* – commonly used measures of concentration and competition – are neither reliable nor robust predictors of financial access. In contrast, both density measures are negatively correlated with credit access, indicating that a larger number of banks and bank branches (per km^2) is associated with easier access to credit.

In columns (9) to (12) we horse race the most commonly used measure, the local *HHI*, and the branch density measure against the various versions of our new *Bilateral competition* measure. We find some weak evidence that, conditional on our new measure, there is a negative correlation between the local *HHI* and credit constraints, suggesting that market concentration alleviates credit constraints for small businesses. The *Branch density* measure remains significant as well. At the same time, the *Bilateral competition* measure continues to be a strong predictor of local credit constraints for such firms. The results in column (10) indicate that a one standard deviation increase in local bilateral bank competition is associated with an increase of 8.5 percentage points in the likelihood that a firm is credit constrained, all else equal. This is a substantial effect given that 37 per cent of all firms in our dataset are credit constrained.

Together these results indicate that SMEs are more likely to be credit constrained if their local credit market was less concentrated and characterised by bank pairs that were actively competing with each other. This is therefore strong evidence against the traditional market-efficiency view and in favour of work suggesting that *less* bank competition may benefit firms, especially smaller ones, as market power allows banks to forge long-term lending relationships (Petersen and Rajan, 1994; Berger and Udell, 1995; Ongena and Smith, 2001).

In Table 5 we present similar regressions but now use interaction terms to differentiate between the impact of competition measures on smaller (<100 employees) versus larger (≥100 employees) firms. The existing literature would suggest that more concentration and less competition may be conducive to alleviating credit constraints for smaller (and hence more opaque) firms but not for larger and more transparent ones (for whom lending relationships are less crucial). Our results provide strong support for this prediction.

We find that the impact of *Bilateral competition* on credit constraints is much larger for small firms than for large ones. This holds consistently across all four versions of our bilateral competition variable (columns 1-4). Unreported Wald-tests confirm that the sum of the two coefficients is in most columns not significantly different from zero, indicating that there is no strong effect of local bilateral bank competition on access to credit for large firms. This is also the case when we add the locality-level *HHI* and *Branch density* and interact these two variables with firm size as well (columns 5-8).

5 Robustness

In this section we subject our main results to a number of robustness tests.

5.1 Alternative credit constraints measures

In Appendix Table A4 we provide similar regressions as in Table 4 while using two alternative proxies for whether a firm is credit constrained. First, in the first four columns, our dependent variable is a dummy that is one if the firm indicates that access to finance is a "major" or "very severe" obstacle to the current operations of the establishment.[17] This variable is more subjective than our main *Credit constrained* proxy but has as an advantage that it is available for more firms. When we use this alternative dependent variable, our main results go through: in localities where bilateral bank competition is more intense, firms themselves perceive access to external finance a more sever obstacle to their daily operations.

Second, in columns (5) to (8) we use a dummy that indicates whether the firm currently uses trade credit to purchase inputs. Earlier work has shown that trade credit is a relatively expensive form of finance that firms typically use as a funding source of last resort (Petersen and Rajan, 1997; Fisman and Love, 2003). Our results show that in localities with more intense bilateral bank competition, firms are more likely resort to (expensive) trade credit. This confirms that in these places firms find it more difficult to access regular bank credit.

In Table A5 we again use interaction terms to differentiate between the impact of *Bilateral competition* on smaller (<100 employees) versus larger (≥100 employees) firms. We also interact *Large firm* with *HHI* and *Branch density*. We again find that strong bilateral competition only exacerbates credit constraints (now proxied by our subjective credit-constraint measure or by the firms' use of trade credit) in the case of smaller firms.

5.2 Heckman selection model

When we define our *Credit constrained* variable, we only observe whether a firm is constrained or not if it expressed the need for a loan in the first place. Since firms that need a loan are unlikely to be a random sub-sample of the complete firm population, we apply a Heckman (1979) selection model to take account of any bias that may result from such selection. The first stage of the model is a probit regression where the need for a loan (*Loan demand*) is the dependent variable. The second stage is then our usual regression where the dependent variable is *Credit constrained*. This second stage now also includes the inverse Mill's ratio derived from the first stage. To identify the model, we include three variables in the first stage that are excluded in the second stage (alongside our standard set of firm and locality covariates and fixed effects). These variables are expected to influence loan *demand* but to be unrelated to loan supply (and therefore credit constraints).

The first such exogenous variable is *Subsidised*, an indicator variable that is 1 if the firm in the past three years has applied for a subsidy from a local or national government (Popov and Udell, 2012). A firm's application for a subsidy may signal that it is in need of external funding. The other two exogenous variables are based on Beck, Degryse, De Haas and Van Horen (2018). *Informal payment* is a dummy equal to 1 if the firm manager states that firms in his or her line of business at least sometimes have to pay irregular "additional payments or gifts" to get things done with regard to customs, taxes, licences and regulations, and 0

[17] More specifically, we use BEEPS question K.30: "Using the response options on the card, to what degree is access to finance an obstacle to the current operations of this establishment?" with answer options "No obstacle", "Minor obstacle", "Moderate obstacle", "Major obstacle" or "Very severe obstacle".

otherwise. *Corruption* is a dummy equal to 1 if the firm experiences corruption as a moderate, major or severe obstacle to its current operations and 0 otherwise. Both variables are positively but only weakly correlated. While *Informal payment* captures the incidence of bribery, *Corruption* gauges its severity.

Informal payments can be related to credit demand in two ways. First, costly bribes can directly increase a firm's financing needs (Ahlin and Pang, 2008). Second, firms that want to grow (and will at some point need bank credit for this expansion) become interesting targets for bureaucrats who seek bribes and have discretion in enforcing regulations and licensing requirements. The negotiating position of expanding firms weakens as the opportunity cost of not paying bribes goes up (Bliss and Di Tella, 1997). The firm-level correlation between making informal payments and needing bank credit is then strengthened further.

Appendix Table A6 shows the results of the second-stage Heckman regressions.[18] In columns (1) to (4) we present our usual regressions where – similar to the equivalent regressions in columns (9) to (12) of Table 4 – firms are matched with nearby bank branches based on locality name. As an additional robustness test, we also present columns (6) to (8) where we match firms with all bank branches within a circle with a 10 km radius around the firm. As can be readily seen, the results are very similar. We also note that the inverse Mills ratio enters significantly throughout all specifications, suggesting that some selection bias is indeed present and that estimates obtained through regressions without a correction for this bias can be inconsistent. Most importantly, the results for our *Bilateral competition* measures remain strong in every specification.

5.3 Cross-country heterogeneity

Our sample represents a diverse set of 20 countries that differ significantly in terms of population size as well their level of financial and economic development (Appendix Table A3). While this is reassuring from the perspective of the external validity of our results, it is important to check whether our findings are not driven by any one (large) country. To this end, Appendix Table A7 provides 20 replications of our baseline result from column (7) of Table 2. In each column, we leave out one sample country.

The table shows that our baseline results are not driven by any particular country. Across the columns we find that banks are more likely to identify another bank as a core competitor in the market for small business lending if their branch networks overlap more; if both banks are foreign owned and, importantly, if the potential competitor bank uses fewer hierarchical decision layers than the bank itself. Moreover, the estimated coefficients are stable across columns, again indicating that there is not one country that has a disproportional influence on our overall results.

5.4 Different definition of a bank's main competitors

So far we have defined bilateral bank competition based on the BEPS II question where we ask banks to identify their top three main competitors. In Appendix Table A8 we now show similar results based on the top two of a bank's closest competitors. That is, we now only consider bank *j* to be a main competitor of bank *i* if bank *j* was among the two main competitors identified by the CEO of bank *i*. We show the results for three baseline specifications for lending to SMEs (columns 1-3) and to corporate firms (columns 4-6).

[18] The unreported first-stage selection equations show that all three of our exogenous variables correlate positively with the likelihood that a firm needs a loan. All coefficients are significant at the 1 per cent level.

We find that the results are in line with our baseline regressions in Tables 2 and 3. If anything, the difference between the market for SME lending and for corporate lending becomes even somewhat more pronounced. That is, bank size, hierarchical efficiency and bank lending techniques are all core drivers for inter-bank competition in the market for lending to opaque SMEs but not for the corporate lending market.

6 Conclusions

Using the second Banking Environment and Performance Survey (BEPS II), we provide the first evidence on the drivers of competition between individual banks, as reported by their "ultimate insiders": bank CEOs themselves. We find that banks are more likely to identify other banks as key competitors in the market for small business lending when their branch networks overlap more (contrary to the mutual-forbearance theory) and when the potential competitor has more efficient lending procedures, is foreign-owned and/or applies the same lending techniques.

A second question we answer is whether local variation in bilateral bank competition also has tangible impacts "on the ground". Here we find that more intense bilateral competition between banks at the local level leads to tighter credit constraints for SMEs. This suggests that local credit market competition tends to impede the formation of lending relationships that are crucial for SMEs. In sharp contrast, we find that large firms do not suffer from bilateral bank competition at the local level.

In sum, our unique behind-the-scenes insight into bilateral competition between banks as reported in BEPS II provides us with a nuanced view about the benefits and risks of increased banking competition in emerging markets. First, our data and novel competition metric reveal that across localities within one and the same country the intensity of inter-bank competition can vary considerably depending on which banks happen to be present in that locality. Second, we find that within localities, firms may be very differently affected by strong inter-bank competition. In contrast to large firms, SMEs may suffer from strong local banking competition as the formation of longer-term lending relationships is hampered.

From a policy perspective, our results suggest that in order to increase access to credit for small firms, it may be more important to create a greater variety in the local supply of bank credit than to increase competition per se. Indeed, our results indicate that an increased presence of similar banks in terms of size, lending techniques and ownership will intensify local competition and reduce access to credit for small firms. Instead, small businesses may stand to benefit more from increased lender diversity in local banking markets.

From the perspective of empirical banking research, one important take-away from this paper is that it can be misleading to treat all banks as equal when constructing local competition measures. Instead, it is important to recognise more explicitly that only certain bank pairs compete actively for clients while other bank pairs are in reality not vying for the same clients. We show that the extent to which banks' branch networks overlap at the extensive and intensive margins is an important and relatively easily observable predictor of whether banks are actively competing or not.

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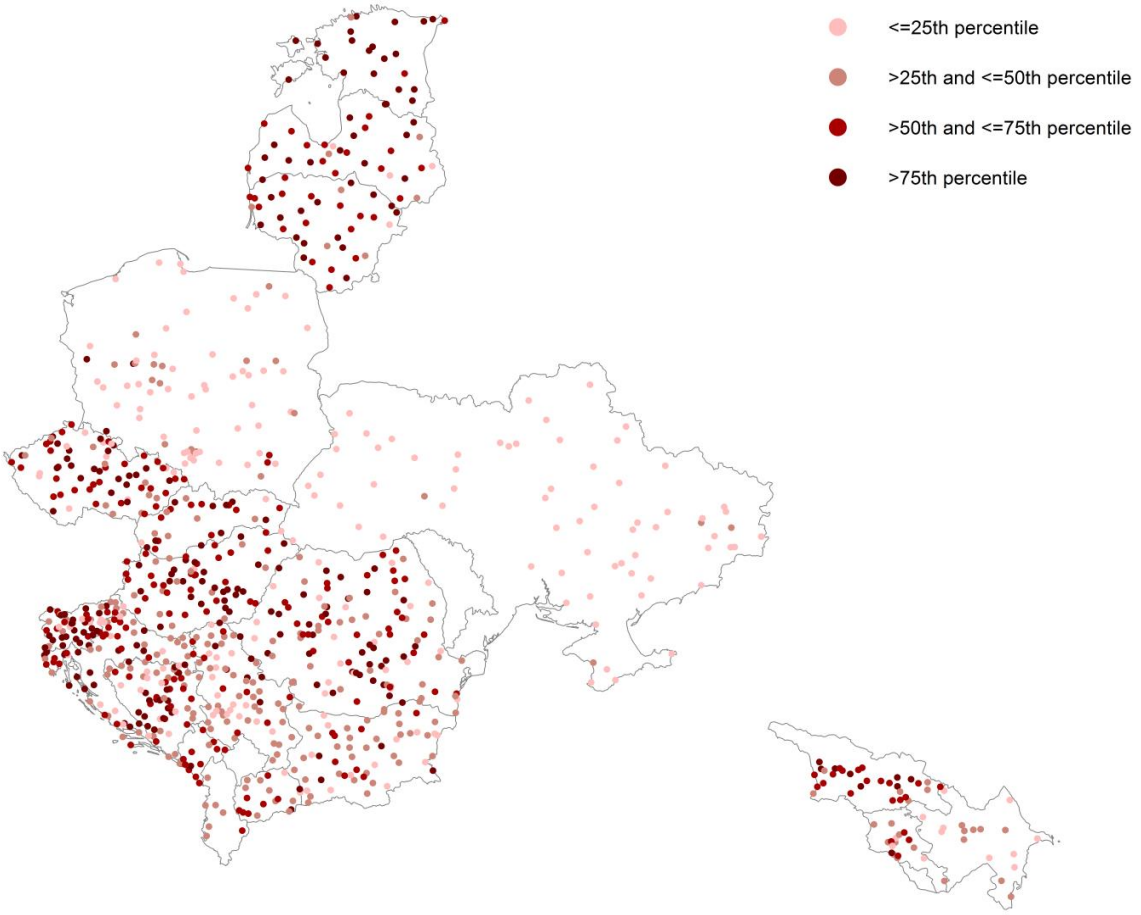
Tables and charts

Chart 1: Local variation in bilateral banking competition across emerging Europe



Sources: BEPS II, BEEPS V.
Note: This heat map plots the geographical localities in our dataset. Darker colours indicate a higher proportion of branch pairs owned by banks that identify each other as one of their three main competitors in SME lending.

Table 1: Summary statistics

Category	Variable name	Obs.	Mean	Median	Std. Dev	Min	P25	P75	Max
Bank *i*	Local branch density *i*	361	146.42	102.23	136.44	10.26	54.43	173.32	516
Bank *j*	Capitalisation *j*	374	13.86	12.43	7.63	1.79	8.75	16.81	45.97
	Wholesale *j*	373	85.46	82.44	37.64	10.26	67.60	96.08	276.41
	Interest margin *j*	372	4.79	4.1135	3.08	0.15	2.71	5.94	19.69
Bank pairs *ij*	(SMEs) Bank *i* perceives bank *j* as competitor	14,882	0.06	0	0.24	0	0	0	1
	(Large firms) Bank *i* perceives bank *j* as competitor	14,882	0.06	0	0.24	0	0	0	1
	(SMEs) Reciprocal competition *ij*	7,200	0.12	0	0.32	0	0	0	1
	(Large firms) Reciprocal competition *ij*	7,200	0.11	0	0.31	0	0	0	1
	Intensive branch overlap *ij*	14,882	4.43	2.90	4.30	0	1.00	5.84	16.30
	Extensive branch overlap *ij*	14,882	0.54	0.54	0.34	0	0.23	0.88	1
	Small bank *i*-Small bank *j*	14,882	0.13	0	0.34	0	0	0	1
	Large bank *i*-Large bank *j*	14,882	0.36	0	0.48	0	0	1	1
	Foreign *i*-Foreign *j*	14,882	0.34	0	0.47	0	0	1	1
	Domestic *i*-Domestic *j*	14,882	0.19	0	0.40	0	0	0	1
	(SMEs) Hierarchical efficiency *ij*	6,182	0.34	0	0.47	0	0	1	1
	(Large firms) Hierarchical efficiency *ij*	5,670	0.36	0	0.48	0	0	1	1
	(SMEs) Relation *i* - Relation *j*	6,182	0.45	0	0.50	0	0	1	1
	(SMEs) Transaction *i* - Transaction *j*	6,182	0.12	0	0.32	0	0	0	1
	(Large firms) Relation *i* - Relation *j*	5,710	0.52	1	0.50	0	0	1	1
	(Large firms) Transaction *i* - Transaction *j*	5,710	0.09	0	0.29	0	0	0	1
	(SMEs) Customer overlap *ij*	7,200	0.86	1	0.35	0	1	1	1
	(Large firms) Customer overlap *ij*	7,200	0.80	1	0.40	0	1	1	1
Locality level	Bilateral competition	944	0.30	0.25	0.23	0	0.13	0.40	1
	Bilateral competition: augmented	944	0.25	0.24	0.12	0.02	0.17	0.31	0.70
	Bilateral competition: augmented *j*	944	0.28	0.28	0.10	0.06	0.21	0.33	0.75
	Bilateral competition: augmented *i*	944	0.25	0.24	0.12	0.02	0.17	0.31	0.70
	HHI	1,044	0.29	0.17	0.29	0.04	0.11	0.33	1
	Bank density	7,972	0.06	0.05	0.07	0.00	0.03	0.08	0.50
	Branch density	7,972	0.79	0.13	2.56	0.00	0.04	0.65	19.03
	Lerner index	1,037	0.33	0.34	0.15	-0.97	0.29	0.41	0.58
	Capitalisation	1,033	13.05	12.43	3.36	4.76	10.61	15.13	24.33

	Credit constrained	3,832	0.37	0	0.48	0	0	1	1
	Credit constrained (subjective)	7,878	0.19	0	0.39	0	0	0	1
	Trade credit	7,399	0.69	1	0.46	0	0	1	1
	Large firm	7,892	0.52	1	0.50	0	0	1	1
	Public firm	7,972	0.02	0	0.14	0	0	0	1
	Proprietorship	7,972	0.12	0	0.32	0	0	0	1
Firm level	Exporter	7,972	0.28	0	0.45	0	0	1	1
	Audited firm	7,757	0.36	0	0.48	0	0	1	1
	Mature firm	7,546	0.54	1	0	0	0	1	1
	Loan demand	7,702	0.50	0	1	0	0	1	1
	Subsidised	7,972	0.11	0	0	0	0	0	1
	Informal payment	7,971	0.36	0	0.48	0	0	1	1
	Corruption	7,972	0.34	0	0.47	0	0	1	1

Sources: BEPS II, BEEPS V, BankScope.
Note*:* This table reports summary statistics for all variables used in our analysis. Table A1 in the Appendix provides variable definitions.

Table 2: Determinants of bilateral bank competition in the credit market for SMEs

	Dependent variable: Dummy =1 if bank i perceives bank j as a top 3 competitor in SME lending									
	Sample-weighted probit									Conditional logit
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Intensive branch overlap *ij*	0.060***	0.059***	0.058***	0.116***	0.115***	0.100***	0.140***	0.140***	0.139***	1.328***
	(0.004)	(0.005)	(0.006)	(0.013)	(0.014)	(0.015)	(0.019)	(0.019)	(0.019)	(0.269)
Extensive branch overlap *ij*	0.129***	0.123***	0.120***	0.200***	0.258***	0.216***	0.301***	0.306***	0.302***	4.283***
	(0.014)	(0.014)	(0.013)	(0.024)	(0.023)	(0.022)	(0.028)	(0.030)	(0.028)	(0.528)
Local branch density *i*	-0.072***	-0.067***	-0.066***	-0.125***	-0.141***	-0.112***	-0.157***	-0.157***	-0.157***	
	(0.005)	(0.006)	(0.006)	(0.012)	(0.012)	(0.013)	(0.015)	(0.014)	(0.014)	
Small *i*-Small *j*		0.008	0.008	0.020	0.011	0.005	0.004	0.004	0.004	-0.153
		(0.010)	(0.010)	(0.023)	(0.023)	(0.021)	(0.028)	(0.028)	(0.028)	(0.321)
Large *i*-Large *j*		0.010*	0.009*	0.020	0.016	0.017*	0.025*	0.025*	0.026*	0.236
		(0.006)	(0.005)	(0.013)	(0.011)	(0.009)	(0.014)	(0.013)	(0.013)	(0.348)
Foreign *i*-Foreign *j*			0.023***	0.037***	0.046***	0.047***	0.065***	0.060***	0.061***	1.184***
			(0.007)	(0.013)	(0.014)	(0.012)	(0.017)	(0.018)	(0.017)	(0.367)
Domestic *i*-Domestic *j*			0.005	0.014	-0.003	-0.003	-0.001	-0.001	0.002	-0.305
			(0.008)	(0.015)	(0.014)	(0.012)	(0.016)	(0.018)	(0.016)	(0.234)
(SMEs) Reciprocal competition *ij*					0.028***					
					(0.010)					
(SMEs) Customer overlap *ij*						0.078***				
						(0.009)				
(SMEs) Hierarchical efficiency *ij*							0.035***		0.035***	0.485***
							(0.012)		(0.012)	(0.147)
(SMEs) Relation *i* - Relation *j*								0.028***	0.028***	0.556***
								(0.009)	(0.009)	(0.193)
(SMEs) Transaction *i* - Transaction *j*								-0.032**	-0.032**	-0.609**
								(0.015)	(0.015)	(0.259)
Capitalisation *j*				-0.002						
				(0.001)						
Wholesale *j*				0.001***						
				(0.000)						
Interest margin *j*				0.006						
				(0.004)						
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Bank *i* fixed effects	No	No	No	No	No	No	No	No	No	Yes
Number of observations	14,882	14,882	14,882	7,222	7,200	7,200	6,182	6,182	6,182	5,704
Pseudo R^2	0.264	0.265	0.272	0.226	0.242	0.254	0.232	0.232	0.235	0.274

Sources: BEPS II, BEEPS V, BankScope.

Note: This table reports estimates from sample-weighted probit regressions in all columns except column 10 which reports a conditional logit model. The dependent variable is a dummy that is 1 if bank *i* perceives bank *j* as one of its three main competitors for lending to SMEs; and 0 otherwise. Appendix Table A1 contains all variable definitions. We report marginal effects except for column 10 which contains estimated coefficients. Robust standard errors are clustered by country and shown in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% level.

Table 3: Determinants of bilateral bank competition in the credit market for large firms

	Dependent variable: Dummy =1 if bank i perceives bank j as a top 3 competitor in corporate lending									
	Sample-weighted probit									Conditional logit
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Intensive branch overlap *ij*	0.067***	0.066***	0.062***	0.107***	0.120***	0.088***	0.151***	0.151***	0.152***	1.612***
	(0.006)	(0.007)	(0.007)	(0.012)	(0.014)	(0.011)	(0.019)	(0.018)	(0.018)	(0.288)
Extensive branch overlap *ij*	0.097***	0.086***	0.081***	0.134***	0.157***	0.121***	0.220***	0.220***	0.217***	3.139***
	(0.016)	(0.017)	(0.015)	(0.033)	(0.034)	(0.025)	(0.045)	(0.045)	(0.045)	(0.736)
Local branch density *i*	-0.063***	-0.053***	-0.053***	-0.096***	-0.099***	-0.076***	-0.135***	-0.135***	-0.136***	
	(0.005)	(0.007)	(0.006)	(0.012)	(0.013)	(0.008)	(0.015)	(0.017)	(0.017)	
Small *i*-Small *j*		0.013	0.013	0.001	0.024	0.023	0.037	0.031	0.034	0.179
		(0.012)	(0.012)	(0.026)	(0.028)	(0.024)	(0.035)	(0.035)	(0.035)	(0.376)
Large *i*-Large *j*		0.018**	0.016**	0.021	0.025*	0.021*	0.030**	0.029**	0.030**	0.230
		(0.009)	(0.008)	(0.014)	(0.014)	(0.011)	(0.014)	(0.015)	(0.014)	(0.322)
Foreign *i*-Foreign *j*			0.038***	0.051***	0.059***	0.047***	0.075***	0.077***	0.076***	1.508***
			(0.010)	(0.013)	(0.015)	(0.011)	(0.015)	(0.015)	(0.015)	(0.356)
Domestic *i*-Domestic *j*			0.008	0.027	0.009	0.002	-0.003	-0.003	-0.003	-0.488**
			(0.008)	(0.017)	(0.016)	(0.012)	(0.017)	(0.017)	(0.017)	(0.232)
(Large firms) Reciprocal competition *ij*					0.060***					
					(0.015)					
(Large firms) Customer overlap *ij*						0.097***				
						(0.010)				
(Large firms) Hierarchical efficiency *ij*							-0.000		-0.003	-0.178
							(0.013)		(0.011)	(0.216)
(Large firms) Relation *i* - Relation *j*								0.018	0.015	0.296
								(0.021)	(0.021)	(0.374)
(Large firms) Transaction *i* - Transaction *j*								-0.019*	-0.021*	-0.462**
								(0.011)	(0.011)	(0.225)
Capitalisation *j*				-0.001						
				(0.002)						
Wholesale *j*				0.000						
				(0.000)						
Interest margin *j*				-0.003						
				(0.004)						
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Bank *i* fixed effects	No	No	No	No	No	No	No	No	No	Yes
Number of observations	14,882	14,882	14,882	7,222	7,200	7,200	5,670	5,710	5,646	5,322
Pseudo R^2	0.226	0.229	0.245	0.204	0.221	0.276	0.236	0.238	0.240	0.269

Sources: BEPS II, BEEPS V, BankScope.

Note: This table reports estimates from sample-weighted probit regressions in all columns except column 10 which reports a conditional logit model. The dependent variable is a dummy that is 1 if bank *i* perceives bank *j* as one of its three main competitors for lending to large corporate firms; and 0 otherwise. Appendix Table A1 contains all variable definitions. We report marginal effects except for column 10 which contains estimated coefficients. Robust standard errors are clustered by country and shown in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% level.

Table 4: Bilateral bank competition at the locality level and SME credit constraints

	Dependent variable: Credit constrained											
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
Bilateral competition	0.170**								0.193*			
	(0.083)								(0.109)			
Bilateral competition: augmented		0.465***								0.633***		
		(0.135)								(0.168)		
Bilateral competition: augmented *j*			0.804***								1.113***	
			(0.215)								(0.272)	
Bilateral competition: augmented *i*				0.449***								0.607***
				(0.134)								(0.202)
HHI					0.138				-0.121	-0.338*	-0.409**	-0.313
					(0.138)				(0.184)	(0.186)	(0.188)	(0.196)
Branch density						-0.008**			-0.007**	-0.006*	-0.004	-0.006*
						(0.003)			(0.003)	(0.003)	(0.003)	(0.003)
Bank density							-0.332**					
							(0.145)					
Lerner index								0.179				
								(0.224)				
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	2,501	2,501	2,501	2,501	2,501	2,501	2,501	2,501	2,501	2,501	2,501	2,501
Pseudo-R2	0.109	0.111	0.113	0.111	0.108	0.109	0.109	0.1077	0.111	0.113	0.115	0.112

Sources: BEPS II, BEEPS V, BankScope.

Note: The table reports estimates from probit regressions. The dependent variable is Credit constrained, which equals 1 if a firm is credit constrained; 0 otherwise. Unreported covariates are Capitalisation, Large firm, Public firm, Proprietorship, Exporter, Audited firm and Mature firm. Appendix Table A1 contains all variable definitions. The table reports marginal effects. Robust standard errors in parentheses are based on a bootstrap with 200 replications. ***, **, * indicate significance at 1%, 5% and 10% level.

Table 5: Bilateral bank competition at the locality level and credit constraints of small and large firms

	Dependent variable: Credit constrained							
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Bilateral competition	0.388***				0.480***			
	(0.111)				(0.146)			
Bilateral competition x Large firm	-0.425***				-0.561***			
	(0.144)				(0.175)			
Bilateral competition: augmented		0.723***				0.887***		
		(0.177)				(0.242)		
Bilateral competition: augmented x Large firm		-0.494**				-0.510*		
		(0.208)				(0.290)		
Bilateral competition: augmented *j*			1.210***				1.547***	
			(0.237)				(0.341)	
Bilateral competition: augmented *j* x Large firm			-0.757***				-0.878***	
			(0.232)				(0.299)	
Bilateral competition: augmented *i*				0.718***				0.886***
				(0.178)				(0.263)
Bilateral competition: augmented *i* x Large firm				-0.515**				-0.553*
				(0.203)				(0.288)
HHI					-0.409	-0.456*	-0.602**	-0.452
					(0.279)	(0.266)	(0.257)	(0.288)
HHI x Large firm					0.535	0.247	0.414	0.281
					(0.360)	(0.359)	(0.334)	(0.346)
Branch density					-0.011**	-0.010**	-0.007	-0.010**
					(0.005)	(0.005)	(0.005)	(0.004)
Branch density x Large firm					0.008	0.008	0.006	0.008
					(0.006)	(0.006)	(0.006)	(0.006)
Large firm	-0.068**	-0.064	0.031	-0.060	-0.115***	-0.099**	0.006	-0.095**
	(0.033)	(0.042)	(0.058)	(0.041)	(0.041)	(0.046)	(0.061)	(0.046)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	2,501	2,501	2,501	2,501	2,501	2,501	2,501	2,501
Pseudo-R2	0.112	0.113	0.116	0.113	0.115	0.115	0.119	0.115

Sources: BEPS II, BEEPS V, BankScope.

Note: The table reports estimates from probit regressions. The dependent variable is Credit constrained which equals 1 if a firm is credit constrained; 0 otherwise. Unreported covariates are Capitalisation, Public firm, Proprietorship, Exporter, Audited firm and Mature firm. Appendix Table A1 contains all variable definitions. The table reports marginal effects. Robust standard errors in parentheses are based on a bootstrap with 200 replications. ***, **, * indicate significance at 1%, 5% and 10% level.

Appendix

Table A1: Variable definitions and sources

Category	Variable names	Definition	Source
Bank *i*	Local branch density *i*	The average number of branches (of all banks) within a circle with a 5 km radius around a branch of bank *i*	BEPS II
Bank *j*	Capitalisation *j*	Equity to total assets of bank *j* in 2011	BankScope
	Wholesale *j*	Net loans over customer funding and short-term funding of bank *j* in 2011	BankScope
	Interest margin *j*	Net interest margin of bank *j* in 2011	BankScope
Bank pairs *ij*	(SMEs/Large firms) Bank *i* perceives bank *j* as competitor	Dummy=1 if bank *i* perceives bank *j* as one of its three main competitors in the SME (corporate) credit market; 0 otherwise	BEPS II
	(SMEs/Large Firms) Reciprocal competition *ij*	Dummy=1 if bank *j* listed bank *i* as one of its three main competitors in the SME (corporate) credit market; 0 otherwise	BEPS II
	Intensive branch overlap *ij*	The average number of branches of bank *j* within a circle with a 5 km radius around a branch of bank *i*	BEPS II
	Extensive branch overlap *ij*	The proportion of branches of bank *i* that has one or more branches of bank *j* within a circle with a 5 km radius	BEPS II
	Small *i*-Small *j*	Dummy=1 if bank *i* and *j* both have fewer branches than the median bank in the country; 0 otherwise	BEPS II
	Large *i*-Large *j*	Dummy=1 if bank *i* and *j* both have more branches than the median bank in the country; 0 otherwise	BEPS II
	Foreign *i*-Foreign *j*	Dummy=1 if both bank *i* and bank *j* are majority foreign owned; 0 otherwise	Various
	Domestic *i*-Domestic *j*	Dummy=1 if both bank *i* and bank *j* are majority owned by domestic investors; 0 otherwise	Various
	(SMEs/Large Firms) Hierarchical efficiency *ij*	Dummy=1 if SME (large firm) loan applications need to pass fewer hierarchical approval levels in bank *j* than in bank *i*; 0 otherwise	BEPS II
	(SMEs/Large Firms) Relation *i* - Relation *j*	Dummy=1 if both bank *i* and *j* consider relationship banking to be a "very important" lending technique; 0 otherwise	BEPS II
	(SMEs/Large Firms) Transaction *i* - Transaction *j*	Dummy=1 if both bank *i* and *j* consider transaction banking to be a "very important" lending technique; 0 otherwise	BEPS II
	(SMEs/Large Firms) Customer overlap *ij*	Dummy=1 if both bank *i* and bank *j* lend to SMEs (large firms); 0 otherwise	BEPS II
Locality level	Bilateral competition	Number of bank pairs where bank *i* perceives bank *j* as one of its three main competitors in SME lending, divided by the total number of possible bank *i*-bank *j* pairs in a locality	BEPS II
	Bilateral competition: augmented	Number of bank pairs where bank *i* is predicted to perceive bank *j* as one of its three main competitors in SME lending, divided by the total number of possible bank *i*-bank *j* pairs in a locality	BEPS II
	Bilateral competition: augmented *j*	Number of bank pairs where bank *i* is predicted to perceive bank *j* as one of its three main competitors in SME lending, divided by the total number of possible bank *i*-bank *j* pairs in a locality, weighted by number of branches of bank *j*	BEPS II
	Bilateral competition: augmented *i*	Number of bank pairs where bank *i* is predicted to perceive bank *j* as one of its three main competitors in SME lending, divided by the total number of possible bank *i*-bank *j* pairs in a locality, weighted by number of branches of bank *i*	BEPS II
	HHI	Herfindahl-Hirschman Index at the locality level. Market shares are measured by the number of branches of each bank	BEPS II
	Bank density	Number of banks per square km within a 10 km radius around the firm	BEPS II
	Branch density	Number of bank branches per square km within a 10 km radius around the firm	BEPS II
	Lerner index	Lerner index of banks at the locality level in 2011, weighted by the number of branches	
	Capitalisation	The average capitalisation (equity/total assets) of the banks in a locality in 2011, weighted by the number of branches	BEPS II
Firm	Credit constrained	Dummy=1 if a firm is credit constrained (discouraged from applying or was refused a loan when it applied);	BEEPS V

level		0 otherwise	
	Credit constrained (subjective)	Dummy=1 if according to a firm access to finance is a "major" or "very severe" obstacle; 0 otherwise	BEEPS V
	Trade credit	Dummy=1 if a firm uses trade credit to purchase inputs; 0 otherwise	BEEPS V
	Large firm	Dummy=1 if the number of employees is above the median; 0 otherwise	BEEPS V
	Public firm	Dummy=1 if the firm is a listed company; 0 otherwise	BEEPS V
	Proprietorship	Dummy=1 if the firm is a sole proprietorship; 0 otherwise	BEEPS V
	Private at start	Dummy=1 if the firm has been privately owned as of its date of establishment; 0 if the firm was formerly state-owned but now private	BEEPS V
	Exporter	Dummy=1 if the firm exports; 0 otherwise	BEEPS V
	Audited firm	Dummy=1 if the firm's annual financial statement was reviewed by an external auditor in the last fiscal year; 0 otherwise	BEEPS V
	Mature firm	Dummy=1 if the firm age is above the sample median; 0 otherwise	BEEPS V
	Loan demand	Dummy=1 if the firm needs a loan; 0 otherwise	BEEPS V
	Subsidised	Dummy=1 if the firm received, in the last three years, subsidies from the central or a local government; 0 otherwise	BEEPS V
	Informal payment	Dummy=1 if the firm manager indicates that firms in his or her line of business at least sometimes have to pay irregular "additional payments or gifts" to get things done with regard to customs, taxes, licenses, and regulations; 0 otherwise	BEEPS V
	Corruption	Dummy=1 if corruption is a moderate, major, or severe obstacle to the firm's operations; 0 otherwise	BEEPS V

Note: BEPS II is the second Banking Environment and Performance Survey. BEEPS V refers to the 2012 wave of the EBRD/World Bank Business Environment and Enterprise Performance Survey.

Table A2: Correlation matrix

		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]
Credit constrained	[1]	1																
Credit constrained (Subj.)	[2]	0.0833*	1															
Trade credit	[3]	-0.1263*	0.0579*	1														
Bilateral competition	[4]	-0.0904*	-0.0455*	0.0768*	1													
Bilateral comp.: augmented	[5]	-0.0962*	-0.0612*	0.0750*	0.8716*	1												
Bilateral comp.: augmented *j*	[6]	-0.1194*	-0.0796*	0.0773*	0.6881*	0.8373*	1											
Bilateral comp.: augmented *i*	[7]	-0.0986*	-0.0586*	0.0699*	0.8699*	0.9905*	0.8446*	1										
HHI	[8]	-0.0697*	-0.0490*	0.0900*	0.5626*	0.5865*	0.5483*	0.5724*	1									
Bank density	[9]	0.0790*	0.0393*	-0.0043	-0.4406*	-0.5516*	-0.5088*	-0.5438*	-0.3634*	1								
Branch density	[10]	0.035	0.019	0.0095	-0.2498*	-0.3225*	-0.3121*	-0.3176*	-0.2006*	0.9214*	1							
Lerner index	[11]	-0.0399*	-0.009	0.0362*	0.0785*	0.0828*	0.2035*	0.0652*	0.1672*	0.0179	-0.0122	1						
Large firm	[12]	-0.1836*	-0.0118	0.0819*	-0.0280*	-0.0545*	-0.0737*	-0.0564*	0.0011	0.0332*	0.0094	0.0435*	1					
Capitalisation	[13]	0.0559*	-0.0075	-0.1020*	-0.1128*	-0.1521*	-0.1270*	-0.1505*	-0.0166	0.1764*	0.1364*	-0.0964*	0.0480*	1				
Public firm	[14]	-0.0231	0.0388*	-0.0389*	-0.0289*	-0.0251	-0.0690*	-0.0263*	-0.0395*	-0.0174	-0.0228	-0.0541*	0.0922*	0.0062	1			
Proprietorship	[15]	0.0659*	0.0146	-0.015	-0.0662*	-0.0715*	-0.0683*	-0.0737*	0.0021	0.0897*	0.0516*	0.1230*	-0.0985*	0.0191	-0.0520*	1		
Exporter	[16]	-0.1199*	0.0149	0.1057*	0.0404*	0.0340*	0.0434*	0.0324*	0.0629*	-0.0226	-0.0011	-0.0016	0.2084*	-0.0679*	0.0125	-0.0680*	1	
Audited firm	[17]	-0.1829*	-0.0178	0.0468*	0.0492*	0.014	-0.0334*	0.0132	0.0159	-0.0378*	-0.0277*	-0.0870*	0.2565*	0.0043	0.0904*	-0.1006*	0.1327*	1
Mature firm	[18]	-0.0839*	0.0155	0.0639*	0.0421*	0.0439*	0.0488*	0.0398*	0.0401*	-0.0581*	-0.0598*	0.0546*	0.1168*	-0.0667*	0.0373*	-0.01	0.0796*	0.0449*

Sources: BEPS II, BEEPS V, BankScope.

Table A3: Overview of country sample

	Banks	Branches	Branches per 100 km^2	Branches per 100,000 persons	Domestic private credit/GDP	GDP/capita (US$)	Population density (persons / km^2)	Population	Land area (km^2)
Albania	16	547	2.00	18.86	39.06	4,248	105.85	2,900,247	27,400
Armenia	23	510	1.79	17.12	40.06	3,566	104.61	2,978,339	28,470
Azerbaijan	44	871	1.05	9.37	20.09	7,394	112.46	9,295,784	82,658
Bosnia & Herzegovina	28	915	1.79	23.90	54.78	4,495	74.77	3,828,419	51,200
Bulgaria	32	3,065	2.82	41.95	66.27	7,378	67.30	7,305,888	108,560
Croatia	36	1,553	2.78	36.39	67.95	13,236	76.26	4,267,558	55,960
Czech Republic	42	3,167	4.10	30.13	49.76	19,730	136.10	10,510,785	77,230
Estonia	17	213	0.50	16.10	72.85	17,422	31.20	1,322,696	42,390
Georgia	19	967	1.39	25.28	34.44	4,143	55.04	3,825,000	69,490
Hungary	27	1,794	1.98	18.08	50.87	12,834	109.58	9,920,362	90,530
Latvia	23	419	0.67	20.60	64.92	13,799	32.72	2,034,319	62,180
Lithuania	16	554	0.88	18.54	46.61	14,348	47.67	2,987,773	62,674
FYR Macedonia	17	456	1.81	22.04	47.17	4,710	82.05	2,069,270	25,220
Montenegro	11	207	1.54	33.35	55.06	6,587	46.14	620,601	13,450
Poland	62	11,844	3.87	31.12	50.10	13,145	124.30	38,063,164	306,220
Romania	39	6,218	2.70	31.00	37.52	8,558	87.20	20,058,035	230,020
Serbia	34	2,117	2.42	29.41	49.51	5,659	82.31	7,199,077	87,460
Slovak Republic	27	1,356	2.82	25.08	46.81	17,275	112.45	5,407,579	48,088
Slovenia	22	570	2.83	27.71	79.82	22,486	102.14	2,057,159	20,140
Ukraine	157	19,102	3.30	41.90	69.58	3,855	78.70	45,593,300	579,320

Sources: BEPS II, IMF and World Bank. Data refer to 2012.

Table A4: Bilateral bank competition at the locality level and SME credit constraints: alternative credit constraint measures

Dependent variable:	*Credit constrained (Subjective)*				*Trade credit*			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Bilateral competition	0.099				0.144**			
	(0.064)				(0.071)			
Bilateral competition: augmented		0.249**				0.323***		
		(0.103)				(0.119)		
Bilateral competition: augmented *j*			0.559***				0.427**	
			(0.157)				(0.187)	
Bilateral competition: augmented *i*				0.215**				0.321**
				(0.106)				(0.131)
HHI	-0.238**	-0.311***	-0.384***	-0.285***	0.142	0.058	0.095	0.063
	(0.102)	(0.109)	(0.102)	(0.110)	(0.115)	(0.124)	(0.119)	(0.132)
Branch density	0.002	0.002	0.003	0.002	0.004	0.005*	0.005*	0.005*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	5,097	5,097	5,097	5,097	4,799	4,799	4,799	4,799
Pseudo-R2	0.037	0.038	0.039	0.038	0.098	0.098	0.098	0.098

Sources: BEPS II, BEEPS V, BankScope.

Note: The table reports estimates from probit regressions. The dependent variable in columns (1) to (4) is Credit constrained (subjective) which equals one if according to the firm access to finance is a "major" or "very severe" obstacle. The dependent variable in columns (5) to (8) is Trade credit, which equals 1 if a firm uses trade credit to purchase inputs; 0 otherwise. Unreported covariates are Capitalisation, Public firm, Proprietorship, Exporter, Audited firm, Large firm and Mature firm. Appendix Table A1 contains all variable definitions. The table reports marginal effects. Robust standard errors in parentheses are based on a bootstrap with 200 replications.***, **, * indicate significance at 1%, 5% and 10% level.

Table A5: Bilateral bank competition at the locality level and credit constraints of small and large firms: alternative constraint measures

Dependent variable:	*Credit constrained (Subjective)*				*Trade credit*			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Bilateral competition	0.178**				0.215**			
	(0.083)				(0.100)			
Bilateral competition x Large firm	-0.149				-0.142			
	(0.116)				(0.130)			
Bilateral competition: augmented		0.405***				0.572***		
		(0.126)				(0.160)		
Bilateral competition: augmented x Large firm		-0.301**				-0.502**		
		(0.145)				(0.203)		
Bilateral competition: augmented *j*			0.651***				0.617***	
			(0.203)				(0.214)	
Bilateral competition: augmented *j* x Large firm			-0.174				-0.393**	
			(0.186)				(0.185)	
Bilateral competition: augmented *i*				0.367***				0.555***
				(0.128)				(0.163)
Bilateral competition: augmented *i* x Large firm				-0.291**				-0.469**
				(0.144)				(0.212)
HHI	-0.315*	-0.421***	-0.428***	-0.393***	0.124	-0.081	0.028	-0.064
	(0.161)	(0.140)	(0.161)	(0.145)	(0.164)	(0.177)	(0.162)	(0.177)
HHI x Large firm	0.139	0.206	0.083	0.197	0.040	0.278	0.145	0.252
	(0.200)	(0.181)	(0.209)	(0.190)	(0.207)	(0.221)	(0.204)	(0.233)
Branch density	-0.001	-0.002	-0.001	-0.002	0.005	0.007*	0.007*	0.007*
	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Branch density x Large firm	0.002	0.004	0.004	0.003	-0.002	-0.005	-0.004	-0.005
	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	(0.005)	(0.006)
Large firm	-0.013	0.005	0.009	0.004	0.112***	0.146***	0.171***	0.143***
	(0.022)	(0.024)	(0.037)	(0.023)	(0.028)	(0.033)	(0.039)	(0.028)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	5,097	5,097	5,097	5,097	4,799	4,799	4,799	4,799
Pseudo-R2	0.037	0.038	0.039	0.038	0.099	0.100	0.099	0.100

Sources: BEPS II, BEEPS V, BankScope.

Note: The table reports estimates from probit regressions. The dependent variable in columns (1)-(4) is Credit constrained (subjective) which equals 1 if a firm is credit constrained; 0 otherwise. The dependent variable in columns (5) to (8) is Trade credit which equals 1 if a firm uses trade credit to purchase inputs; 0 otherwise. Unreported covariates are Capitalisation, Public firm, Proprietorship, Exporter, Audited firm and Mature firm. Appendix Table A1 contains all variable definitions. The table reports marginal effects. Robust standard errors in parentheses are based on a bootstrap with 200 replications. ***, **, * indicate significance at 1%, 5% and 10% level.

Table A6: Bilateral bank competition at the locality level and access to credit: Heckman selection model

Dependent variable:	*Credit constrained*							
	Locality level				Circle with 10 km radius			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Bilateral competition	0.208***				0.117*			
	(0.071)				(0.070)			
Bilateral competition: augmented		0.540***				0.256**		
		(0.116)				(0.113)		
Bilateral competition: augmented *j*			0.865***				0.309**	
			(0.186)				(0.154)	
Bilateral competition: augmented *i*				0.523***				0.257**
				(0.130)				(0.111)
HHI	-0.211	-0.360***	-0.378***	-0.342***	-0.104	-0.156	-0.128	-0.148
	(0.129)	(0.123)	(0.126)	(0.128)	(0.100)	(0.110)	(0.101)	(0.102)
Branch density	-0.005**	-0.004*	-0.003	-0.004**	-0.006***	-0.005**	-0.005***	-0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Inverse Mills ratio	0.985***	0.989***	1.018***	0.987***	0.975***	0.966***	0.981***	0.970***
	(0.173)	(0.177)	(0.191)	(0.177)	(0.180)	(0.182)	(0.184)	(0.181)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	2,501	2,501	2,501	2,501	2,521	2,521	2,521	2,521

Sources: BEPS II, BEEPS V, BankScope.

Note: The table reports estimates from Heckman probit regressions. The second-stage dependent variable is Credit constrained which equals 1 if a firm is credit constrained; 0 otherwise. Inverse Mills' ratio is the inverse of Mills' ratio from the probit model of the selection equation. In this first-stage regression (unreported) the dependent variable is Loan demand which equals 1 if the firm has loan demand, and 0 otherwise. The variables that are included in the first stage but excluded from the second-stage regression are Subsidised, Informal payment and Corruption. Appendix Table A1 contains all variable definitions. The table reports marginal effects. Robust standard errors in parentheses are based on a bootstrap with 200 replications. ***, **, * indicate significance at 1%, 5% and 10% level. Unreported covariates are Public firm, Proprietorship, Exporter, Audited firm, Large firm and Mature firm.

Table A7: Robustness: sensitivity to variation in the country sample

	Dependent variable: Dummy =1 if bank i perceives bank j as a top 3 competitor in SME lending									
	Albania	Armenia	Azerbaijan	Bosnia and Herzegovina	Bulgaria	Czech Republic	Croatia	Estonia	Georgia	Hungary
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Intensive branch overlap *ij*	0.142***	0.147***	0.137***	0.144***	0.142***	0.140***	0.148***	0.132***	0.137***	0.142***
	(0.018)	(0.017)	(0.019)	(0.020)	(0.020)	(0.019)	(0.024)	(0.019)	(0.020)	(0.019)
Extensive branch overlap *ij*	0.285***	0.279***	0.303***	0.297***	0.297***	0.297***	0.318***	0.294***	0.291***	0.303***
	(0.028)	(0.025)	(0.028)	(0.033)	(0.027)	(0.028)	(0.034)	(0.029)	(0.028)	(0.029)
Local branch density *i*	-0.157***	-0.153***	-0.155***	-0.162***	-0.151***	-0.155***	-0.166***	-0.152***	-0.153***	-0.160***
	(0.013)	(0.015)	(0.015)	(0.016)	(0.013)	(0.015)	(0.019)	(0.015)	(0.015)	(0.015)
Small *i*-Small *j*	0.017	0.011	0.001	0.016	0.003	0.004	0.002	0.002	0.003	0.005
	(0.030)	(0.031)	(0.028)	(0.031)	(0.030)	(0.028)	(0.031)	(0.028)	(0.028)	(0.029)
Large *i*-Large *j*	0.017	0.027*	0.023	0.023	0.034***	0.025*	0.027*	0.026*	0.024*	0.025*
	(0.012)	(0.015)	(0.014)	(0.015)	(0.012)	(0.014)	(0.016)	(0.014)	(0.014)	(0.014)
(SMEs) Hierarchical efficiency *ij*	0.035***	0.034***	0.037***	0.035***	0.035***	0.034***	0.038***	0.040***	0.036***	0.035***
	(0.012)	(0.013)	(0.012)	(0.013)	(0.013)	(0.012)	(0.014)	(0.011)	(0.012)	(0.012)
Foreign *i*-Foreign *j*	0.063***	0.065***	0.064***	0.068***	0.067***	0.065***	0.071***	0.058***	0.067***	0.065***
	(0.017)	(0.016)	(0.016)	(0.018)	(0.018)	(0.017)	(0.019)	(0.016)	(0.017)	(0.017)
Domestic *i*-Domestic *j*	0.001	0.003	-0.003	0.002	0.001	-0.001	0.002	-0.006	-0.002	-0.001
	(0.016)	(0.020)	(0.017)	(0.017)	(0.017)	(0.016)	(0.019)	(0.015)	(0.018)	(0.017)
Number of observations	6,026	5,910	5,910	5,910	5,720	6,126	5,480	6,072	6,026	6,126
Pseudo R^2	0.236	0.249	0.236	0.228	0.234	0.228	0.216	0.220	0.232	0.231

Continued on next page

	Dependent variable: Dummy =1 if bank i perceives bank j as a top 3 competitor in SME lending									
	Lithuania	Latvia	FYR Macedonia	Montenegro	Serbia	Slovak Rep	Slovenia	Romania	Poland	Ukraine
	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]	[20]
Intensive branch overlap *ij*	0.135***	0.136***	0.139***	0.134***	0.143***	0.137***	0.141***	0.133***	0.155***	0.144***
	(0.020)	(0.019)	(0.020)	(0.019)	(0.021)	(0.019)	(0.020)	(0.019)	(0.018)	(0.020)
Extensive branch overlap *ij*	0.292***	0.311***	0.297***	0.287***	0.329***	0.298***	0.292***	0.317***	0.328***	0.310***
	(0.029)	(0.028)	(0.029)	(0.029)	(0.031)	(0.028)	(0.029)	(0.029)	(0.029)	(0.029)
Local branch density *i*	-0.152***	-0.159***	-0.154***	-0.152***	-0.169***	-0.154***	-0.153***	-0.157***	-0.174***	-0.162***
	(0.015)	(0.016)	(0.015)	(0.015)	(0.018)	(0.015)	(0.015)	(0.017)	(0.014)	(0.016)
Small *i*-Small *j*	0.010	-0.015	0.005	0.007	0.001	0.002	-0.001	-0.002	0.009	0.005
	(0.031)	(0.017)	(0.030)	(0.032)	(0.031)	(0.028)	(0.029)	(0.028)	(0.030)	(0.029)
Large *i*-Large *j*	0.024*	0.020	0.026*	0.027*	0.023	0.026*	0.021	0.030**	0.026*	0.024*
	(0.014)	(0.014)	(0.014)	(0.014)	(0.016)	(0.014)	(0.014)	(0.015)	(0.015)	(0.014)
(SMEs) Hierarchical efficiency *ij*	0.033***	0.035***	0.032***	0.027***	0.041***	0.035***	0.037***	0.034***	0.030***	0.035***
	(0.012)	(0.012)	(0.012)	(0.010)	(0.013)	(0.012)	(0.012)	(0.013)	(0.011)	(0.012)
Foreign *i*-Foreign *j*	0.056***	0.065***	0.064***	0.064***	0.070***	0.065***	0.057***	0.079***	0.063***	0.066***
	(0.015)	(0.017)	(0.018)	(0.017)	(0.019)	(0.017)	(0.015)	(0.016)	(0.017)	(0.017)
Domestic *i*-Domestic *j*	-0.011	0.003	-0.002	0.006	-0.007	-0.001	0.001	-0.002	0.001	0.001
	(0.012)	(0.017)	(0.017)	(0.017)	(0.016)	(0.016)	(0.019)	(0.017)	(0.017)	(0.017)
Number of observations	6,050	5,972	6,026	6,072	5,480	6,126	5,942	5,582	5,532	5,370
Pseudo R^2	0.224	0.234	0.235	0.234	0.231	0.227	0.231	0.228	0.245	0.232

Sources: BEPS II, BEEPS V, BankScope.

Note: This table reports estimates from sample-weighted probit regressions similar to those in column 7 of Table 2. In each regression we drop one country from our sample. The dependent variable is a dummy that is 1 if bank *i* perceives bank *j* as one of its three main competitors for lending to SMEs; and 0 otherwise. Appendix Table A1 contains all variable definitions. Robust standard errors are clustered by country and shown in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% level.

Table A8: Robustness: measuring competition by the top 2 instead of the top 3 main competitors

	Dependent variable: Dummy =1 if bank i perceives bank j as a top 2 competitor					
	Sample-weighted probit					
	SMEs			Large Firms		
	[1]	[2]	[3]	[4]	[5]	[6]
Intensive branch overlap *ij*	0.034***	0.083***	0.082***	0.038***	0.105***	0.104***
	(0.004)	(0.013)	(0.013)	(0.006)	(0.012)	(0.012)
Extensive branch overlap *ij*	0.078***	0.203***	0.203***	0.051***	0.144***	0.142***
	(0.009)	(0.018)	(0.019)	(0.008)	(0.028)	(0.027)
Local branch density *i*	-0.040***	-0.095***	-0.095***	-0.034***	-0.093***	-0.093***
	(0.005)	(0.010)	(0.010)	(0.004)	(0.009)	(0.010)
Small *i*-Small *j*	0.009	0.010	0.010	0.007	0.029	0.027
	(0.008)	(0.023)	(0.023)	(0.009)	(0.031)	(0.032)
Large *i*-Large *j*	0.007*	0.021**	0.021**	0.005	0.010	0.010
	(0.004)	(0.011)	(0.011)	(0.004)	(0.011)	(0.011)
Hierarchical efficiency *ij*		0.021**	0.020**		-0.005	-0.007
		(0.008)	(0.008)		(0.011)	(0.009)
Relation *i* - Relation *j*			0.016*			0.002
			(0.008)			(0.015)
Transaction *i* - Transaction *j*			-0.018**			-0.013
			(0.008)			(0.008)
Foreign *i*-Foreign *j*	0.013***	0.034***	0.032**	0.019***	0.040***	0.040***
	(0.005)	(0.012)	(0.013)	(0.007)	(0.014)	(0.014)
Domestic *i*-Domestic *j*	0.004	-0.003	-0.001	0.005	0.002	0.002
	(0.006)	(0.013)	(0.013)	(0.005)	(0.015)	(0.015)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank *i* fixed effects	No	No	No	No	No	No
Number of observations	14,882	6,182	6,182	14,882	5,670	5,646
Pseudo R^2	0.242	0.202	0.205	0.240	0.222	0.220

Sources: BEPS II, BEEPS V, BankScope.

Note: This table reports estimates from sample-weighted probit regressions. The dependent variable is a dummy that is 1 if bank *i* perceives bank *j* as one of its two main competitors for lending to SMEs (columns 1-3) or large firms (columns 4-6); and 0 otherwise. Appendix Table A1 contains all variable definitions. Robust standard errors are clustered by country and shown in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% level.