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

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### Abstract

We interview 379 bank CEOs in 20 emerging markets to identify their banks' main competitors. We show that banks are more likely to identify another bank as a main competitor in small-business lending when both banks are foreign owned or relationship oriented; when there exists a large spatial overlap in their branch networks; and when the potential competitor has fewer hierarchical layers. We then construct a novel bilateral competition measure at the locality level and assess how well it explains geographic variation in firms' credit constraints. We show that intense bilateral bank competition tightens local credit constraints, especially for small firms, as competition may impede the formation of lending relationships.

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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 emerging markets, banks have become more diverse in terms of their ownership, organizational structure, and the lending techniques they use. This increased heterogeneity has also resulted in a geographically more variegated pattern of bank branches within countries. Towns and cities 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; Lee and Luca, 2019).[1]

Against this background, we investigate the causes and local 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.[2] 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.

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 create a new competition metric

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[1]Further supporting evidence can be found in Canales and Nanda (2012) for Mexico; Popov and Udell (2012) and Beck, Degryse, De Haas, and Van Horen (2018) for emerging Europe; and Bircan and De Haas (2020) for Russia.

[2]We define emerging Europe as the following 20 countries: Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Latvia, Lithuania, Montenegro, North Macedonia, Poland, Romania, Serbia, Slovak Republic, Slovenia and Ukraine.

that accounts for the fact that the intensity of competition varies significantly across bank pairs. We show that banks are more likely to identify other banks as key competitors in the market for SME lending when a potential competitor is foreign owned, a relationship lender, has fewer hierarchical layers, and/or when the banks' branch networks overlap more.

We then investigate the consequences of bilateral bank competition for individual firms located in villages, towns and cities (henceforth: 'localities') across 20 emerging markets. We do so by examining 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 can differ markedly between these localities. If more bank pairs actively compete with each other for certain clients, then local competition will be more intense. We therefore ask whether firms located near bilaterally competing banks are less or more credit constrained compared to similar firms in localities with branches of non-competing banks.

To conduct this empirical analysis, we link 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 (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. In line with theoretical work by, for example, Petersen and Rajan (1995), we interpret this 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 economic development and population density as well as local credit-market variation in terms of bank size, ownership, capitalization, and funding structure. Our results are also robust to different ways of clustering the standard errors; using alternative credit-constraint definitions; accounting for the prevalence of online lending; and defining local credit markets in alternative ways.

**Related literature**

This paper makes three key contributions. First, we directly address an important unsettled issue in the literature: whether inter-bank competition promotes or impedes credit availability for small businesses. A particular feature of the banking industry is the often substantial information asymmetry between lenders and (small and opaque) borrowers. Because of this asymmetry, economic theory makes conflicting predictions on whether borrowers benefit from inter-bank competition. On the one hand, the *market power hypothesis* posits that bank competition alleviates credit constraints as more loans become available at better terms (Pagano, 1993).[3] This in turn fosters local economic growth (Guiso, Sapienza and Zingales, 2004; Benfratello, Schiantarelli and Sembenelli, 2008; Amore, Schneider and Žaldokas, 2013).

On the other hand, the *information hypothesis* suggests that *less* bank competition may benefit firms, especially more opaque ones, as some degree of market power allows banks to forge long-term lending relationships. 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). Petersen and Rajan (1995) show theoretically how in a concentrated banking market, lenders subsidize early loans by extracting rents from later ones.[4] Banks will only assist firms in the beginning of a relationship if these firms can credibly commit not to leave the bank in the future. This may be difficult in highly competitive markets, thus

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[3]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) for empirical evidence.

[4]For similar theoretical arguments, see Mayer (1988) and Ogura (2010).

ruling out the intertemporal smoothing of interest rates that is needed to give opaque borrowers a chance. In a similar vein, Marquez (2002) shows that borrower-specific information is dispersed in more competitive banking markets. This leads to a less efficient screening of borrowers and more expensive credit.

Several studies confirm that intense bank competition can impede access to credit. At the sector level, Cetorelli and Gambera (2001) and Bonaccorsi di Patti and Dell'Ariccia (2004) show that lender concentration is positively related to growth in industries more dependent on external finance. At the firm level, Zarutskie (2006) finds that small firms in the U.S. are less leveraged in more competitive local banking markets.[5] Degryse, Ioannidou, and von Schedvin (2012) use data from a Swedish bank to show that when a firm obtains a loan from another bank, the incumbent lender responds by reducing its willingness to lend to the firm.

Most of these studies use single-country data sets, 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 and to use this information to create a measure of the intensity of bank competition as perceived by banks themselves. We then horse race this new competition metric at the locality level (and across 20 emerging markets) against more conventional measures. We show that our bilateral bank competition measure has substantial explanatory power over and above 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.

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[5]See also Petersen and Rajan (1994, 1995); Berger and Udell (1995); Ongena and Smith (2001); and Dell'Ariccia and Marquez (2006).

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).[6] However, if inter-bank collusion (Edwards, 1955) is difficult to achieve in practice, then multimarket contact may result in more intense competition (Solomon, 1970; Park and Pennacchi, 2009). Mester (1987) shows that when high bank concentration is accompanied by multimarket contact, banks behave more competitively compared with a situation without multimarket contact. In line with the latter results, Levine, Lin, and Wang (2020) find that geographic overlap of U.S. banks' branch networks increases the probability that two banks merge and boosts cumulative abnormal returns after their merger.

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. Our contribution is to use novel data on the geographical location of bank branches to construct (within-country) multimarket contact measures at the intensive and extensive margins. We show that these multimarket contact measures are highly correlated with our new direct (interview-based) measure of inter-bank rivalry at the national level.

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

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[6]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.

politicians and where property rights are relatively well protected. In such regions, bank branches help firms to finance innovation and to become more productive (Bircan and De Haas, 2020).[7] 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

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

firms' access to credit across localities throughout emerging Europe.

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

# 2 Data and variable construction

This section introduces the data we combine to determine the local intensity of bilateral bank competition and to gauge the impact of such competition on firms' credit constraints.[8]

## 2.1 A bank-pair measure of bank competition

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.[9] 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.[10] The aim was to survey banks that jointly represent at least 95 percent of all bank assets in each country. To arrive at this sample, a list was obtained from each country's central bank with all savings, commercial, and cooperative banks (Appendix Table A2, column 1). By country, these banks were then ordered by total assets and, moving down the list, banks were added until an aggregate market share of at least 95 percent was reached.[11] The resulting sampling frame

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[8]Table 1 and Appendix Table A1 provide summary statistics and variable definitions, respectively. Online Appendix Table OA1 contains a correlation matrix of all variables.

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

[10]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.

[11]In each country, the goal was therefore to interview all banks except for the very smallest ones: those

consists of 496 banks in 20 countries (Table A2, column 3). Out of this sampling frame, 379 CEOs were successfully interviewed (column 4), a relatively high success rate of 76.4 percent. These banks represent 80.1 percent of all bank assets in these 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.[12] 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.[13] 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.

## 2.2 Data and variables at the firm level

Our analysis considers 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

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banks that (jointly) make up no more than five percent of all bank lending. Leaving out these banks by design is unlikely to affect our results as these banks typically only operate one or very few branches. Even in countries with a concentrated banking sector, there typically exists substantial variation across localities in the number and type of bank branches. Even in such countries, there is therefore substantial local variation in bilateral bank competition. It is exactly this within-country variation that we exploit.

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

[13]Banks could only choose banks in the same country as one of their main competitors. To revisit the example in footnote 10, 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.

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. About half of all firm managers indicated that during the past year they needed a bank loan (*Loan demand*, Table 1). Among those, we then identify firms that were credit constrained: they were either discouraged from applying for a loan or were rejected when they applied (Cox and Jappelli, 1993; Duca and Rosenthal, 1993).[14] In particular, we follow Popov and Udell (2012) and use BEEPS question K16: *"Did the establishment apply for any loans or lines of credit in the last fiscal year?".* For firms that answered *"No"*, we move to question K17, which asks: *"What was the main reason the establishment did not apply for any line of credit or loan in the last fiscal year".* For firms that answered *"Yes"*, question K18a subsequently asks: *"In the last fiscal year, did this*

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[14]Several recent papers use firm-survey data and rely on self-reported credit constraints (Beck, Demirgüç-Kunt and Maksimovic, 2005) or combine data on 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.

*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 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 one in five firms was credit constrained in 2012.

We also use BEEPS V to create dummy variables that we include as firm covariates throughout our empirical analysis. These are 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 its 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, we create variables that describe the local credit market in which it is based. We first carefully match our data on firm location with information on all bank branches around these firms. This information was hand-collected as part of BEPS II by either 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. The firm and branch data thus match closely in terms of timing. Appendix Table A2 shows that the geo-coordinates of 55,532 branches (column 6) operated by 690 banks (column 1) 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.[15] 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 7.5, or 10 kilometers around the geo-coordinates of each firm and link the firm to only those branches inside that circle.[16] On average, a locality in our data set contains 21 bank branches whereas a circle with a 7.5 or 10 kilometer radius contains 36 and 42 branches, respectively. 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 4.5.3 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. We also calculate versions of *Bilateral competition* where we weigh with the number

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[15]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.

[16]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.

of branches of either bank $i$ ('perceiver') or bank $j$ ('perceived'). Because some bank CEOs did not participate in the BEPS II survey, we have incomplete information on competitor perceptions for some bank pairs. We exclude such pairs when calculating our locality-level measures of bilateral bank competition. Importantly, all our results go through when we instead use a probit model (shown in column (2) of Online Appendix OA2) to predict whom bank CEOs regard as their key competitors.

Table 1 shows that on average around 29 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 0 and 100 percent. Figure 1 shows a 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 control variables that characterize local credit markets. *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*). 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*.

*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

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[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

Lerner (1934) index.[18] We use annual bank 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 10km radius around the firm. *Branch density* does the same for the number of bank branches.

In Online Appendix Table OA1, *Bilateral competition* correlates negatively with *Branch density* (after removing country fixed effects). This reflects that in many countries there are several "key banks" present in most localities. These banks often directly compete which each other. In some localities, in particular larger cities, there are also smaller banks. What the negative correlation between *Bilateral competition* and *Branch density* shows is that when 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 banks 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 yields a negative correlation between competition and density.

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*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. 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.

# 3 Methodology

Our analysis views bilateral bank competition through the lens of economic geography. We investigate how local variation in bilateral bank competition affects the credit constraints of firms across towns and cities. Before we get to this, we briefly explore the determinants of bilateral bank competition at the bank-pair level.

## 3.1 Determinants of bilateral bank competition

We can use our bank-pair data to gain insights into the characteristics that make banks more formidable competitors. We do so by running probit models where the dependent variable indicates whether bank $i$ regards bank $j$ as one of its three main competitors when lending to SMEs. 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.

As explanatory variables, we first include two spatial measures of multimarket contact: *Intensive branch overlap* and *Extensive branch overlap*. Around each branch of bank $i$ we draw a circle with a 5km radius and count the number of branches of bank $j$ within that circle. We calculate an average value for bank $i$ and define this as the intensive branch overlap between bank $i$ and bank $j$. We also measure the share of branches of bank $i$ that have at least one branch of bank $j$ within a 5km circle: the extensive branch overlap.

Next, we create variables that indicate whether both banks are small (*Small i–Small j*) or large (*Large i–Large j*). We categorize banks as *Small* or *Large* depending on whether their number of branches is below or above the country median $k$. The existing literature suggests that small banks have a comparative advantage in lending to small and 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).

Similarly, we measure whether both banks are foreign *(Foreign i–Foreign j)* or domes-

tic *(Domestic i–Domestic j)* and whether both are relationship *(Relation i–Relation j)* or transaction lenders *(Transaction i–Transaction j)*. Domestic banks can possess a comparative advantage in reducing information asymmetries vis-à-vis local firms (Mian, 2006; Beck, Ioannidou, and Schäfer, 2016). In contrast, foreign banks may have difficulties in processing soft information and therefore grant loans on a transaction-by-transaction (Berger, Klapper and Udell, 2001). Yet, recent contributions argue that foreign banks can successfully apply transaction technologies that use hard information to lend to SMEs (Berger and Udell, 2006). Indeed, Beck, Degryse, De Haas and Van Horen (2018) show that among *both* domestic and foreign banks, large shares can be characterized as relationship lenders. Bank ownership and lending techniques may thus be increasingly orthogonal.[20]

Next, we create a variable that indicates whether bank $j$ is a relatively efficient lender compared to bank $i$ (*Hierarchical efficiency*). 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."* Decentralized banks may deal more effectively with soft information whereas centralized, hierarchical banks use hard information that is easy to transmit across hierarchical levels (Berger and Udell, 2002; Stein, 2002).

Lastly, we count for each bank the average number of branches (from all banks in country $k$ except for bank $i$ itself) within a circle with a 5km 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

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[20]To characterize banks' lending technologies, we follow Beck et al. (2018) and use BEPS II question Q6 which asks CEOs to rate on a five-point scale the importance (frequency of use) of the following techniques when dealing with SMEs: Relationship lending; fundamental and cash-flow analysis; business collateral; and personal collateral (personal assets pledged by the entrepreneur). Although, as expected, almost all banks find building a relationship (knowledge of the client) of some importance 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. 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.

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. Finally, a separate variable *Customer overlap* indicates whether both banks lend to SMEs.

Online Appendix Table OA2 reveals several robust determinants of bank competitor status (tabulated values represent marginal effects). First, and contrary to the mutual-forbearance hypothesis but in line with Mester (1987), multimarket contact at the intensive and extensive margins increases the likelihood that a bank is perceived as a strong competitor. Second, foreign banks identify other foreign lenders as key competitors and this holds when controlling for bank size. Third, if a bank operates relatively streamlined application procedures, it is more likely to be considered a strong competitor (column 6). Fourth, while relationship lenders compete more with each other for SMEs, transaction lenders are less likely to do so (column 7). This is in line with earlier studies showing that relationship lending is more appropriate for relatively opaque SME clients.[21] In column (8), we add both the variables on lending techniques and hierarchical levels (as well as the size and ownership variables). Both variables continue to be empirically relevant.

Together, these patterns indicate that our novel measure of bilateral bank competition correlates with various bank characteristics in a way that is consistent with findings documented in the existing banking literature.

## 3.2  Bilateral bank competition and credit constraints: Identification

We now proceed to 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. We underline here that banks (or better: bank CEOs) can identify each other as key competitors at the country level, reflecting the average level of bilateral competition across all subnational

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

banking markets.[22] This implies that whether bank $i$ regards bank $j$ as a key competitor is exogenous to the economic conditions of any specific locality. An important part of our identification strategy is therefore to determine bilateral bank competition at the level of the bank as a whole, but study its consequences at the disaggregated level of individual localities.

An important question is whether the presence of (particular) banks is exogenous to local economic conditions. Here our identifying assumption is that the local banking landscape imposes an exogenous geographic limitation on the banks that a firm has access to. For this assumption to hold, two things must be true. First, it requires that small firms cannot borrow from banks that are far away, that is: small firms experience geographical credit rationing. A large empirical literature supports this assertion.[23]

Second, it requires that the type of banks operating in a particular locality is as-good-as-random after conditioning on key characteristics of the local economy. In Section 4, we will bring two pieces of evidence to bear in support of this requirement. First, we show that our estimates are highly robust to adding more spatial covariates. If these spatial characteristics would correlate strongly with the intensity of bilateral bank competition, then their inclusion would erode the coefficient of interest. This is not what we find. Second, we show that our locality-level banking variables cannot be explained in a meaningful and systematic way by firm-level characteristics averaged at the locality level. Taken together, this evidence supports our assumption that the banking landscape near firms imposes an exogenous geographical limitation on the banks that firms have access to (see also Berger, Miller, Petersen, Rajan and Stein, 2005). We estimate the baseline model:

$$Y_{flks} = \beta_1 X_{flks} + \beta_2 L_{lk} + \beta_3 BilateralCompetition_{lk} + \beta_4 D_k + \beta_5 D_s + \epsilon_{flks} \qquad (1)$$

where $Y_{flks}$ is a dummy equal to 1 if firm $f$ in locality $l$ of country $k$ in industry $s$ is credit

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[22]This is in line with theoretical and empirical work underlining how multimarket contact across geographic banking markets can strengthen interbank competition (for example Solomon, 1970 and Mester, 1987).

[23]See, for example, Petersen and Rajan (2002); Guiso, Sapienza and Zingales (2004); Degryse and Ongena (2005); Lee and Luca (2019); Bonfim, Nogueira and Ongena (2021); and Granja, Leuz and Rajan (2022).

constrained (rejected or discouraged, see Section 2.2), and 0 otherwise. Our independent variable of interest is *Bilateral competition*, the share of 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 $\beta_3$ which can be interpreted as the impact of the intensity of local bilateral bank competition on firms' credit constraints. $X_{flks}$ is a matrix of controls 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*, *Relationship banks*, and *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 using the GADM database of global administrative areas (cf. footnote 24). 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 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. Robust standard errors are clustered by within-country (GADM) region.[24]

# 4 Results

## 4.1 Baseline results

Table 2 provides our baseline results. We aim to establish whether bilateral competition between banks that surround a firm helps or hinders this firm's access to credit. We are particularly interested in whether our *Bilateral competition* measure sheds light on local

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[24]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. Online Appendix Table OA4 shows that our results are robust to using other clustering approaches.

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 (8) we include often-used bank competition and composition variables at the locality level: the *HHI* (column 4), *Lerner index* (column 5), the share of *Relationship banks* (column 6), *Branch density* (column 7), and *Bank density* (column 8). We find that, when included on their own, the *HHI*, *Lerner index*, and the share of *Relationship banks* are neither reliable nor robust predictors of financial access. In contrast, both density measures are negatively correlated with credit access, indicating that a larger number of banks and bank branches (per $km^2$) is associated with easier access to credit.

In columns (9) to (11), we horse race these commonly used measures against our new *Bilateral competition* measure. While there is no significant correlation between the local *HHI* and credit constraints, the *Branch density* measure remains statistically significant in all three specifications. At the same time, the *Bilateral competition* measure continues to be a strong and robust predictor of local credit constraints. The results in column (9) indicate that a one standard deviation increase in local bilateral bank competition is associated with an increase of 3.6 percentage points in the likelihood that a firm is credit constrained, all else equal. This is a substantial effect given that 20 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 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).

## 4.2 Bilateral competition, firm size, and credit constraints

In Table 3, we present similar regressions but now use interaction terms to differentiate between the impact of our competition measure on smaller (<100 employees) versus larger (100 or more employees) firms. The existing literature suggests 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 in each column, the sum of the two coefficients is not significantly different from zero, meaning there is no strong effect of local bilateral bank competition on access to credit for large firms. This also holds when adding the locality-level *HHI*, *Lerner index*, share *Relationship banks*, and *Branch density* and interacting these variables with firm size, too. This can be seen in columns (4)-(6) of Table 3 where, for the sake of conciseness, we do not show the various additional interaction terms with *Large firm*.

## 4.3 Locality controls and effect size

Our identification strategy relies on the assumption that the type of banks operating in a locality is as-good-as-random after conditioning on key characteristics of the local economy. We now present evidence in support of this premise by showing that our estimates are highly

robust to gradually adding more spatial covariates. If such spatial characteristics correlate strongly with the bilateral bank competition, then their inclusion would erode the coefficient of interest. Table 4 shows this is not the case. In column (1), we start with a parsimonious specification that only includes our bilateral competition measure. Column (2) adds country fixed effects. This turns out to be a crucial step: the unconditional correlation between local bilateral competition and firm-level credit constraints is negative but turns positive once we add country fixed effects. This shows how country-level factors strongly confound the relationship between local bilateral banking competition and firm-level constraints. Once we compare firms located in different localities but within the same country, we uncover a strong positive relationship between bilateral competition and credit constraints.

In the subsequent columns of Table 4, we show that this positive within-country relationship is highly robust. We do so by saturating our specifications with industry fixed effects (column 3); our standard firm covariates (column 4); other local banking variables (*HHI*, *Lerner index*, *Relationship banks* and *Branch density*, column 5); regional GDP growth (column 6, which corresponds to our baseline specification in column (9) of Table 2); the level of regional GDP (column 7); and population density (column 8). To control for population density, we match a firm's geo-location to gridded population density data. We access these granular data from the Socioeconomic Data and Applications Center (SEDAC) hosted by the Center for International Earth Science Information Network (CIESIN) (revision 11). We use 30km x 30km grid cells.

This gradual saturation of our baseline specification reveals that the positive effect of bilateral competition on credit constraints remains very stable when we absorb more and more potential confounders. This is reassuring as it makes it unlikely that unobservable factors would erode our coefficient of interest once they would be included (under the assumption that they co-vary in a similar way with the regressor of interest as our current controls).

In Table 5, we provide further evidence on the robustness of the estimated effect of bilateral bank competition on small firms' credit constraints when controlling for several

other local credit-market characteristics. 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. Neither local wholesale funding nor bank capitalization strongly impact firms' credit constraints. 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 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 more in the wake of the global financial crisis as foreign banks deleveraged abroad 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. 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 on wholesale funding (column 5).

In column (6), we control for the adjustment in net parent bank lending (again a branch-weighted average by locality) between 2007 (before the global financial crisis and the Euro-zone crisis) and 2012 (at the time of the survey). This variable accounts for the fact that in 2012, the parent banks of some local subsidiaries were still adjusting their risk-weighted

assets. We find that in host-country localities with branches whose parent banks expanded net lending more at home, credit constraints tend to be tighter. This is in line with multinational banks trading off increased lending abroad and at home. Importantly, our coefficient of interest remains stable.

In column (7), we look at the local role of bank size rather than ownership. Our variable of interest is *Small banks*, the local share of branches of banks with 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 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, columns (8) and (9) control for the local share of relationship lenders and the Lerner index, respectively. While we find no effect of the latter variable, we do find a borderline significant effect of relationship lending on credit constraints over and above that embedded in the bilateral competition measure. This effect becomes statistically stronger (at the 5 percent level) when we add the control variables jointly in column (11). In line with Beck et al. (2018), we find that the local presence of relationship lenders can help alleviate the credit constraints of small businesses. Lastly, column (10) controls for the share or local branches owned by state-owned banks. We find, at the 10 percent level of statistical significance, that a larger presence of state banks may reduce small firms' access to credit. This is in line with recent work highlighting how state banks tend to focus on larger enterprises, including 'national champions' (De Haas, Guriev and Stepanov, 2022).

In sum, the results in Table 5 show that various other locality characteristics—either

independently or, as in column (11), jointly—do not explain away the effect of local bilateral bank competition on small firms' credit constraints.

## 4.4 The role of online lending

Although the advent of online lending may have reduced the role of brick-and-mortar branches, empirical evidence suggests that the distance between firms and bank branches continues to influence small business lending (Granja, Leuz and Rajan, 2022). For example, recent evidence from the Covid-19 crisis shows that the vast majority of Italian small businesses that applied for a government guaranteed loan—which were available online—did so at a bank branch in the same municipality as the firm (Core and De Marco, 2023).

To investigate the importance of online lending in our sample countries, we use a more recent (third) wave of the Banking Environment and Performance Survey (BEPS III), which was fielded between October 2020 and June 2021. An advantage of BEPS III is that it contained detailed questions on bank's online lending to different types of borrowers. In BEPS III, both the bank's CEO and its Head of Credit were interviewed (separately). Of most interest to us is question H14 posed to each bank's Head of Credit: "*Does your bank accept online applications for SME loans? Please select the option that best describes whether you accept online applications: (1) Yes, our bank accepts online applications and will in some cases disburse funds without meeting the client; (2) Yes, our bank accepts online applications but a subsequent face-to-face meeting with the client is always required before disbursement; (3) No, SME applications are never accepted online.*"

Column (1) of Table 6 shows that only 6 percent of the surveyed banks fully accept online SME applications. Another 39 percent indicate that SMEs can apply on-line but that a subsequent face-to-face meeting in a branch is still required. Lastly, 54 percent of all banks say SME loan applications are never accepted online. This shows that more than 90 percent of all the surveyed banks require SMEs to visit their branch at least once during the loan approval process, even if the initial application can be done online.

Next, we want to gauge how quantitatively important banks are that accept online SME applications. To do so, we download the full firm population in our sample countries from Bureau Van Dijk's Orbis database. We limit ourselves to firms with non-missing financial information and to ten countries were Orbis has sufficient coverage in terms of observed firm-bank linkages: Bosnia and Herzegovina, Bulgaria, Croatia, Hungary, Lithuania, Latvia, Poland, Serbia, Slovenia, and Ukraine. We create a balanced panel for the years 2013-20. Crucial for our purposes, Orbis includes an indicator of whether a firm has an active banking relationship. For almost 250k firms we know that they have a bank relationship and we have information, from the BEPS III survey, on their bank's SME lending techniques (see columns (2) and (3) of Table 6). We find that 93 percent of all firms are linked to a bank that requires at least one face-to-face meeting before approving an SME loan application. This clearly shows how geographic proximity between (potential) SME borrowers and brick-and-mortar bank branches is still of paramount importance in the region we study.

In Table 7, we re-estimate our baseline regressions while using the recently collected information about online lending to SMEs. In column (1), we use information on the branches of all banks interviewed during the survey. In column (2), we drop branches belonging to banks that allow SMEs to apply for credit fully online. Our results go through in both cases, indicating that our results are not systematically biased by the presence of banks that have fully automated their lending to SMEs (but may still operate local branches for retail or corporate lending). It also shows how important brick-and-mortar bank branches still are, at least for small business applicants, in the countries we study.

It is worth highlighting that the recent BEPS III survey provided us with a completely new set of CEO answers to the question which banks they consider to be their main competitors. These answers may differ from those of the previous BEPS II survey for many reasons: banks have entered and exited the market, bank CEOs have been replaced by other CEOs, and competitive dynamics may have changed. Yet, when we replicate our results using these more recent CEO surveys, and link them to the most recent round of the World Bank-EBRD

Enterprise Surveys, conducted in 2019, we find that we can fully replicate our original results on the basis of these new bank-level and firm-level data. This indicates that the answers of the bank CEOs contain information that allows us to differentiate meaningfully between banks that actively compete with each other and those that do not.

## 4.5   Robustness tests

### 4.5.1   Alternative credit-constraints measures

In Appendix Table A3, we use three alternative proxies for whether a firm is credit constrained. In column (1), we consider a firm credit constrained if it applied for a loan and was subsequently rejected by a bank (dummy is '1'). This variable is '0' if the application was approved or if the firm did not need a loan. In column (2), the dependent variable is '1' if the firm's loan application was rejected and '0' if it was approved. Here we drop firms without a need for credit from the sample altogether. Using both these alternative approaches, we continue to find a strong positive relationship between the intensity of local bilateral bank competition and the likelihood that a small business is credit constrained.

Lastly, in column (3), the dependent variable *Trade credit* equals '1' if the firm pays for inputs after delivery and is '0' otherwise. Earlier work shows that trade credit is a relatively expensive form of finance that firms typically use as a funding source of last resort (Petersen and Rajan, 1997; Fisman and Love, 2003).[25] Our results show, at the 10% level of statistical significance, that in localities with more intense bilateral bank competition, firms are more likely to resort to (potentially expensive) trade credit. This is in line with firms finding it more difficult to access regular bank credit in such localities.

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[25]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.

### 4.5.2 Exogeneity of local credit-market characteristics

Next, in Online Appendix Table OA3, we test whether our local credit-market characteristics can be explained in a systematic way by local firm characteristics. We regress the local banking variables on country fixed effects and several key firm traits averaged at the locality level: the proportion of large firms, sole proprietorships, exporters, and audited firms. To capture less tangible aspects of the local business environment, we also control for the local share of firms that indicate that in their 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. We use Wald tests to check whether these firm characteristics are jointly significantly correlated with local bilateral bank competition (column 1); bank concentration (column 2); branch density (column 3); and bank density (column 4). The $p$-values at the bottom of Table OA3 indicate that we can never reject the null hypothesis of no systematic relation between locality-level firm traits and local banking characteristics.

### 4.5.3 Redefining local credit markets

As explained in Section 2.3, our baseline approach to linking firms to surrounding bank branches is to match them on the basis of locality names. An alternative approach is to draw a circle around each firm and link it to all branches within that circle. In Online Appendix Table OA5, we provide results where we use circles with various radii to calculate the variables that describe the banking landscape in the immediate vicinity of a firm (that is, *Bilateral competition*, *HHI* and *Branch density*). The results in the first two columns show that our baseline results go through when we define local banking markets using a 7.5km circle (column 1) or a 10km circle (column 2) around each firm.

In columns (3) and (4) of Table OA5, we follow a more differentiated approach that accounts for cross-locality variation in population density. We now let the size of the local banking market depend on the population density at the geo-location of the firm. That is, we allow banking markets to be larger in less densely populated areas. We use the SEDAC data

to divide firms in each country into three buckets: those in areas with a population density below the 33rd percentile; those in areas between the 33rd and 66th percentile; and those in the most densely populated areas (above the 66th percentile). We then draw a 10km, 7.5km and 5km radius around firms in the least, medium, and most densely populated areas, respectively. In this way, we take into account that in low-density areas firms will be willing to travel over a larger distance to visit a bank branch, meaning that the 'local' banking market is spatially more extensive. We do this using either the 1km (column 3) or the 5km (column 4) grid cell in which the firm is located. Our results are also robust to this more flexible way of defining local banking markets.

### 4.5.4 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 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.

The most 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. Online Appendix Table OA6 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 OA6 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.

### 4.5.5 Excluding doubtful survey answers and the largest cities

The BEPS II and BEEPS V surveys were conducted by experienced teams from reputable survey firms. During the training sessions, 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 debriefing survey after each interview in which they rated the perceived truthfulness of the answers they received. Only in very few cases did surveyors doubt the veracity of (some) answers given. In the first three columns of Online Appendix Table OA7, we exclude these observations. Our results hold.

Second, we drop firms located in the largest cities (over 1 million inhabitants) to ensure that such large agglomerations are not driving our results. Due to the regional sampling of BEEPS V, there are many small towns and agglomerations among our localities. Indeed, the most populous size bracket of BEEPS localities comprises towns with fewer than 50,000 inhabitants. In a country like Poland, these include localities such as Grojec (16,674 inhabitants), Lomianki (24,328), and Sucha Beskidzka (9,295). It is this granular spatial variation in bilateral bank composition and other local credit market conditions that we exploit for identification. The results in columns (4) to (6) of Table OA7 confirm that when we exclude larger cities, effectively reducing the sample by 14 per cent, all our results continue to hold.

### 4.5.6 Local credit demand

Lastly, in Online Appendix Table OA8, we present specifications where we regress firms' demand for credit (columns 1-3) or whether they applied for credit (columns 4-6), both averaged at the locality level, on our local measure of bilateral bank competition and our standard control variables and fixed effects. Importantly, we find no correlation between the intensity of local bilateral competition and credit demand. This rules out a channel in which local bilateral bank competition intensifies in response to higher local credit demand. Instead, these results support our interpretation that, given a certain local demand for credit, small firms are less likely to have this credit demand met in localities where banks compete more strongly amongst each other.

## 5 Conclusions

Using the Banking Environment and Performance Survey, we provide the first international evidence on the impact 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.

We then show that local variation in bilateral bank competition has tangible impacts "on the ground". In particular, 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, even 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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