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Close Competitors? Bilateral Bank Competition and Spatial Variation in Firms' Access to Credit

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JEL Classification: F36, F65, D22, D40, G21, R11, R30, R51

Keywords: Bilateral bank competition, geography of banking, credit constraints, small-business lending

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Close Competitors? Bilateral Bank Competition and Spatial Variation in Firms' Access to Credit*

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November 2021

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1 Introduction

The process of financial globalization over the past decades has had a profound impact on banking sectors across the world. Especially in many emerging markets, banking sectors have not only become more competitive (Claessens, Demirgüç-Kunt and Huizinga, 2001) but also more diverse in terms of ownership, organizational structure, and lending techniques. Importantly, these developments did not play out evenly within countries but instead resulted in a geographically variegated pattern of bank branches. Towns and cities continue to differ not only in the number of branches present, but also in terms of the size, ownership, and organizational complexity of the banks that these branches belong to. The ability of firms to access credit remains strongly dependent on this local banking variation (Pollard, 2003).[1]

Against this background, we investigate the causes and consequences of bilateral bank competition. Despite its theoretical importance (Hotelling, 1929; Salop, 1979) and practical relevance, bilateral competition in banking has—as far as we know—not yet been measured directly or analyzed empirically. Our focus is on emerging Europe, a financially liberalized region with substantial variation in local bank competition—both between and within countries. As in many other emerging markets, the business landscape remains heavily dominated by small and medium-sized enterprises (SMEs), which—in the absence of well-developed capital markets—depend on banks for most of their external funding. This makes the region an ideal testing ground for our purposes.

Our analysis proceeds in two distinct but closely related steps. Because the extant literature is largely silent about how banks identify competitors, we first ask the simple question: Why does bank A regard bank B as a close competitor but not bank C? To answer this question, we break new ground by extracting hitherto unavailable information on inter-bank competition from 379 face-to-face interviews with the 'ultimate bank insiders': their CEOs. We use these unique data to gauge which characteristics make a bank more likely to be

[1] See, for instance, Canales and Nanda (2012) for evidence from Mexico; Popov and Udell (2012) and Beck, Degryse, De Haas and Van Horen (2018) for evidence from emerging Europe; and Lee and Luca (2019) for international evidence.

identified as a key competitor by other banks in the same country. This allows us to create a new competition metric that accounts for the fact that the intensity of competition varies significantly across bank pairs. For example, our metric can capture the strategic—possibly multi-market—interactions between banks when dealing with a multitude of customers. This first part of our analysis shows that banks are more likely to identify other banks as key competitors when a potential competitor is foreign owned or has fewer hierarchical layers and when their branch networks overlap more across space. In the market for SME lending (but not in the corporate lending market) relationship lenders also compete more intensively with each other than do transaction lenders.

After having identified the main drivers of bank competition at the bank-pair level, the second part of our analysis investigates the consequences of bilateral bank competition at the level of individual firms located in villages, towns and cities (henceforth: 'localities') across 20 emerging markets. We examine empirically to what extent the intensity of local bilateral bank competition is structurally related to small firms' credit constraints. We conjecture that even if two localities contain the same number of banks with the same market shares, the intensity of local bank competition may still differ markedly 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 to similar firms in localities where branches belong to non-competing banks.

This second part of our analysis links our data on banks' perceptions of their key competitors to newly collected and comprehensive information about the geographical location of these banks' branches in their country of incorporation. We also match this information with firm-level data from the EBRD–World Bank's Business Environment and Enterprise Performance Survey, Round V (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 locality level, the impact of bilateral competition on firms' credit constraints.

Using this empirical setup, we show that more intense bilateral bank competition at the locality level actually *increases* small firms' credit constraints. We interpret this striking finding to indicate that local bank competition can impede the formation of long-term lending relationships with such firms. The richness of our data allows us to control for a battery of firm, bank, and locality covariates. The estimated coefficient on bilateral bank competition is reassuringly stable when we saturate our baseline specification with additional variables that control for within-country variation in regional economic growth and for local credit-market variation in bank size, ownership, capitalization, and funding structure. Our results are also robust to different ways of clustering the standard errors and to a two-step Heckman model that accounts for firms' selection into the credit market.

Our paper makes three key contributions. First, we directly address an important unsettled issue in the literature: whether bank competition promotes or impedes credit availability for small businesses. 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).

Other contributions, however, 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 subsidize 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 not to leave 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

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

competition may ease access to credit (Boot and Thakor, 2000). If competition incentivizes 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.

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 measure of the intensity of bank competition as perceived by banks themselves. We then horserace this new competition metric at the locality level (and across 20 emerging markets) against more conventional measures. We show that our bilateral bank competition measure has substantial explanatory power over and beyond such measures. In doing so, we also contribute to recent work showing how financial liberalization and other market-oriented reforms have not automatically led to better borrowing terms in emerging markets (Brock and Suarez, 2000). The ability of financial reforms to unleash competitive forces instead depends crucially on national institutional endowments (Delis, 2012). We show how, keeping such country-level endowments constant, within-country variation in local competition at the bank-pair level further shapes firm-level credit outcomes.

Second, we contribute to the literature on multimarket contact in banking. Banks that compete in multiple localities may fear that aggressive competition in one area leads 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

[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 U.S. airline industry.

(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. In line with the latter results, Levine, Lin, and Wang (2020) find that pre-deal geographic overlap of U.S. banks' branch networks increases the probability that two banks merge and boosts cumulative abnormal returns after their merger.

Our contribution here is threefold. First, we use our data on the geographical location of bank branches to construct (within-country) 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. 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. This literature shows that there are stark geographical differences in firms' ability to access bank credit, even in an increasingly digitalized world (Guiso, Sapienza and Zingales, 2004; Lee and Luca, 2019; Granja, Leuz and Rajan, 2021). A number of country-specific papers show how local variation in the number and type of lenders can explain spatial variation in credit constraints. For Russia, Berkowitz, Hoekstra, and Schoors (2014) show that the regional presence of privatized banks has contributed to local financial development but, on average, not to more local economic growth. Growth only benefited in regions where newly privatized banks are no longer connected to politicians and where property rights are relatively well protected. In such regions, bank branches help firms to finance product innovation and to become more productive (Bircan

and De Haas, 2020).[4] Berger, Miller, Petersen, Rajan and Stein (2005) find for the U.S. that decentralized 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 decentralized banks to lend to small firms can be conditional on local bank competition. If the local market is uncompetitive, decentralized banks may abuse their market power and restrict credit. Relatedly, Presbitero and Zazzaro (2011) find for Italy that when local markets are dominated by decentralized banks, stronger inter-bank competition promotes relationship lending. For the UK, Zhao and Jones-Evans (2017) show that small firms find it more difficult to access credit when nearby bank branches are owned by relatively distant headquarters.

While we also investigate how bank organization shapes bank 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. Giannetti and Ongena (2012) show that while foreign banks in this region are more likely to lend to large and foreign-owned firms, their entry indirectly improves credit access for all firm types. Popov and Udell (2012) qualify this result by showing that during the global financial crisis, firms in localities with financially weaker foreign banks had greater difficulty in accessing credit. Relatedly, Ongena, Popov and Udell (2013) find that 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 across localities throughout emerging Europe.

We proceed as follows. The next section describes the different data sources we combine,

[4] Lee and Brown (2016) find for the UK that innovative firms in relatively peripheral areas are more likely to be credit constrained.

after which Section 3 presents our methodology. Sections 4 and 5 then discuss our empirical results and several robustness tests, respectively. Section 6 concludes.

2 Data and variable construction

This section introduces the data we combine to, first, determine the drivers of bilateral bank competition and, second, to gauge the impact of bilateral bank competition on firms' credit constraints. Our identification rests on joining three key pieces of information: bank-pair level data on the intensity of bilateral bank competition; data on individual firms' credit constraints; and data on the bank branches near firms. We now discuss these in turn.[5]

2.1 Data and variables at the bank-pair and bank level

To measure competition at the bank-pair level, we turn to the 2nd Banking Environment and Performance Survey (henceforth: BEPS II) undertaken by the EBRD and Tilburg University.[6] As part of this unique survey, senior financial consultants—each with considerable first-hand banking experience—conducted in-depth, face-to-face interviews with bank CEOs. The interviews followed a standardized survey instrument and were carried out in 2012.

The BEPS II research design covers both large and small banks. The aim was to survey banks that jointly represent at least 95 percent of all bank assets in each country.[7] To arrive at this sample, a list was obtained from each country's central bank with all savings, commercial, and cooperative banks (Appendix Table A3, column 1). By country, these banks were then ordered by total assets and, moving down the list, banks were added to

[5] Table 1 and Appendix Table A1 provide summary statistics and variable definitions, respectively, while Appendix Table A2 provides a correlation matrix.

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

[7] In case of multinational banks, each subsidiary is treated as an independent (foreign-owned) bank. For example, the Italian bank UniCredit operates subsidiaries in several countries. Rather than interviewing the Italian CEO of UniCredit, the survey team separately interviewed the CEOs of the UniCredit subsidiaries in Bosnia and Herzegovina, Bulgaria, Czech Republic, Estonia, Latvia, Lithuania, Romania, Serbia, Slovakia, and Slovenia.

the sampling frame until an aggregate market share of at least 95 percent was reached. The resulting frame consists of 496 banks in the 20 countries in our data set (Table A3, column 3). Out of this sampling frame, 379 CEOs were successfully interviewed (Table A3, column 4), a relatively high success rate of 76.4 percent. These banks represent 80.1 percent of all bank assets in the 20 countries.

As part of the BEPS II survey, banks were asked to divulge the identity of their three main bank competitors for SME lending as well as lending to corporate clients.[8] The survey 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 used in an aggregate and anonymized format. [...] What are the names of your three main bank competitors (in order of decreasing importance) in SME lending [corporate lending]?"*

To use the answers to this question, we first generate all possible bank pairs in a country (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.[9] We construct separate variables for bilateral competition in lending to SMEs (<250 employees) and to corporate firms (250 or more employees). The summary statistics in Table 1 show that in 6 percent of all the bank pairs in our data set, a bank identifies the other bank as a close competitor. This holds for both the SME and the corporate segment.

We then turn to the potential determinants of bilateral bank competition. We 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-kilometer radius and count the number of branches of bank j within that circle.[10] We calculate an average value for

[8]Non-bank lending, especially to SMEs, is still relatively scarce in most of emerging Europe (European Commission, 2012; EBRD, 2015).

[9]We also create an indicator of whether, conversely, bank j regards bank i as a key competitor *(Reciprocal competition)*. Banks could only choose banks in the same country as one of their main competitors. To revisit the example in footnote 7, we paired the survey responses of the CEO of UniCredit Bulbank with the responses of all other Bulgarian bank CEOs to construct Bulgarian bilateral competition measures.

[10]This radius is based on previous work that measures the median distance between SME clients and the branches from which they borrow (see footnote 15). We assume this distance is also a reasonable proxy for

bank i and define this as the intensive branch overlap between bank i and bank j. The average bank 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-kilometer 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 characterize the bank types in each pair. An advantage of our survey data is that we can observe a number of distinct bank characteristics for which an earlier literature often had to use proxy measures or had to make strong assumptions to categorize banks. This is helpful information to have as, for instance, in the model of Park and Pennacchi (2009) large multimarket banks are assumed to use standardized 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 fueling 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 categorize banks as either *Small* or *Large* depending on whether the number of their 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 create bank-pair variables that indicate whether both banks are small (*Small i–Small j*) or large (*Large i–Large j*). This is the case in 13 and 36 percent of the bank pairs, respectively (Table 1). All other pairs are mixed-size combinations.

We also classify each bank as either *Foreign* (at least half of its equity is in foreign hands)

the threshold below which bank branches compete with each other.

or *Domestic* to analyze whether banks perceive certain types of owners as more threatening than others. In addition, we categorize banks by their main lending technique(s) and label them as *Relationship bank* and/or *Transaction bank*. A substantial literature has developed on banks' comparative advantages in lending to specific clients. Our data allow us to test, in a novel way, some of the conjectures put forward in this literature. In particular, earlier work has shown that domestic banks can possess a comparative advantage in reducing information asymmetries vis-à-vis local firms (Mian, 2006; Beck, Ioannidou, and Schäfer, 2016). In this view, domestic banks have a deep understanding of local businesses and base their lending decisions on 'soft' qualitative information (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 standardized decision methodologies (Berger, Klapper and Udell, 2001).[11] Yet, recent contributions argue that foreign banks can successfully apply transaction technologies that use hard information, such as credit scoring, to lend to SMEs (Berger and Udell, 2006). Indeed, Beck, Degryse, De Haas and Van Horen (2018)—also using the BEPS II survey—show that among *both* domestic and foreign banks, large proportions can be characterized as relationship lenders. Banks' ownership and their lending techniques may thus be increasingly orthogonal.

Table 1 shows that 63 percent of the banks in our data set are foreign. We create bank-pair variables that indicate whether both banks are foreign *(Foreign i–Foreign j)* or domestic *(Domestic i–Domestic j)*. This is the case in 34 and 19 percent of the bank pairs, respectively. The other bank pairs are of opposing ownership type. To characterize banks' lending technologies, we follow Beck et al. (2018) and use BEPS II question Q6. This question 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). Al-

[11] Relationship lending—repeatedly interacting with clients to obtain and exploit proprietary borrower information—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.

though, as expected, almost all banks find building a relationship (knowledge of the client) of some importance when lending, Table 1 shows that 59 percent of the banks find building a relationship "very important", while the rest considers it only "important" or "neither important nor unimportant". This is 77 percent for transaction lending. Similar questions were asked about lending techniques for corporate clients. We categorize banks that think that building a client relationship is "very important" as relationship lenders and those that consider fundamental and cash-flow analysis to be "very important" as transaction lenders.[12] These categories are not mutually exclusive. Using this information, we create dummies for each bank pair where both banks indicate they are relationship lenders *(Relation i–Relation j)* or transaction lenders *(Transaction i–Transaction j)*.

Next, we create a variable that indicates whether bank j is a relatively efficient lender to SMEs compared to bank i (we create an analogous variable for lending to large firms). We measure whether at bank j loan applications proceed through fewer hierarchical levels than at bank i. We use BEPS II question Q4: *"For first-time SME customers, how many hierarchical layers are typically involved in making a lending decision? By hierarchical layer we mean an organizational 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 decentralized banks deal more effectively with soft information whereas centralized, 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 is 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 (Table 1). Variation across countries is substantial too and ranges from an average of 1.9 hierarchical layers involved in SME loan approvals in the Czech

[12]Beck et al. (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.

Republic to 3.4 in Albania. We define *Hierarchical efficiency* as a dummy that is one 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 processes loan applications through fewer hierarchical layers than bank i itself.

Lastly, we also measure 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-kilometer radius around a branch of bank i. We call this variable *Local branch density* and use it to control for the fact that certain banks are located in more densely banked areas and are therefore surrounded by more branches on average. In addition, for each potential competitor bank j we determine its *Capitalization* (equity over total assets, 2011), use of *Wholesale funding* (loans over customer deposits, 2011) and its net *Interest margin* in 2011. We expect that banks that are better capitalized, have easier access to wholesale funding, and operate with a tighter interest margin are more likely to be perceived as key competitors. Finally, a separate variable *Customer overlap* indicates whether both banks lend to SMEs (or, alternatively, to large firms). This is the case in 86 (80) percent of our bank pairs.

2.2 Data and variables at the firm level

In the second part of our analysis, we move from the bank-pair level—where we analyze the causes of bilateral bank competition—to the level of individual firms across localities (recall that these are the villages, towns, and cities in each of the countries). This allows us to estimate the consequences of bilateral bank competition at the grassroots level. Our firm data come from the BEEPS V survey conducted in 2012 (that is, in tandem with the BEPS II bank survey). BEEPS V enables us, first of all, to measure credit constraints among almost 6,000 firms across the 20 emerging European countries that we focus on. Face-to-face interviews were held with the owner or main manager of each firm. The purpose of

the survey is to gauge the extent to which different features of the business environment (including access to finance) pose obstacles to firms' operations. The survey also records a large number of firm characteristics including, importantly, its geographical location.

A strength of the BEEPS V survey is that it provides a statistically representative picture of a country's SME population. The design starts with a comprehensive sample frame (typically the business registry) of all formal private-sector firms with at least five employees. Uniform sampling is then applied to minimize measurement error and to maximize cross-country comparability. Three stratification criteria are used: sector of activity, firm size, and geographical location. Size stratification divides the population into small (5-19 employees), medium (20-99) and large firms (100 or more). The design also ensures the sample adequately represents the sectoral and geographical distribution of a country's SME population.

By combining answers to various BEEPS V 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 needed a bank loan (*Loan demand*, 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).[13] 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 favorable"*; *"Collateral requirements are too high"*; *"Size of loan and*

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

maturity are insufficient"; or *"Did not think it would be approved"* to K17. This strategy allows us to 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 credit). Table 1 shows that 37 percent of the firms were credit constrained in 2012. Behind this average lies substantial variation across and within countries.

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 more or fewer employees than the country median); 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.

2.3 Data and variables at the locality level

For each firm in our data set, we create variables that describe the local credit market in which the firm is based. To do so, we first carefully match our data on firm location with information on all bank branches that surround these firms. This information was hand-collected as part of BEPS II by either directly contacting banks or by downloading data from bank websites and subsequently double-checking them with the bank. Our data provide us with a near complete picture of the branching landscape in 2011: the year before the firm and bank surveys took place. The firm and branch data thus match closely in terms of timing. Appendix Table A3 shows that in total the geo-coordinates of 56,445 branches operated by 422 banks were collected. These branches represent 96.8 percent of all bank assets in the sample countries and include the branches of the 379 banks whose CEOs were interviewed as part of BEPS II.

We connect the firm and branch data in two ways. First, we make sure that the names of

localities (towns and cities) are spelled consistently in both data sets and then match firms and branches by locality. For instance, we link all BEEPS firms in the second largest city of the Czech Republic—Brno—to all bank branches in Brno.[14] The (plausible) assumption is that a firm has access to all branches in the locality where it is incorporated. Second, we draw circles with a radius of 5 or 10 kilometers around the geo-coordinates of each firm and link the firm to only those branches inside that circle.[15] On average, a locality in our dataset contains 21 bank branches whereas a circle with a 5 (10) kilometer radius contains 18 (30) branches. In our baseline 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).

Our main explanatory variable at the locality level is *Bilateral competition*. This is the number of bank pairs where bank i perceived bank j as one of its three main competitors in SME (or corporate) lending divided by the total number of possible bank i-bank j pairs in the locality. For example, suppose three banks (A, B, and C) are located in a town. Each of these banks can then form a pair with the other two, so there are six pairs in total. For each pair we determine whether bank i identifies bank j as a key competitor. Suppose bank A considers bank B to be a main competitor while bank B considers bank C to be one. At the same time, bank A does not consider bank C to be a competitor and neither does bank B consider bank A to be one. Finally, bank C perceives neither bank A nor B to be a main competitor. Bilateral competition then takes the value of 1/3 (2 out of 6) in this locality.

Because not all banks were surveyed in BEPS II, we do not always have information on the competitor perceptions of all local banks. We therefore use our data to estimate a

[14] 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 impact any of our results.

[15] 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). Empirical evidence from Belgium, the US, and Italy (Alessandrini, Presbitero, and Zazzaro, 2009) is consistent with this heuristic. For instance, the median Belgian SME borrower in Degryse and Ongena (2005) is located 2.5 kilometers (1.6 miles) from the lending bank's branch. In the US data of Petersen and Rajan (2002) and Agarwal and Hauswald (2010) this median distance is 3.7 kilometers (2.3 miles) and 4.2 kilometers (2.6 miles), respectively.

probit model in which we predict for all banks (whether we observe their competitor choice or not) whom they regard as their key competitors.[16] We then use these predicted values to construct our bilateral competition variable (while bootstrapping the standard errors). We also calculate versions of *Bilateral competition* where we weigh with the number of branches of either bank i ('perceiver') or bank j ('perceived').

Table 1 shows that on average around 25 percent 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 market. Yet, variation is substantial as this percentage varies between 2 and 70 percent. Figure 1 shows a heat map of the intensity of 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 investigate how bank competition affects the credit constraints experienced by small businesses.

We also create several control variables that characterize credit markets at the locality level. *Foreign banks* measures the share of branches in a locality that are owned by foreign banks. To control for banks' dependence on *Wholesale funding*, we calculate the branch-weighted average, across all banks in a locality, of net loans over customer and short-term funding. We also create an equivalent measure for foreign-bank subsidiaries only (*Foreign bank wholesale funding*) and for their parent banks (*Foreign bank wholesale funding (parents)*). As in Popov and Udell (2012), we also control for bank capitalization. We create two versions of this variable: one where we measure the Tier 1 ratio of all banks in a locality (both domestic and foreign banks) and one where we take the Tier 1 ratio of domestic banks but the Tier 1 ratio of the parent bank in the case of foreign banks. We also calculate the share of branches owned by *Relationship banks*, *Small banks*, and *State banks*.

[16] This prediction is based on the probit specification in column (2) of Table 2 but we obtain similar results when using any of the other specifications in that 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. We use the model to predict bilateral competition (without using any threshold values) and then aggregate these predictions at the locality level.

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.[17] We also calculate a local Lerner (1934) index.[18] 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.[19] 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.

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. 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

[17] We define the HHI as $\sum_{k=1}^{K_i} \left(\#branch_k / \sum_{k=1}^{K_i} \#branch_k \right)^2$ where Ki 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.

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

[19] We weigh the $Bilateral\ competition_i$ and $Bilateral\ competition_j$ measures using the number of branches of the paired banks in a particular locality. By doing so, we take into account that the competitive effect of a bank pair with many branches in a locality is higher than if the banks only have one branch each. In the latter case, the competitive effect of the two branches that belong to a competitive bank pair gets watered down by the many other non-competing branches in the locality. For the same reason, we also weigh the Lerner index and Tier 1 ratio by the number of branches in a locality. However, *HHI* is not branch weighted because this variable already uses the number of branches of a bank in a locality as its local market share. Similarly, *Bank density* and *Branch density* are not weighted.

between competition and density.

In other words, while branch density can 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 data suggest is that these smaller banks are often niche players that are less frequently identified as competitors by key banks and that themselves not always identify those key banks as their main competitors.

3 Methodology

The first part of our analysis is at the bank-pair level and explores the determinants of bilateral bank competition. The second part then views bilateral bank competition through the lens of economic geography. It investigates how local variation in bilateral bank competition affects the credit constraints of individual firms across towns and cities.

3.1 Determinants of bilateral bank competition

We first 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:

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

where subscripts i and j denote the banks in pair ij in country k. The dependent variable *Competitor* is a dummy 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 bank is identified as a key competitor is lower, by weighing the dependent variable by the number of banks in that particular 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*, *Capitalization*, *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 that is one if the banks identify each other as a main competitor; a *Customer overlap* dummy that is one 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 within-country (GADM) region.[20]

3.2 Bilateral bank competition and firms' credit constraints

In the second step of our 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 thus assume that the banking landscape near firms imposes an exogenous geographical limitation on the banks that firms have access to. We estimate the baseline model:

$$Y_{flks} = \beta_1 X_{flks} + \beta_2 L_{lk} + \beta_3 BilateralCompetition_{lk} + \beta_4 D_k + \beta_5 D_s + \epsilon_{flks} \qquad (2)$$

where Y_{flks} is a dummy variable equal to 1 if firm f in locality l of country k in industry s is credit constrained (rejected or discouraged, see Section 2.2), and zero otherwise. Our main independent variable of interest is *Bilateral competition*, the share of bank branches in locality l of country k that belong to banks that have identified another bank in the locality as a core competitor. We are interested in β_3 which can be interpreted as the impact of the intensity of local bank competition on firms' credit constraints. X_{flks} is a matrix of

[20]To ensure cross-country comparability in administrative classification, we use the GADM database of global administrative areas. This high-resolution spatial database maps the boundaries of administrative areas within countries. The granularity of these areas varies by country and we use the level 1 division, which equates provinces or similar administrative regions, to cluster. Appendix Table A8 shows that our results are robust to using other clustering approaches.

firm covariates to control for observable firm-level heterogeneity: *Large firm*, *Public firm*; *Proprietorship*; *Exporter*; *Audited firm* and *Mature firm*. L_{lk} is a matrix of other credit market characteristics in locality l of country k, including the *HHI*, *Branch density* or *Bank density*, and the local *Lerner index*. L_{lk} also includes regional GDP growth during the global financial crisis. To construct this variable, we first link each firm locality to its administrative region. To ensure cross-country comparability in classification, we use the GADM database of global administrative areas (cf. footnote 20). Following Gennaioli, La Porta, Lopez de Silanes, and Shleifer (2014), we then measure regional output growth over the period 2007-09—using data from Eurostat as well as regional statistical offices—and add this control variable throughout our analysis. Lastly, we further saturate the model with country and industry fixed effects, D_k and D_s, with the latter defined at the ISIC Rev 3.1 2-digit level, to absorb all (un)observable variation at these aggregation levels.

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 com-

petitor. 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 percent higher likelihood of bank i identifying bank j as a main competitor. This number is 4.4 percent for a standard deviation increase in the extensive branch overlap. This finding is 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 to mixed-size bank pairs, we do not find that small banks are more likely to regard other small banks as key competitors.[21] 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 coefficient for the *Foreign i–Foreign j* dummy variable remains precisely estimated, and even increases in size, when controlling for bank balance

[21] This contrasts with similar evidence from surveys in the U.S., where local small banks are considered as top competitors by majorities of both small and large banks (FDIC, 2018). This likely reflects the dominance of community banks in lending to small businesses in the U.S. In contrast, in both Western and emerging Europe, local community banks play a much smaller role and most small business lending is conducted by banks that operate across (large parts of) a country as a whole.

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 better 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 percent 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 one 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 percent.

In column (8), we distinguish between banks with different lending techniques. We include dummies that are one 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 percent higher (3.2 percent lower) than in case of bank pairs that use different lending techniques. This result is in line with earlier studies that find that relationship lending techniques are more appropriate when lending to relatively opaque SME clients.[22] We show that by using such techniques banks indeed become more credible competitors in the market for SME lending.[23]

Lastly, in columns (9) and (10), we add the variables on lending techniques and hierarchical levels (as well as the size and ownership variables). 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 bank 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 to 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 SMEs rather than to corporate clients.

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

[23] The excluded type of bank pairs are the mixed pairs, where one bank is a transaction lender and the other a relationship lender. Compared to such mixed pairs, pairs where both banks are transaction lenders are even less likely to regard each other as a main competitor. Banks are thus less likely to compete with each other for SME clients when neither of them is a relationship lender than when at least one of them is a relationship lender.

4.2 Bilateral bank competition and firms' credit constraints

In Table 4 we move to our empirical analysis at the firm level. We want to establish whether more intense bilateral competition among the banks that surround a firm helps or hinders 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*. The first three columns include our measures of locality-level bilateral bank competition while controlling for a battery of firm covariates as well as industry fixed effects, country fixed effects, and the severity with which the global financial crisis hit the administrative region in which the locality is based. In column (1) we use our baseline *Bilateral competition* measure whereas in the next two columns we use the variant where we weigh with the number of branches of either bank j (the 'perceived' bank, column 2) or bank i (the 'perceiver' bank, column 3). 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 (4) to (7) we use more traditional competition metrics at the locality level: the *HHI* (column 4), *Branch density* (column 5), *Bank density* (column 6) and a *Lerner index* (column 7). 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 (8) to (10), we horse race the most commonly used measure, the local *HHI*, and the branch density measure against the variants of our new *Bilateral competition* measure. We find some statistically 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 statistically significant in two out of three specifications. At the same time, the *Bilateral competition* measure continues to be a strong and robust predictor of local credit constraints for such firms. The results in column (8) indicate that a one standard deviation increase in local bilateral bank competition is associated with an increase of 8.7 percentage points in the likelihood that a firm is credit constrained, all else equal. This is a substantial effect given that 37 percent of all firms in our data set is credit constrained.

Together these results indicate that SMEs are more likely to be credit constrained if their local credit market is less concentrated and characterized by bank pairs that are actively competing with each other. This is strong evidence against the traditional market-efficiency view and in favor 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 or more 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.

The impact of *Bilateral competition* on credit constraints is much bigger for small than for large firms. This holds for all three versions of our bilateral competition variable (columns 1-3). Unreported Wald tests confirm that the sum of the two coefficients is in most columns not significantly different from zero. Hence there is no strong effect of local bilateral bank competition on access to credit for large firms. This is also true when we add the locality-level *HHI* and *Branch density* and interact these variables with firm size too (columns 4-6).

5 Robustness

5.1 Additional locality-level controls

Tables 4 and 5 showed that the size and the statistical significance of the coefficient for *Bilateral competition* was robust not only to the inclusion of various firm-level covariates, while controlling for regional economic growth, but also to the inclusion of other proxies for credit market competition and concentration at the locality level. In Table 6 we show that the sign, size, and statistical significance of the effect of *Bilateral competition* are also robust to saturating the specifications with additional key characteristics of locality-level credit markets. In particular, we want to capture any possible lingering effects of the global financial crisis on firms' credit constraints and that may correlate with bilateral bank competition across localities.

The first three columns control for the (branch-weighted) average funding structure of banks in a locality. In column (1), we add banks' average dependence on wholesale funding. Earlier work on a global sample of emerging markets has shown that at the height of the global financial crisis, banks that depended more on (relatively volatile) wholesale funding had to deleverage more (De Haas and Van Lelyveld, 2014). In columns (2) and (3), we control for the local average Tier 1 ratio. We create two versions of this variable: one where we measure the Tier 1 ratio of all banks in a locality (that is, both domestic and foreign banks) and one where we take the Tier 1 ratio of domestic banks but the Tier 1 ratio of the *parent* bank in the case of foreign banks. Popov and Udell (2012) find for the early stages of the global financial crisis that firms in emerging Europe were more likely to be credit constrained in localities where (foreign) banks were less well capitalized. We find results for neither local wholesale funding nor bank capitalization. This suggests that several years after the crisis, when banks had a chance to recapitalize and to wean themselves off wholesale funding, locality variation in balance-sheet strength was no longer a first-order determinant of local firms' access to credit.

In column (4), we control for the local share of branches that are owned by foreign banks. Such branches may have had to cut lending particularly strongly in the wake of the global financial crisis as foreign banks deleveraged mainly abroad in order to protect the supply of credit in their home market. Indeed, De Haas and Van Lelyveld (2014) show that at the height of the crisis, both bank funding and ownership mattered for lending stability. That is, foreign banks were not simply different because of a different balance sheet structure but also because they were part of a multinational bank holding. We find no evidence, however, that local bank ownership still determined access to credit several years after the global financial crisis. The same holds when we focus on the pre-crisis reliance of foreign-bank subsidiaries (column 5) or foreign-bank parent banks (column 6) on wholesale funding.[24]

In column (7), we look at the local role of bank size rather than ownership. Our variable of interest here is *Small banks*, the local share of banks that belong to banks that have a relatively small branch network. Berger, Bouwman, and Kim (2017) use survey data on U.S. small firms' financial constraints and find that small banks have a comparative advantage in alleviating financial constraints of small firms, especially during adverse economic conditions. The authors interpret this advantage as reflecting small banks' superior ability in relationship lending. We do not find such a role for smaller banks. This may reflect that we study a period of relatively stable economic growth across our sample countries. More importantly, we assess the local role of small banks *over and above* their role in determining local bilateral competition. Our locality-level bilateral competition measure is based on predictions that already capture the effect of bank size and their use of relationship lending.

Next, column (6) controls for the local share of relationship lenders. Here we do find a separate effect of relationship lending on credit constraints over and above that embedded in the bilateral competition measure. In line with Beck et al. (2018), we find that the local

[24]We also experimented with various other proxies for how much the global financial crisis affected foreign banks in particular. These include these banks' 2010 level of non-performing loans (NPLs); the increase in NPLs between 2007 and 2010; and asset growth between 2007 and 2010. None of these locality-level proxies for the health of foreign banks yields statistically significant coefficients and in all cases our baseline results for *Bilateral competition* remain virtually unchanged.

presence of relationship lenders clearly alleviates the credit constraints of small businesses.[25] Lastly, in column (7) we control for the share or local branches owned by state-owned banks. We find no statistically significant relation between local state ownership of bank branches and firms' credit constraints.

Importantly, the results in Table 6 show that these various other locality characteristics—either independently or, as in column (10), jointly—do *not* explain away the effect of local bilateral bank competition on firms' credit constraints. If anything, a comparison of the first and the last column shows a slight increase in the coefficient. This indicates that previously unobserved local variation in bank ownership and funding structures may have led to a small underestimation of the true relationship between bilateral bank competition and credit constraints. This is reassuring.

5.2 Other robustness tests

Table 7 provides a number of other robustness exercises. Both the BEPS II and the BEEPS V survey were conducted by experienced and well-trained teams from reputable survey firms. During the training sessions for surveyors, great care was taken to develop protocols to maximize the probability that respondents answered truthfully. In line with best practice, surveyors had to fill out a short debriefing survey after each interview in which they had to rate the perceived truthfulness of the answers they received. Only in very few cases did the surveyors indicate that they doubted the veracity of (some) answers given during the survey. In the first three columns of Table 7, we exclude these observations. All our results hold.

Second, we drop all firms located in the largest cities (over 1 million inhabitants) in our data set in order to make sure that such large agglomerations are not driving our results. We note that due to the regional sampling of BEEPS V (cf. Section 2.2), there are many small

[25] We have also experimented with an interaction term between the proportion of relationship lenders in a locality and the bilateral competition measure. We find that there is a negative interaction between both in some specifications and at the 10 percent level of statistical significance. This suggests that relationship lending not only has a direct beneficial impact on small firms' access to credit but may also protect these firms to some extent from the negative effect of intensive local bilateral bank competition.

towns and agglomerations among our localities. Indeed, the most populous size bracket of BEEPS localities consists of towns with fewer than 50,000 inhabitants. In a country like Poland, these include localities such as Grojec (16,674 inhabitants), Lomianki (24,328), Oborniki (18,176), and Sucha Beskidzka (9,295). It is this granular geographic variation in bilateral bank composition and other local credit market conditions that we exploit for identification. The results in columns (4) to (6) confirm that when we exclude larger cities, effectively reducing the sample by 21 per cent, all our results continue to hold at the same levels of statistical significance. Moreover, the estimated coefficient is very stable.

Third, 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 firm population as a whole, 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 variable is *Subsidized*, an indicator variable that is one if the firm in the past three years 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 needs 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 one 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, licenses, and regulations (zero otherwise). *Corruption* is a dummy equal to one if the firm experiences corruption as a moderate, major,

or severe obstacle to its current operations (zero otherwise). Both variables are positively but weakly correlated. While *Informal payment* captures the incidence of bribery, *Corruption* gauges its severity.

Informal payments can be linked to credit demand in two ways.[26] First, costly bribes can directly increase a firm's need for external funding (Ahlin and Pang, 2008). Second, firms aiming to grow (and that at some point need bank credit for this expansion) become 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.

Columns (7) to (12) show the results of the second-stage Heckman regressions.[27] In columns (7) to (9), we present our usual regressions where—similar to the equivalent regressions in Table 4—firms are matched with nearby bank branches based on locality name. As an additional robustness test, we also present columns (10) to (12) 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. The inverse Mill's 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 Representativeness of SME lending in our localities

One may wonder how representative the lending by BEPS II sample banks is of SME lending in general. We note that the SME sample is by design a representative sample of the SME population in each country. Moreover, the BEPS survey aims to cover all banks except for

[26] Qi and Ongena (2009) assess the impact of bribery on credit access (through credit demand and supply) and on firm performance.

[27] 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 percent level.

the very smallest. By construction, the SME lending that we observe in the sample localities should therefore be fairly representative of overall SME lending in a country. To verify whether this is indeed the case, we proceed as follows. First, we get information from the BEEPS survey on the identity of the bank from whom SMEs borrow (for those SMEs that took out a loan in the recent past). Second, for each country we rank these banks so that we get a list of the most common lenders to BEEPS firms. Third, we access the Orbis database, which for a number of countries contains data on firm-bank relationships.

For our sample countries, comprehensive data on firm-bank links is available for Bulgaria, Croatia, Hungary, Serbia, and Ukraine. For these countries, we download this information for all SMEs that report a relationship with a bank. If the SME lending in our BEEPS sample is representative, then the lender ranking based on that sample and the ranking based on all SMEs in Orbis should be similar. Reassuringly, this is indeed the case. Appendix Table A4 shows how the banks that dominate SME lending in our BEEPS sample (odd columns) are the same banks that lend to SMEs in general (even columns). Take Bulgaria as an example. Columns (1) and (2) show that UniCredit Bulbank provided 24.4 percent of all BEEPS SME borrowers with a loan and 21.1 percent of all SMEs in Orbis. These percentages are 15.7 and 11.0 for the second-ranked bank, Raiffeisenbank Bulgaria. The bottom of Table A4 also shows for each country the Spearman's rank-order correlation between both bank rankings. For each country, the correlation is high and statistically strong.

5.4 Alternative credit-constraints measures

In Appendix Table A5, we use two alternative proxies for whether a firm is credit constrained. In Panel A, 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.[28] Similar to the small business survey data used in Berger, Bouwman, and Kim (2011), this

[28] 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*".

variable is a direct managerial self-assessment of financial constraints. As such it is more subjective than our main *Credit constrained* proxy but is available for more firms (as it is not conditional on an explicit manifestation of firm-level credit demand). The regressions in the odd (even) columns are similar to those in Table 4 (5). When we use this alternative dependent variable, the results for the sample as a whole are positive but not statistically significant at conventional levels (odd columns). Yet, when we contrast the role of bilateral bank competition for small versus large firms (in the even columns), the results are similar to those in Table 5. In localities where bilateral bank competition is more intense, small firms themselves perceive access to external finance a more severe obstacle to their daily operations.

Second, in Panel B, we use a dummy that indicates whether the firm currently uses trade credit to purchase inputs. Earlier work has shown that trade credit may be 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).[29] Our results show that in localities with more intense bilateral bank competition, firms are more likely to resort to (potentially expensive) trade credit. This confirms that firms find it more difficult to access regular bank credit in these places.

5.5 Cross-country heterogeneity

Our sample represents a diverse set of twenty emerging markets that differ significantly in terms of population size as well their level of financial and economic development. 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 A6 provides twenty replications of our baseline result from column (7) of Table 2. In each column, we leave out one sample country.

[29] Using detailed data on trade credit from the U.S., Giannetti, Burkart, and Ellingson (2011) paint a more nuanced picture. They show that firm-specific characteristics and bargaining power, even within the same industry, determine contract terms and the cost of trade credit, with many firms receiving comparatively cheap trade credit.

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.

5.6 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 3 main competitors. In Appendix Table A7 we now show similar results based on the top 2 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). 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 2nd Banking Environment and Performance Survey, we provide the first international 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 across space (contrary to the mutual-forbearance theory) and when the potential competitor has more efficient lending procedures, is foreign-owned, and/or applies similar 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-scene insight into bilateral competition between banks as reported in BEPS II provides us with a nuanced view about the benefits and risks of increased bank 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 bank competition as the formation of longer-term lending relationships is hampered.

From a policy perspective, our findings 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.

More generally, our results confirm that (local) geography still has first-order impacts on the ability of firms to access bank credit in a highly globalized world. Most countries in our data set by now operate well-functioning credit registries or bureaus. The ability of all banks to access information about loan applicants in a centralized credit registry, has

increased inter-bank competition on average but could also have reduced the importance of competition at the local level. Our results clearly show, however, that the physical proximity of bank branches continues to have a strong impact on whether banks perceive each other as important competitors or not. This, in turn, is a key determinant of the intensity of interbank competition at the level of individual localities.

From the perspective of empirical research on the geography of finance, 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 recognize 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 spatially 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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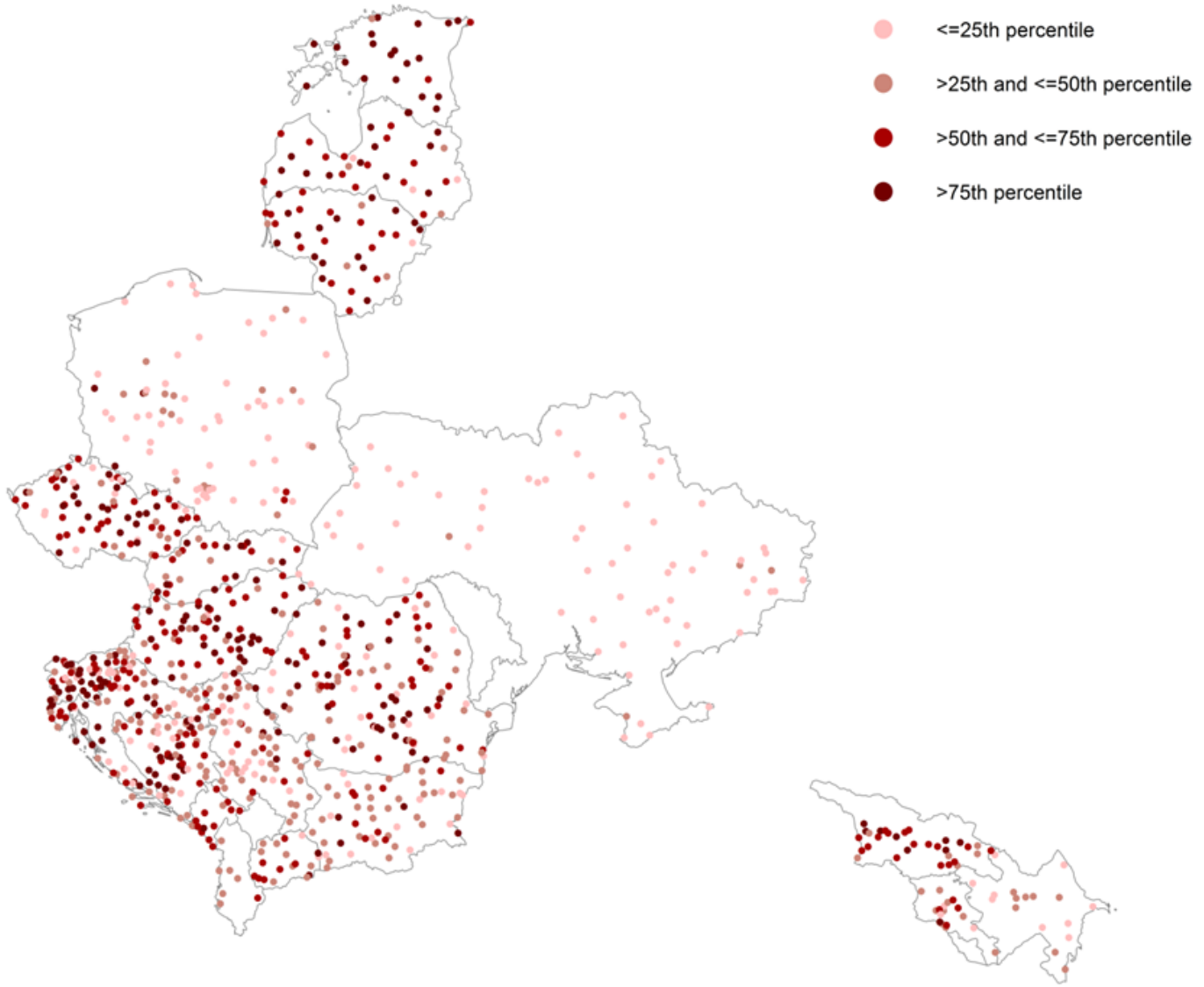
Figure 1: Local Variation in Bilateral Bank Competition across Emerging Europe



Notes: This heat map plots the geographical localities (towns and cities) across the 20 countries in our data set. Each dot represents a locality where at least one sample firm is based. Darker colors indicate localities with a higher proportion of branch pairs owned by banks that identify each other as one of their three main competitors in lending to small and medium-sized enterprises (SMEs).

Table 1: Summary Statistics

Category	Variable name	Obs.	Mean	Median	Std. Dev	Min	P25	P75	Max
Bank level	Local branch density	361	146.42	102.23	136.44	10.26	54.43	173.32	516.00
	Capitalization	374	13.86	12.43	7.63	1.79	8.75	16.81	45.97
	Wholesale	373	85.46	82.44	37.64	10.26	67.60	96.08	276.41
	Interest margin	372	4.79	4.11	3.08	0.15	2.71	5.94	19.69
	Foreign bank	361	0.63	1	0.48	0	0	1	1
	Small bank	361	0.49	0	0.48	0	0	1	1
	Relationship bank	335	0.59	1	0.49	0	0	1	1
	Transaction bank	335	0.77	1	0.42	0	1	1	1
	Bank hierarchy (SMEs)	335	2.32	2.00	0.98	1.00	2.00	3.00	7.00
	Bank hierarchy (Large)	312	2.85	3.00	1.15	1.00	2.00	4.00	7.00
	Number of branches	361	102.60	35.00	337.42	1.00	12.00	91.00	5780.00
Bank pairs$_{ij}$	(SMEs) Bank$_i$ perceives bank$_j$ as competitor	14,882	0.06	0	0.24	0	0	0	1
	(Large) 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) 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	0.00	1.00	5.84	16.30
	Extensive branch overlap$_{ij}$	14,882	0.54	0.54	0.34	0.00	0.23	0.88	1.00
	Small$_i$-Small$_j$	14,882	0.13	0	0.34	0	0	0	1
	Large$_i$-Large$_j$	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) 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) Relation$_i$-Relation$_j$	5,710	0.52	1	0.50	0	0	1	1
	(Large) 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) Customer overlap$_{ij}$	7,200	0.80	1	0.40	0	1	1	1
Locality level	Bilateral competition	910	0.25	0.24	0.11	0.02	0.17	0.31	0.70
	Bilateral competition j	910	0.28	0.28	0.10	0.06	0.21	0.33	0.70
	Bilateral competition i	910	0.25	0.24	0.11	0.02	0.17	0.31	0.70
	Foreign banks	914	0.66	0.71	0.23	0.00	0.50	0.82	1.00
	Wholesale funding	913	130.74	127.58	25.33	57.28	117.09	142.48	290.29
	Tier 1 capital	819	15.41	14.70	3.17	7.65	13.65	17.07	25.67
	Tier 1 capital (parents)	892	12.41	12.04	2.00	6.70	11.25	12.96	22.30
	Relationship banks	884	0.41	0.42	0.22	0.00	0.25	0.55	1.00
	Small banks	884	0.32	0.23	0.32	0.00	0.00	0.53	1.00
	HHI	914	0.19	0.14	0.13	0.04	0.10	0.25	0.50
	Branch density	914	0.15	0.04	0.73	0.00	0.02	0.09	19.03
	Bank density	914	0.04	0.03	0.03	0.00	0.02	0.04	0.50
	Lerner Index	914	0.32	0.33	0.12	-0.32	0.29	0.40	0.58
	Foreign bank wholesale funding	877	126.60	112.18	51.78	54.70	91.11	158.71	495.88
	Foreign bank wholesale funding (parents)	858	142.18	134.65	25.93	32.11	127.02	153.01	248.48
	State banks	914	0.07	0.00	0.12	0.00	0.00	0.10	1.00
Firm level	Credit constrained	2,707	0.37	0	0.48	0	0	1	1
	Credit constrained (subjective)	5,635	0.19	0	0.39	0	0	0	1
	Trade credit	5,246	0.68	1	0.47	0	0	1	1
	Large firm	5,636	0.51	1	0.50	0	0	1	1
	Public firm	5,694	0.03	0	0.16	0	0	0	1
	Proprietorship	5,694	0.09	0	0.28	0	0	0	1
	Exporter	5,694	0.26	0	0.44	0	0	1	1
	Audited	5,520	0.35	0	0.48	0	0	1	1
	Mature firm	5,385	0.53	1	0.50	0	0	1	1
	Loan demand	5,483	0.49	0	0.50	0	0	1	1
	Subsidized	5,694	0.11	0	0.31	0	0	0	1
	Informal payment	5,694	0.08	0	0.26	0	0	0	1
	Corruption	5,694	0.34	0	0.47	0	0	1	1

Notes: 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 SME Lending

Dependent variable: Dummy = 1 if Bank i perceives Bank j as a Top 3 competitor in SME lending

	Sample-weighted probit									Cond. 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)
Capitalization$_j$				-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
Observations	14,882	14,882	14,882	7,222	7,200	7,200	6,182	6,182	6,182	5,704
Pseudo R2	0.264	0.265	0.272	0.226	0.242	0.254	0.232	0.232	0.235	0.274

Notes: 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 one if Bank i perceives Bank j as one of its three main competitors for lending to SMEs; and zero 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 statistical significance at the 1%, 5% and 10% level.

Table 3: Determinants of Bilateral Bank Competition in Lending to Large Firms

Dependent variable: Dummy = 1 if Bank i perceives Bank j as a Top 3 competitor in corporate lending

	Sample-weighted probit									Cond. 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) Reciprocal competition$_{ij}$					0.060***					
					(0.015)					
(Large) Customer overlap$_{ij}$						0.097***				
						(0.010)				
(Large) Hierarchical efficiency$_{ij}$							-0.000		-0.003	-0.178
							(0.013)		(0.011)	(0.216)
(Large) Relation$_i$-Relation$_j$								0.018	0.015	0.296
								(0.021)	(0.021)	(0.374)
(Large) Transaction$_i$-Transaction$_j$								-0.019*	-0.021*	-0.462**
								(0.011)	(0.011)	(0.225)
Capitalization$_j$				-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
Observations	14,882	14,882	14,882	7,222	7,200	7,200	5,670	5,710	5,646	5,322
Pseudo R2	0.226	0.229	0.245	0.204	0.221	0.276	0.236	0.238	0.240	0.269

Notes: 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 one if Bank i perceives Bank j as one of its three main competitors for lending to large firms; and zero 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 statistical significance at the 1%, 5% and 10% level.

Table 4: Local Bilateral Bank Competition and SME Credit Constraints

Dependent variable: Credit constrained										
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Bilateral competition	0.506***							0.649**		
	(0.178)							(0.257)		
Bilateral competition$_j$		0.865***							1.122***	
		(0.267)							(0.391)	
Bilateral competition$_i$			0.494***							0.632**
			(0.179)							(0.260)
HHI				0.163				-0.318	-0.381	-0.299
				(0.146)				(0.230)	(0.234)	(0.229)
Branch density					-0.008**			-0.006**	-0.005	-0.007**
					(0.003)			(0.003)	(0.003)	(0.003)
Bank density						-0.355***				
						(0.127)				
Lerner index							0.198			
							(0.255)			
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional GDP growth	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,497	2,497	2,497	2,497	2,497	2,497	2,497	2,497	2,497	2,497
Pseudo R2	0.112	0.114	0.112	0.108	0.110	0.110	0.108	0.114	0.116	0.114

Notes: The table reports estimates from probit regressions. The dependent variable is *Credit constrained* which equals one if a firm is credit constrained; zero otherwise. Unreported covariates are *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 are clustered at the regional (GADM) level. ***, **, * indicate statistical significance at the 1%, 5% and 10% level.

Table 5: Local Bilateral Bank Competition and Credit Constraints of Small and Large Firms

Dependent variable: Credit constrained						
	[1]	[2]	[3]	[4]	[5]	[6]
Bilateral competition	0.763***			0.888***		
	(0.211)			(0.307)		
Bilateral competition × Large firm	-0.504***			-0.501*		
	(0.190)			(0.284)		
Bilateral competition$_j$		1.262***			1.531***	
		(0.291)			(0.435)	
Bilateral competition$_j$ × Large firm		-0.759***			-0.860***	
		(0.187)			(0.281)	
Bilateral competition$_i$			0.762***			0.894***
			(0.212)			(0.310)
Bilateral competition$_i$ × Large firm			-0.526***			-0.544*
			(0.192)			(0.289)
HHI				-0.412	-0.551*	-0.413
				(0.294)	(0.299)	(0.294)
HHI × Large firm				0.218	0.387	0.253
				(0.316)	(0.302)	(0.319)
Branch density				0.008***	0.006**	0.008***
				(0.003)	(0.003)	(0.003)
Branch density × Large firm				-0.010***	-0.008**	-0.010***
				(0.004)	(0.004)	(0.004)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm covariates	Yes	Yes	Yes	Yes	Yes	Yes
Regional GDP growth	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,497	2,497	2,497	2,497	2,497	2,497
Pseudo R2	0.114	0.118	0.114	0.117	0.120	0.117

Notes: The table reports estimates from probit regressions. The dependent variable is *Credit constrained* which equals one if a firm is credit constrained; zero otherwise. Unreported covariates are *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 are clustered at the regional (GADM) level. ***, **, * indicate statistical significance at the 1%, 5% and 10% level.

Table 6: Robustness – Additional Locality Covariates

Dependent variable: Credit constrained										
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Bilateral competition	0.474***	0.397**	0.389**	0.514***	0.527***	0.435**	0.615***	0.493***	0.456***	0.528**
	(0.176)	(0.186)	(0.189)	(0.177)	(0.172)	(0.170)	(0.215)	(0.178)	(0.169)	(0.221)
Wholesale funding	-0.001									0.000
	(0.001)									(0.001)
Tier 1 capital		0.015								
		(0.016)								
Tier 1 capital (parents)			0.019							0.016
			(0.020)							(0.022)
Foreign banks				-0.121						-0.055
				(0.150)						(0.166)
Foreign bank wholesale funding					-0.001					
					(0.001)					
Foreign bank wholesale funding (parents)						-0.002*				
						(0.001)				
Small banks							0.146			0.203*
							(0.098)			(0.120)
Relationship banks								-0.262**		-0.347***
								(0.125)		(0.126)
State banks									0.396	0.548*
									(0.265)	(0.328)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional GDP growth	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,496	2,352	2,433	2,497	2,440	2,402	2,393	2,393	2,497	2,332
Pseudo R2	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118

Notes: The table reports estimates from probit regressions. The dependent variable is *Credit constrained* which equals one if a firm is credit constrained; zero otherwise. Unreported covariates are *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 are clustered at the regional (GADM) level. ***, **, * indicate statistical significance at the 1%, 5% and 10% level.

Table 7: Miscellaneous Robustness Tests

Dependent variable: Credit constrained						
	[1]	[2]	[3]	[4]	[5]	[6]
	Truthful responses only			Exclude largest cities		
Bilateral competition	0.499***			0.525***		
	(0.176)			(0.192)		
Bilateral competition$_j$		0.860***			0.765***	
		(0.265)			(0.276)	
Bilateral competition$_i$			0.486***			0.502***
			(0.177)			(0.189)
Observations	2,484	2,484	2,484	1,966	1,966	1,966
Pseudo R2	0.112	0.114	0.112	0.119	0.120	0.118

	[7]	[8]	[9]	[10]	[11]	[12]
	Heckman selection			Heckman selection (10 km)		
Bilateral competition	0.521***			0.268**		
	(0.177)			(0.117)		
Bilateral competition$_j$		0.826***			0.330*	
		(0.284)			(0.182)	
Bilateral competition$_i$			0.508***			0.272**
			(0.177)			(0.120)
Inverse Mills ratio	0.982***	0.975***	0.980***	0.979***	0.990***	0.980***
	(0.178)	(0.190)	(0.178)	(0.184)	(0.188)	(0.183)
Observations	2,497	2,497	2,497	2,519	2,519	2,519
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm covariates	Yes	Yes	Yes	Yes	Yes	Yes
Regional GDP growth	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table reports estimates from probit regressions. The dependent variable is *Credit constrained* which equals one if a firm is credit constrained; zero otherwise. Unreported covariates are *Capitalization*, *Large firm*, *Public firm*, *Proprietorship*, *Exporter*, *Audited firm* and *Mature firm* in columns 1-12, and, in addition, *HHI* and *Branch density* in columns 7-12. Appendix Table A1 contains all variable definitions. The additional variables used in the first stage Heckman selection are *Subsidized*, *Informal payments* and *Corruption*. The table reports marginal effects. Robust standard errors are clustered at the regional (GADM) level. ***, **, * indicate statistical significance at the 1%, 5% and 10% level.

Table A1: Variable Definitions and Sources

Category	Variable name	Definition	Source
Bank level	Local branch density	The average number of branches (of all other banks) within a circle with a 5 kilometer radius around the branches of a bank	BEPS II
	Capitalization	Equity to total assets in 2011	BankScope
	Wholesale	Net loans over customer funding and short-term funding in 2011	BankScope
	Interest margin	Difference between interest income and interest expenses in 2011	BankScope
	Foreign bank	Dummy=1 if a bank is majority foreign owned; 0 otherwise	BEPS II
	Small bank	Dummy=1 if a bank has fewer branches than the median bank in the country; 0 otherwise	BEPS II
	Relationship bank	Dummy=1 if a bank considers customer relationships (knowledge of the client) a very important lending technique; 0 otherwise	BEPS II
	Transaction bank	Dummy=1 if a bank considers fundamental/cash flow analysis a very important lending technique; 0 otherwise	BEPS II
	Bank hierarchy (SMEs/Large)	Number of hierarchical approval levels for SME (Large firm) loan applications	BEPS II
Bank pairs$_{ij}$	(SMEs/Large) Bank$_i$ perceives bank$_j$ as competitor	Dummy=1 if bank$_i$ lists bank$_j$ as one of its three main competitors in the SME (Large firm) credit market; 0 otherwise	BEPS II
	(SMEs/Large) Reciprocal competition$_{ij}$	Dummy=1 if bank$_j$ lists bank$_i$ as one of its three main competitors in the SME (Large firm) credit market; 0 otherwise	BEPS II
	Intensive branch overlap$_{ij}$	The average number of branches of bank$_j$ within a circle with a 5 kilometer radius around branches 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 kilometer 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	BEPS II
	Domestic$_i$-Domestic$_j$	Dummy=1 if both bank$_i$ and bank$_j$ are majority domestically owned; 0 otherwise	BEPS II
	(SMEs/Large) 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) 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) 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) Customer overlap$_{ij}$	Dummy=1 if both bank$_i$ and bank$_j$ lend to SMEs (Large firms); 0 otherwise	BEPS II

Table A1 cont. on next page

Table A1 cont.: Variable Definitions and Sources

Category	Variable name	Definition	Source
Locality level	Bilateral competition	Number of bank pairs in a locality where $bank_i$ is predicted to list $bank_j$ as one of its three main competitors in SME lending, divided by the total number of possible $bank_i$-$bank_j$ pairs in that locality	BEPS II
	Bilateral competition$_j$	Number of bank pairs in a locality where $bank_i$ is predicted to list $bank_j$ as one of its three main competitors in SME lending, divided by the total number of possible $bank_i$-$bank_j$ pairs in that locality, weighted by the number of branches of $bank_j$	BEPS II
	Bilateral competition$_i$	Number of bank pairs in a locality where $bank_i$ is predicted to list $bank_j$ as one of its three main competitors in SME lending, divided by the total number of possible $bank_i$-$bank_j$ pairs in that locality, weighted by the number of branches of $bank_i$	BEPS II
	Foreign banks	Share of branches in locality owned by foreign banks	BEPS II
	Wholesale funding	Net loans over customer and short term funding, averaged over all banks in a locality (branch weighted)	BankScope
	Tier 1 ratio	Branch weighted tier 1 ratio of all banks in a locality	BankScope
	Tier 1 ratio (parents)	Branch weighted tier 1 ratio of all banks in a locality where in the case of foreign banks, the tier 1 ratio refers to the parent bank	BankScope
	Relationship banks	Share of relationship banks in a locality (branch weighted)	BEPS II
	Small banks	Share of branches in a locality owned by banks with a relatively small (below median) national branch network	BEPS II
	HHI	Herfindahl-Hirschman Index at the locality level. Market shares are measured by the number of branches of each bank in the locality	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	BEPS II & BankScope
	Foreign bank wholesale funding	Gross loans to customer deposits ratio of foreign banks, averaged over all banks in a locality (branch weighted)	BEPS II & BankScope
	Foreign bank wholesale funding (parents)	Gross loans to customer deposits ratio of the parent of foreign banks, averaged over all banks in a locality (branch weighted)	BEPS II & BankScope
	State banks	Share of branches in locality owned by state banks	BEPS II

Table A1 cont. on next page

Table A1 cont.: Variable Definitions and Sources

Category	Variable name	Definition	Source
Firm level	Credit constrained	Dummy=1 if a firm needs credit (Loan demand=1) but is either discouraged from applying for a loan or was rejected when it applied for a loan); 0 otherwise	BEEPS V
	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
	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
	Subsidized	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 indicates that in its line of business, firms at least sometimes have to pay irregular 'additional payments or gifts' to get things done with regard to customs, taxes, licenses, and/or 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

Notes: BEPS II is the 2nd 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]
Credit constrained	[1]	1											
Credit constrained (subjective)	[2]	0.086***	1										
Trade credit	[3]	-0.132***	0.061***	1									
Bilateral competition	[4]	-0.069***	-0.047***	0.093***	1								
Bilateral competition j	[5]	-0.091***	-0.062***	0.090***	0.845***	1							
Bilateral competition i	[6]	-0.077***	-0.048***	0.089***	0.998***	0.843***	1						
Foreign banks	[7]	-0.179***	-0.053***	0.053***	0.372***	0.445***	0.382***	1					
Foreign bank wholesale funding	[8]	0.159***	0.033**	-0.074***	-0.247***	-0.311***	-0.248***	-0.682***	1				
Foreign bank wholesale funding (	[9]	-0.144***	-0.034**	0.108***	0.270***	0.354***	0.281***	0.344***	-0.278***	1			
Wholesale funding	[10]	0.008	-0.050***	0.091***	0.058***	0.080***	0.048***	-0.044***	0.258***	0.464***	1		
Relationship banks	[11]	-0.103***	-0.008	0.052***	0.239***	0.166***	0.240***	0.509***	-0.479***	0.139***	-0.080***	1	
Tier 1 capital	[12]	0.099***	-0.01	0.035**	0.028**	0.173***	0.030**	0.028**	0.201***	0.333***	0.386***	-0.132***	1
Tier 1 capital (parents)	[13]	0.169***	0.005	-0.035**	-0.284***	-0.202***	-0.292***	-0.413***	0.246***	-0.159***	-0.156***	-0.518***	0.425***
Small banks	[14]	0.052***	0.017	-0.146***	-0.144***	-0.158***	-0.129***	0.078***	0.051***	-0.210***	-0.196***	0.198***	-0.030**
State banks	[15]	0.100***	0.026*	0.049***	-0.189***	-0.267***	-0.202***	-0.221***	0.235***	0.114***	0.110***	-0.187***	0.214***
HHI	[16]	-0.068***	-0.049***	0.082***	0.671***	0.615***	0.675***	0.159***	-0.109***	0.285***	0.173***	0.066***	0.184***
Bank density	[17]	0.079***	0.040***	-0.006	-0.521***	-0.486***	-0.526***	-0.367***	0.318***	-0.203***	0.011	-0.294***	0.169***
Branch density	[18]	0.035*	0.018	0.009	-0.318***	-0.312***	-0.319***	-0.230***	0.201***	-0.066***	0.018	-0.194***	0.162***
Lerner index	[19]	-0.043**	-0.011	0.041***	0.135***	0.234***	0.121***	-0.178***	-0.058***	-0.061***	0.062***	-0.180***	-0.077***
Large firm	[20]	-0.169***	-0.011	0.077***	-0.052***	-0.070***	-0.053***	-0.087***	0.080***	-0.037***	0.038***	-0.078***	0.017
Public firm	[21]	-0.022	0.040***	-0.038***	-0.036***	-0.082***	-0.038***	-0.080***	0.073***	-0.100***	0.011	0.034**	-0.082***
Proprietorship	[22]	0.061***	0.013	-0.025*	-0.064***	-0.066***	-0.070***	-0.183***	0.075***	-0.060***	-0.012	-0.133***	0.029**
Exporter	[23]	-0.120***	0.014	0.104***	0.044***	0.053***	0.044***	0.050***	-0.058***	0.153***	0.116***	0.029**	0.023*
Audited	[24]	-0.175***	-0.018	0.042***	0.005	-0.041***	0.008	0.055***	0.027**	0.016	0.105***	0.034**	-0.005
Mature firm	[25]	-0.086***	0.017	0.066***	0.059***	0.060***	0.055***	0.051***	-0.059***	0.063***	0.072***	0.032**	-0.025*

Table A2 cont. on next page

Table A2 cont. Correlation Matrix

		[13]	[14]	[15]	[16]	[17]	[18]	[19]	[20]	[21]	[22]	[23]	[24]	[25]
Tier 1 capital (parents)	[13]	1												
Small banks	[14]	-0.268***	1											
State banks	[15]	0.258***	-0.132***	1										
HHI	[16]	-0.043***	-0.264***	0.035***	1									
Bank density	[17]	0.327***	0.083***	0.108***	-0.365***	1								
Branch density	[18]	0.251***	0.074***	0.087***	-0.200***	0.922***	1							
Lerner index	[19]	0.157***	-0.422***	-0.206***	0.180***	0.019	-0.013	1						
Large firm	[20]	0.052***	-0.048***	0.017	-0.004	0.034***	0.01	0.046***	1					
Public firm	[21]	-0.066***	0.078***	-0.023*	-0.038***	-0.017	-0.022*	-0.056***	0.094***	1				
Proprietorship	[22]	0.173***	-0.137***	0.005	-0.015	0.095***	0.057***	0.138***	-0.092***	-0.050***	1			
Exporter	[23]	-0.060***	-0.119***	0.030**	0.066***	-0.023*	-0.001	-0.001	0.204***	0.012	-0.065***	1		
Audited	[24]	-0.063***	0.008	-0.005	0.013	-0.041***	-0.030**	-0.087***	0.255***	0.097***	-0.101***	0.129***	1	
Mature firm	[25]	-0.068***	-0.148***	0	0.043***	-0.057***	-0.060***	0.054***	0.118***	0.035***	0.011	0.080***	0.050***	1

Notes: ***, **, *indicates statistical significance at the 1%, 5% and 10% level, respectively.

Table A3: Country Sample

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
	Banks									
	Full population		BEPS II Survey							
	All	Foreign	Sample frame	Interviewed	Foreign	Branches	Branches per 100 km^2	Branches per 100,000 persons	Domestic private Credit / GDP	GDP / Capita (USD)
Albania	16	12	13	13	11	547	2.00	18.86	39.06	4,248
Armenia	23	6	19	17	5	510	1.79	17.12	40.06	3,566
Azerbaijan	44	2	22	17	1	871	1.05	9.37	20.09	7,394
Bosnia & Herzegovina	28	15	20	17	12	915	1.79	23.90	54.78	4,495
Bulgaria	32	21	31	25	19	3,065	2.82	41.95	66.27	7,378
Croatia	36	15	35	30	14	1,553	2.78	36.39	67.95	13,236
Czech Republic	42	16	33	12	11	3,167	4.10	30.13	49.76	19,730
Estonia	17	8	11	11	8	213	0.50	16.10	72.85	17,422
Georgia	19	6	13	13	6	967	1.39	25.28	34.44	4,143
Hungary	27	20	30	18	8	1,794	1.98	18.08	50.87	12,834
Latvia	23	11	23	19	9	419	0.67	20.60	64.92	13,799
Lithuania	16	9	16	12	8	554	0.88	18.54	46.61	14,348
North Macedonia	17	11	16	14	9	456	1.81	22.04	47.17	4,710
Montenegro	11	6	11	11	6	207	1.54	33.35	55.06	6,587
Poland	62	35	43	29	21	11,844	3.87	31.12	50.10	13,145
Romania	39	27	33	28	24	6,218	2.70	31.00	37.52	8,558
Serbia	34	20	33	30	19	2,117	2.42	29.41	49.51	5,659
Slovak Republic	27	16	20	11	9	1,356	2.82	25.08	46.81	17,275
Slovenia	22	9	21	17	9	570	2.83	27.71	79.82	22,486
Ukraine	157	35	53	35	20	19,102	3.30	41.90	69.58	3,855
Total	*692*	*300*	*496*	*379*	*229*	*56,445*				

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

Table A4: SME-Bank Links in the BEEPS V Sample and in Orbis

Bank name	Bulgaria: % SMEs in BEEPS V	Bulgaria: % SMEs in Orbis	Bank name	Croatia: % SMEs in BEEPS V	Croatia: % SMEs in Orbis	Bank name	Hungary: % SMEs in BEEPS V	Hungary: % SMEs in Orbis
	(1)	(2)		(3)	(4)		(5)	(6)
UniCredit Bulbank	24.4	21.1	Zagrebacka banka (Unicredit)	25.26	11.21	OTP Bank	16.50	15.7
Raiffeisenbank (Bulgaria)	15.7	11.0	Privredna Banka Zagreb (Intesa)	18.56	13.68	K&H Bank	15.53	13.9
United Bulgarian Bank	9.4	9.0	Erste & Steiermarkische Bank	16.49	16.97	Budapest Bank	14.56	8.2
Eurobank EFG Bulgaria	9.4	7.7	Hypo Alpe-Adria-Bank	10.31	10.7	CIB Bank	8.74	6.5
DSK Bank	7.9	6.5	Raiffeisenbank Austria	10.31	9.42	Erste Bank	7.77	4.3
Allianz Bank Bulgaria	5.5	2.3	Splitska Banka d.d. (SocGen)	4.64	4.01	Raiffeisen Bank	7.77	10.2
ProCredit Bank	4.7	0.9	Croatian Bank for Recon. & Dev.	2.58	n.a.	Takarekbank	6.80	3.3
Societe Generale Expressbank	3.9	4.8	OTP Bank Croatia	2.58	5.12	MKB Bank	5.83	5.1
International Asset Bank	3.1	1.2	Volksbank	1.55	0.85	Unicredit Bank	4.85	8.4
Corporate Commercial Bank	2.4	0.7	Croatian Postal Bank	1.03	4.52	Citibank	1.94	2.9
Spearman's rho (rank test)	0.94			0.85			0.72	
P-value	0.00			0.00			0.02	

Bank name	Serbia: % SMEs in BEEPS V	Serbia: % SMEs in Orbis	Bank name	Ukraine: % SMEs in BEEPS V	Ukraine: % SMEs in Orbis
	(7)	(8)		(9)	(10)
Banca Intesa	23.53	13.22	PrivatBank	23.57	8.55
Komercijalna Banka	11.76	7.25	Raiffeisen Bank Aval	13.57	10.09
Raiffeisen Banka	9.09	9.13	Ukrsotsbank (Unicredit)	12.86	4.78
UniCredit Bank Serbia	6.95	9.79	JSIB UkrSibbank (BNP Paribas)	11.43	3.23
ProCredit Bank	5.88	3.57	Oschadny Bank Ukrainy	6.43	2.69
Societe Generale Banka Srbija	4.81	5.39	Alfa Bank	3.57	2.13
Vojvodjanska Banka	4.81	6.90	State Export-Import Bank of Ukraine	3.57	2.89
Credit Agricole	4.28	2.51	OTP Bank	3.57	3.23
Hypo Alpe-Adria-Bank	3.74	3.88	First Ukrainian International Bank	2.14	1.53
Cacanska banka	3.74	0.52	Kredobank	2.14	0.87
Spearman's rho (rank test)	0.84			0.91	
P-value	0.00			0.00	

Notes: This table compares the incidence of bank-SME lending relationships in the BEEPS V sample (odd columns) with the incidence of bank-SME relationships among all SMEs (firms with at most 250 employees) in the Orbis database (even columns). For example, column (1) shows that of all Bulgarian SMEs that were surveyed as part of BEEPS V and which had a loan outstanding, 24.4 percent received that loan from UniCredit Bulbank. Column (2) shows that this percentage is 21.1 among the full population of Bulgarian SMEs in Orbis.

Table A5: Local Bilateral Bank Competition and Alternative Credit Constraint Measures

Panel A: Credit constrained (Subjective)						
	[1]	[2]	[3]	[4]	[5]	[6]
Bilateral competition	0.234	0.374**				
	(0.175)	(0.175)				
Bilateral competition × Large firm		-0.279**				
		(0.130)				
Bilateral competition$_j$			0.504	0.577*		
			(0.309)	(0.307)		
Bilateral competition$_j$ × Large firm				-0.145		
				(0.152)		
Bilateral competition$_i$					0.201	0.339**
					(0.171)	(0.170)
Bilateral competition$_i$ × Large firm						-0.271**
						(0.133)
Observations	5,093	5,093	5,093	5,093	5,093	5,093
Pseudo R2	0.038	0.039	0.040	0.040	0.038	0.038

Panel B: Trade credit						
	[7]	[8]	[9]	[10]	[11]	[12]
Bilateral competition	0.473***	0.735***				
	(0.146)	(0.177)				
Bilateral competition × Large firm		-0.536***				
		(0.183)				
Bilateral competition$_j$			0.689***	0.886***		
			(0.233)	(0.260)		
Bilateral competition$_j$ × Large firm				-0.414**		
				(0.204)		
Bilateral competition$_i$					0.483***	0.729***
					(0.147)	(0.180)
Bilateral competition$_i$ × Large firm						-0.502***
						(0.186)
Observations	4,795	4,795	4,795	4,795	4,795	4,795
Pseudo R2	0.097	0.098	0.097	0.097	0.097	0.098
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm covariates	Yes	Yes	Yes	Yes	Yes	Yes
Regional GDP growth	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table reports estimates from probit regressions. The dependent variable in Panel A 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 Panel B is *Trade Credit* which equals one if a firm uses trade credit to purchase inputs. Unreported covariates are *Public firm*, *Proprietorship*, *Exporter*, *Audited firm*, *Large firm*, *Mature firm*, *HHI* and *Branch density* in Panel A and B. Additional unreported covariates in Panel B are *HHI* × *Large firm* and *Branch density* × *Large firm*. Appendix Table A1 contains all variable definitions. The table reports marginal effects. Robust standard errors are clustered at the regional (GADM) level. ***, **, * indicate statistical significance at the 1%, 5% and 10% level.

Table A6: 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 & Herz.	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)
Observations	6,026	5,910	5,910	5,910	5,720	6,126	5,480	6,072	6,026	6,126
Pseudo R2	0.236	0.249	0.236	0.228	0.234	0.228	0.216	0.220	0.232	0.231

	Lithuania	Latvia	North Macedonia	Montenegro	Serbia	Slovakia	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)
Observations	6,050	5,972	6,026	6,072	5,480	6,126	5,942	5,582	5,532	5,370
Pseudo R2	0.224	0.234	0.235	0.234	0.231	0.227	0.231	0.228	0.245	0.232

Notes: 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 one if Bank i perceives Bank j as one of its three main competitors for lending to SMEs; and zero otherwise. Appendix Table A1 contains all variable definitions. Robust standard errors are clustered by country and shown in parentheses. ***, **, * indicate statistical significance at the 1%, 5% and 10% level.

Table A7: Robustness – Top 2 instead of 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$_j$ fixed effects	No	No	No	No	No	No
Observations	14,882	6,182	6,182	14,882	5,670	5,646
Pseudo R2	0.242	0.202	0.205	0.240	0.222	0.220

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

Table A8: Robustness – Clustering of Standard Errors

Dependent variable: Credit constrained					
	[1]	[2]	[3]	[4]	[5]
Bilateral competition	0.649**	0.649***	0.649***	0.649*	0.649**
	(0.257)	(0.175)	(0.149)	(0.346)	(0.292)
HHI	-0.318	-0.318*	-0.318**	-0.318	-0.318
	(0.230)	(0.183)	(0.132)	(0.210)	(0.203)
Branch density	-0.006**	-0.006*	-0.006***	-0.006***	-0.006***
	(0.003)	(0.003)	(0.002)	(0.001)	(0.002)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Firm covariates	Yes	Yes	Yes	Yes	Yes
Regional GDP growth	Yes	Yes	Yes	Yes	Yes
Clustering	GADM	No clustering	Industry	Country	Industry + Country
Observations	2,497	2,497	2,497	2,497	2,497
Pseudo R2	0.114	0.114	0.114	0.114	0.114

Notes: This table reports estimates from probit regressions. The dependent variable is *Credit constrained* which equals one if a firm is credit constrained; zero otherwise. Unreported covariates are *Large firm*, *Public firm*, *Proprietorship*, *Exporter*, *Audited firm* and *Mature firm*. Column 1 replicates column 8 of Table 4. In column 2, the robust standard errors are not clustered. In columns 3, 4, and 5, robust standard errors are clustered by industry, country, and double clustered by industry and country, respectively. Appendix Table A1 contains all variable definitions. The table reports marginal effects. ***, **, * indicate statistical significance at the 1%, 5% and 10% level.