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The relationship between bank size and the propensity to lend to small firms: New empirical evidence from a large sample

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ABSTRACT

Small and medium-sized enterprises, in aggregate, are the biggest employer in most countries, accounting for about two thirds of all employment in the UK, and an even greater proportion in Germany and Japan. Small firms are largely dependent on bank credit for external funding. This paper examines the question whether there is a significant relationship between bank size and customer size and whether bigger or smaller banks are more likely to be helpful to small and very small businesses in terms of providing loans. Using data on over 14,000 active and inactive U.S. banks of all sizes, from 1994 to 2013, utilising over 178,000 observations, we conduct hitherto the largest empirical examination of this question, applying a new and superior methodology that resolves prior controversies. The results are robust and indicate an inverse relationship between bank size and the propensity of banks to lend to small businesses. We thus contribute towards settling a long-standing debate about the influence of bank size on bank finance for small firms. Policy implications are discussed, such as the importance of a diverse and decentralised banking sector that includes a large number of small banks, such as exists in the US (but not in the UK), in order to help overcome growth constraints on small and micro businesses.

1. Introduction

There has been increasing interest in financial analysis that distinguishes between large firms on the one hand, small and medium-sized enterprises (SMEs) on the other and micro firms as a third option. Ramalho and Vidigal da Silva (2009) examined capital structure of these differently sized firms and found that firm size is negatively related to the proportion of debt used by firms. On the other hand, there has been much interest in the question to what extent bank size matters – especially when it comes to network effects, contagion and systemic risk (see, for instance, Siebenbrunner et al., 2017). Policy-makers have been concerned with the question to what extent bank size matters when it comes to bank lending to SMEs and micro businesses. In this paper we present the results of the largest empirical study to date on this question.

Especially small and microbusinesses are known to face barriers to growth that are mainly due to a lack of access to finance (Cook, 1999; Pissarides, 1999; Hessels and Parker, 2013). Pissarides (1999) finds in a large empirical study on Eastern European SMEs that "credit constraints constitute one of the main obstacles to growth of SMEs". Many entrepreneurs

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resort to bank financing over venture capital financing in order to retain full control of their ventures, and retain strong incentives (De Bettignies and Duchen, 2015).

At the same time, since the 2008 banking crisis many entrepreneurs have been quoted in the financial press to the effect that the big banks have not been helpful to them and, specifically, are failing to provide funding to entrepreneurs and SMEs. Many policy-makers have since emphasised the need to increase bank lending to SMEs. Riding and Haines (2001) already argued that government interventions in the credit markets, to facilitate credit to entrepreneurial start-ups, expansion of existing SMEs and SME survival, are important for economic development and job creation. Examples for such interventions include the loan guarantee programmes in Canada and the United States and similar schemes in Japan, Korea, the United Kingdom and Germany. In recent years in the U.K, in addition to the grant, loan and government guarantee schemes (operated by the Department for Business, Energy and Industrial Stragey), a number of other government initiatives have been launched to stimulate bank lending to SMEs. These include Project Merlin (HM Treasury) and the Funding for Lending Scheme (FLS, operated by the Bank of England) as well as the Bounce Back Loan Scheme (BBLS) and the Coronavirus Business Interruption Loan Scheme (CBILS) began soon after government lockdown measures restricted business activity and harmed many small firms in particular. Meanwhile, the Federation of Small Businesses (FSB) has been flagging up the continuing unmet demand for credit by SMEs. Thus policy-makers and business representatives recognise problems with the funding of small businesses and entrepreneurs in many countries, while in others, such as Germany, this problem does not seem significant, even after the 2008 crisis.

In the United Kingdom, the then Department for Business, Innovation and Skills had tasked an entrepreneur (as 'Serial Entrepreneur in Residence' in 2013–14, Mr Lawrence Tomlinson) with looking into the practices of the big banks, in order to see whether they discriminate against small firms.[1] His report was disparaging about big banks, but has been criticised for its focus on case studies and lack of quantitative analysis.

It is well established in the scholarly literature that SMEs are more dependent on bank lending than other sources of external funding (e.g. Beck and Demirguc-Kunt, 2006). Recent developments in financial markets have widened the spectrum of entrepreneurial funding opportunities, with peer-to-peer lending and crowdfunding (Belleflamme et al., 2014) growing in importance, but the question concerning the optimal size of financial services provider (and hence structure of the financial sector) for the main employer (small and medium-sized enterprises) remains largely open. At a time of accelerated concentration of banking sectors in many countries and declining numbers of ever bigger banks, in this paper we ask whether big banks are less prone to support small firms, and whether small banks are more likely to lend to small firms.

Many studies have investigated the link between the organisational structure of financial institutions and lending to small businesses. These studies developed a conventional wisdom that larger banks devote a smaller proportion of their lending portfolios to small businesses than smaller banks (e.g. Berger and Udell, 1995; Keeton, 1995; Berger et al., 1998, 2005; Strahan and Weston, 1998; Haynes et al., 1999; Berger and Udell, 2002; Gilje, 2019). Others have explicitly examined the role of bank size (Bertay et al., 2013), though without considering customer size.

The main theoretical argument of these studies centres on differing lending technologies adopted by banks of different size: large banks are said to enjoy comparative advantages in 'hard information' lending (or 'transactions lending'), thus targeting more transparent and large firms, while small banks have comparative advantages in 'soft information' lending (or 'relationship lending') and thus are more interested in lending to small, opaque firms. Because of the informational opaqueness associated with small businesses, relationship lending is regarded as one of the most important technologies through which banks provide credit to small businesses (e.g. Berger and Udell, 2002). Thus large banks may be disadvantaged at relationship lending to small firms. This is said to be due to difficulties in processing 'soft information', which is problematic to quantify, verify and transmit through the communication channels of organisationally complex large banks, causing additional expenses and problems (e.g. agency problems) due to Williamson-type (1988) managerial diseconomies, which may also occur in transactions lending (e.g. Stein, 2002). On the other hand, the comparative advantages of small banks in lending to informationally opaque small businesses may be attributed to the superior ability of small banks to avoid managerial diseconomies. Additionally, small banks are more often located closer to their potential relationship clients, offering smoother communications that enable the bank management to collect and transmit more easily 'soft information' about the local market and the firm characteristics. Small banks with fewer layers of management hierarchy may mitigate contracting problems between the bank managers and the loan officers (e.g. Berger and Udell, 2002).

However, Berger and Udell (2006) question this conventional wisdom for being "oversimplified", by failing to distinguish between transactions lending technologies, and viewing them as a single homogenous lending technology used mainly by large banks dealing with informationally transparent firms. They develop a theoretical framework postulating how financial structures affect the feasibility and profitability of the different lending technologies, and the effects of these technologies on small business credit availability. According to this framework, only the financial statement lending technology satisfies such characteristics, while the rest of transactions lending technologies (e.g. small business credit scoring, fixed-asset lending, leasing, asset-based lending, and factoring) may be used to target informationally opaque borrowers. This provides a note of caution against drawing a conclusive answer to the question of whether a large market presence of small banks is essential for small businesses to obtain credit. Similarly, Petersen and Rajan (2002) claim that the use of information and communication technologies (e.g. credit scoring) has made local information previously only possessed by small banks less valuable in

[1] see https://www.gov.uk/government/news/you-re-hired-entrepreneurs-in-residence-to-advise-government

assessing small business loans, reducing the advantage that small local banks may have enjoyed in small business lending, and made it easier for large banks to approach small businesses (Berger et al., 2014).

Nevertheless, researchers such as Brickley et al. (2003) or Butler et al. (2016) provide justifications for an important role for small banks, such as when borrowers are considered poor credit and loan requests are small. This includes the literature on the functional distance between bank branches and their headquarters as a critical factor affecting credit availability to SMEs (Alessandrini et al., 2009; Cotugno et al., 2013) and innovations by SMEs (Alessandrini et al., 2010). That is to say, in markets where local banking is more dispersed and functionally distant, SMEs become more credit-rationed and less innovative. On the other hand, the impact of large banks on SMEs introducing innovations was found to be insignificant by Alessandrini et al. (2010). Giannetti and Yafeh (2012) reveal that lead banks offer smaller loans at a higher interest rate to more culturally distant borrowers and also require more collateral. A study from Poland, by Hasan et al., (2017), highlights the importance of local cooperative banks in facilitating credit to SMEs at a lower cost and contributing to the growth of SMEs.

Due to such counter-arguments and contradictory or ambiguous empirical results (e.g. Berger and Udell, 2002; Petersen and Rajan, 2002), it can be said that the question whether SME lending is best or most often done by small banks, or whether large banks are doing the job just as well, remains open. In order to contribute to this debate, we have analysed the empirical evidence from the world's largest and most diverse banking system, that of the USA. We analysed the relationship between bank size and small business lending. The degree to which the findings in other studies can be generalised may be questionable and their methodology to gauge the bank propensities to small business lending may be considered faulty. This paper thus contributes to the literature in two ways: (1) Unlike most of the papers that have employed survey data, our bank-level dataset consists of 14,453 domestic U.S depositary institutions insured by the FDIC, that is, approximately all U.S depositary institutions over two decades, utilising over 173,000 observations. Accordingly, the results can be generalised across the USA. (2) Improvements of two measures of bank propensities to lend to small and micro businesses are presented, which address the weakness in prior work of potential biases due to the "denominator effect" and an imprecision in the calculations of propensity ratios, as identified by Berger et al. (2007).

This paper is structured as follows: In the next section, a review is presented of the literature on bank size, bank consolidation, propensity measures and small business lending. The following section describes the data and the methodology utilised in our study. After this, results are presented, discussed and further subjected to robustness tests. The final section concludes.

2. Literature review

Two strands can be distinguished from the extant literature of bank size and small business lending. Firstly, a number of studies have investigated the extent to which banks of different sizes approach and lend to small businesses. Secondly, another strand of research has examined the extent to which bank size resulting from bank mergers and acquisitions (M&As) affect small business lending.

Concerning the first strand of literature, it has been argued that small banks allocate a higher proportion of their loan portfolio to small businesses than large banks do (e.g. Berger et al., 1998), whereas larger banks charge small businesses lower loan interest rates and less frequently require collateral from them (e.g. Berger and Udell, 1995; Carter et al., 2004). Here it is argued that a lower loan rate implies less opaque borrowers. Haynes et al., (1999) find that large banks are more likely to lend to larger and older small businesses and hence more secured ones. On the other hand, small banks are more willing to serve micro businesses, mainly through relationship lending as an advantageous technology that is inherent in small banks' lending to small businesses (Berger and Udell, 1995). A central interest of the literature is the process by which banks of different sizes approach small businesses. For instance, a study by Cole et al., (2004, also Cole, 1998), lends support to the conventional wisdom that large banks are more tied to transactions lending to control for agency problems, while small banks rely more on relationship lending. Recently, Beck et al., (2017) find that foreign banks follow large banks with more transactions lending, and their pricing is based more on credit ratings and collateral pledges. Further, Berger et al., (2005) assert that small banks have longer and more exclusive relationships, deal more personally with borrowers, and are more effective in alleviating credit constraints than large banks, and therefore small banks tend predominantly to lend to smaller, financially distressed firms. That is, small local banks are superior in channelling funds to SMEs and microbusinesses. For instance, Gilje (2019) documents that a positive local credit supply shock, resulting from an increase in local bank deposits, significantly increases the number of business establishments in the United States. Uchida (2011) observes a partial shift from collateral/guarantee lending to relationship lending following the banking crisis in Japan. In this context, Shimizu (2012) contends that in the local credit market in Japan a greater amount of non-performing loans (NPL) is held by small banks than large banks, and that such NPLs at small banks are associated with a lower number of bankrupt unincorporated firms or small businesses with a very small number of employees.

Unlike other studies, Berger et al., (2007) explore the impact of market size structure (i.e. the shares of different bank sizes in the local market) on credit supply to small businesses. Their findings contradict the above conventional wisdom and supports the hypothesis in Berger and Udell (2006), suggesting that large banks are not disadvantaged in lending to small or informationally opaque businesses, rather they may have alternative transactions lending technologies to approach small and opaque businesses. Berger et al., (2007) also find that small business borrowing rates are significantly negatively affected

by a larger market presence of large banks, but not by the bank's size itself. More recently, Berger and Black (2011) assert that 1) the comparative advantages of large banks in transactions lending vary across technologies, lending support to Berger and Udell (2006)'s framework against grouping transactions lending technologies, 2) not all of those advantages appear to be monotonically increasing as firm size increases, and 3) small banks may have a comparative advantage in relationship lending, however, the strongest advantage is found for lending to the largest firms. Accordingly, small banks may not be superior in serving small businesses. Further evidence to contradict the conventional wisdom is presented by Ongena and Sendeniz-Yuncu (2011) from Turkey. They report that small firms are more interested in dealing with large, domestic, private banks than small banks. They speculate that this may be due to the extensive influence of loan officers at large banks in Turkey (Benvenuti et al., 2009).

An important aspect in relationship lending is the role that loan officers can play in producing soft information about their small business clients. This role may differ according to bank type and size. Uchida et al., (2012) stress that loan officers do play a critical role in relationship lending; in particular, loan officers in small banks produce more soft information than those at large banks. However, the superiority of small banks in relationship lending is not due to the inability of large banks to produce soft information, rather it is due to greater efforts exerted by loan officers at small banks to produce soft information, and greater incentives granted by less organisationally complex banks (Stein, 2002), and a tendency by large banks to focus on transactions lending instead. Moreover, a reduction in the number of loan officers, due to permanent or temporary leave, interrupts the personalised relationship between the borrowers and the bank. Such interruption leads to loss in soft information and, consequently, reduction in the number of new loans, especially at banks that are specialised in SME lending (Drexler and Schoar, 2014).

A small number of cross-country studies exists in the empirical literature. De La Torre et al., (2010) consider 12 developed and developing countries. They conclude that all types of private banks are essentially interested in lending to small businesses and view them as a profitable market segment. Yet, banks do not rely solely on relationship lending when serving small businesses. In contrast, Mudd (2012) uses data from 71 countries to emphasise the importance of small banks in lending to small businesses through the implementation of the relationship lending technology, suggesting that a greater market presence of small banks in total lending increases the credit access for small businesses. In a recent cross-country study, Kysucky and Norden (2016) find that the beneficial effects of relationship lending vary across countries and increase with higher levels of bank competition. The greatest benefits for borrowers are found in the U.S, although SMEs are less important than in Germany, France, Italy and Japan.

The effect of bank consolidation on small business lending is an important subject that has been intensively investigated over the past two decades. To start with, Peek and Rosengren (1996) conclude that most banks that are involved in M&A activities reduced credits to small businesses in New England. This reduction occurs (e.g. for efficiency reasons, see Akkus et al., 2015) when most large and distant acquirers recast the targets' business strategies and consider them as junior partners (Keeton, 1995), such as modifications in the loan terms and reassessment of the lending portfolios (Bonaccorsi di Patti and Gobbi, 2007). The negative impact on small business lending is stronger with out-of-state urban acquirers (Keeton, 1995), and when many of the pre-merger relationships with small borrowers are terminated (Bonaccorsi di Patti and Gobbi, 2007). Since most small businesses are single-relationship borrowers, Degryse et al. (2011) argue that borrowing firms which hold single-relationships with target banks are more likely to be dropped and, consequently, being deprived of credits in Belgium. These dropped firms show a deteriorating performance and a higher rate of bankruptcy compared to others that do not face discontinuation of relationships or those that switch to other banks. In view of that, large borrowers, which build multiple relationships with lenders, are more likely to survive the consequences of bank mergers.

Moreover, Berger et al., (1998) employ a large sample of almost all U.S. M&As (namely 6000) that took place between 1977 and 1992. The static analysis suggests a decrease in small business loans, whereas the dynamic investigation shows that such decline is mostly offset by other lenders in the same market and partially by recasting post-consolidation policies toward small business lending. In a later study from Italy, Sapienza (2002) reports that small borrowers tend to seek financial alternatives to satisfy their credit demands following the mergers of their banks. Together, large acquirers tend to reduce their lending to small borrowers subsequent to the acquisition of small banks. Nevertheless, such decline is offset in the market after three years of M&A events (Bonaccorsi di Patti and Gobbi, 2007), while Craig and Hardee (2007) claim that it is partially offset by non-bank institutions.

A number of studies have taken a far more positive view of M&As on small business lending. Strahan and Weston (1996) document evidence of no effects of bank M&As on lending to small businesses, however, in a subsequent study Strahan and Weston (1998) find an increase in such lending following small bank consolidations. Along the same line of argument, Peek and Rosengren (1998) argue that small business lending increases when the acquirer is small or the acquirer has a greater share of small business loans than that of its target. On the other hand, small business lending decreases when the acquirer is large and not specialised in small business lending. Jayaratne and Wolken (1999) do not observe a significant decrease in the probability of a small business obtaining a line of credit as result of a reduced presence of small banks in the market. In a deeper attempt at examining the changes in post-consolidation lending policies, Erel (2009) concludes that banks, after mergers, charge lower interest rates especially for small loans. The reduction in spreads can be attributed to scale and/or scope efficiencies in the long-run, as well as efficiency gains in the short term, thanks to the mergers. Accordingly, larger acquirers do not significantly reduce small business lending by smaller targets. Rather, they grant greater amounts of loans to small businesses, implying a positive effect of mergers on small business lending. More recently, Jagtiani et al. (2016) argue that large banks have filled the gap in small business lending following the decline in the number of small community

banks as a result of M&As. They conclude that the acquisition of small banks by larger banks contributes to a sounder and safer banking system. Unlike our paper, Jagtiani *et al.* adopt the ratio of small business loans to total assets to measure the small business lending propensity. Another angle is to investigate the effect of M&As on the rate of new business formations. Again, the studies yield diverging results: some argue this is beneficial, others find the opposite.[2]

3. Weaknesses in the literature and how to address them

The significant amount of controversies in the above reviewed large literature demonstrates that further research is needed to shed new light on the underlying question, while addressing the likely causes of the controversies. We hold that most contradictory findings can be attributed to factors such as the sample size and data source, but also to the proxy measures employed and the empirical model adopted. There are at least three fundamental issues, and ours is the first research addressing all of them:

1) The empirical literature relies primarily on data taken from surveys (e.g. NSSBF survey for the US) of small business borrowing activities (e.g. Cole, 1998) or the Survey of Incorporated Businesses in Japan (e.g. Uchida, 2011). Others, such as Berger et al. (1998), Peek and Rosengren (1998) and McNulty et al. (2011), take samples of bank lending activity, such as the so-called Call Reports. Moreover, a number of researchers form samples by matching small business borrowers with their lenders, such as matching data from the NSSBF survey and the Call Reports (e.g. Haynes et al., 1999; Berger and Black, 2011). It is possible that, for instance, the Survey of Small Business Finances used by Berger et al. (2007) is not fully representative of the population of all small businesses with commercial bank loans found in the Call Report data, due to possible survivorship bias and probable exclusion of very small businesses. Results from these studies may be questioned concerning the degree to which their results can be generalised and whether there are any inherent biases.

By contrast, as will be seen below, in our Call Report data we consider *all* small business loans made by *all* commercial banks that were active at some time during the observation period (1994 to 2013). This almost certainly explains the difference between their interpretation of the data and ours. An important example is the widely used NSSBF survey which is conducted only once every five years and may neglect many of the micro firms. By relying on it, many researchers do not account for the changes in lending propensity over time and may face questions concerning sampling bias. As we aim to examine small business lending patterns from the banks' perspective, we collect a representative sample of virtually all depositary institutions in the U.S. over 20 years.

2) As for the proxy measures employed, Uchida (2011), for instance, criticises other studies (e.g. Berger et al., 2005; Uchida et al., 2008; and Berger and Black, 2011) for merely relying on measures of contract terms and the relationship strength between banks and firms to identify lending technologies rather than focusing on factors that drive such terms and strength. He collects data on loan screening from Japan and conducts a factor analysis in order to study the impact of small business characteristics on loan underwriting decisions. Yet, his data on the loan screening and the bank process of credit evaluation are merely taken from borrowers' perceptions. Further, Shen et al. (2009) reach contradictory results when using different measures of bank size. That is, bank size does not have effects on lending when measured by total assets, whereas it does have an effect when it is measured by the number of levels in the decision-making hierarchy.

A number of studies rely primarily on the ratio of small business loans to total assets as an indicator of bank propensity to lend to small businesses (e.g. Berger and Udell, 1995; Berger et al., 1998; Peek and Rosengren, 1998; Strahan and Weston, 1998; Akhavein et al., 2005; Frame et al., 2004; Laderman, 2008; Jagtiani et al., 2016). For instance, Berger et al. (1998) employ this lending propensity indicator to find a negative impact of M&As on small business lending in the U.S. Besides, Peek and Rosengren (1998) assert that small business lending propensities at target banks follow the same pattern as the acquirers following the M&As, but those propensities do not change when the acquirers are also small banks. In other words, they find that an acquiring bank tends to impose its business model on the target, in effect reconstructing the target bank in its own image. Their results show that the ratio of small business loans to total assets for the consolidated institution converges toward the pre-merger ratio of the acquirer (see also Karceski et al., 2005 on Norway). These findings, of imposing a new small business lending pattern, provide strong evidence that the reduced lending to small businesses is mainly due to changes in bank policy or, in other words, changes in the propensity to lend to small businesses.

On the other hand, Berger et al. (2007) question the importance of lending propensities. They suggest that perhaps large banks have lower ratios because the denominator is expanded (i.e. growth opportunities) and not because the numerator is contracted. Their results are based on matching firm data from the National Survey of Small Business Finance and bank data from the Call Reports and the Summary of Deposits. There are 648 matched bank-firm observations. By contrast, we look at virtually *all* small business loans made by banks by considering all usable Call Reports data reported by the FDIC. Clearly, lending propensities are important because they are a reflection of major differences in the business models of large and

[2] Black and Strahan (2002) find that the decline in the share of small banks, as a result of bank consolidations helps entrepreneurs and positively affects the formation of new businesses in the United States. This may occur, as previously stressed by Strahan and Wetson (1998), as a result of size-related diversification which reduces delegated monitoring costs incurred by small banks to build long-term relationships with their borrowers. In contrast, Francis et al., (2008) conclude that both in-market and out-of-market consolidations by large acquirers hamper the formation of new businesses. However, the adverse effects become positive in the long-term. Yet, consolidations by small or medium-sized acquirers are found to have a positive impact on small business formation and local entrepreneurial activities.

small banks. These differences determine the effect of specific mergers on individual small business borrowers at individual banks, as the relevant literature has shown.

Berger et al. (2007) claim that large banks are more capable, and less legally constrained than small banks, of expanding their assets by making large business loans or other investments. Such asset expansion shrinks the ratio of small business loans to total assets, as a result of a larger denominator rather than a smaller numerator. To correct for this problem, a few studies alternatively use the ratio of small business loans to total loans (e.g. Shen et al., 2009; McNulty et al., 2011). The latter ratio ameliorates the effect of the denominator that is inherent in the former ratio by excluding other specific large bank assets, (i.e. investment assets, trading account assets and other assets that would be a more significant portion of large bank balance sheets than small bank balance sheets), which are more likely to amount to a substantial portion of large bank assets. The ratio of small business loans to total loans is calculated by Shen et al. (2009) and McNulty et al. (2013), as follows:

$$Propensity\ \ Ratio = \frac{Small\ \ Business\ \ Loans}{\begin{array}{c} Total\ \ Loans \\ (i.e.\ \ Total\ \ Assets - Investments\ \ assets + \\ Trading\ \ account\ \ assets + \\ other\ \ large\ \ bank\ \ specific\ \ assets) \end{array}}$$

However, this correction may not be sufficient, as this ratio may include loans which are provided by banks that are more specialised in other types of lending (e.g. real estate lending) or more capable of providing large-scale loans to other depository institutions. As a result, the inclusion of these loans is translated in the ratio of small business loans to total loans as a low propensity (i.e. due to a larger denominator resulting from larger total loans or a smaller numerator resulting from a smaller amount of small business loans), erroneously showing them as being unwilling to lend to small businesses. Therefore, the literature has not done enough to ameliorate this problem.

As solution we suggest that the propensity to lend to small firms should be defined as the ratio of small business loans to total *business* loans. Our improved ratio excludes other non-business loans (i.e. personal loans, property loans, agricultural loans, credit card loans, loans to depository institutions and other non-commercial and industrial loans), as follows:

$$Propensity\ \ Ratio = \frac{Small\ \ Business\ \ Loans}{\begin{array}{c} Business\ \ loans \\ (i.e.\ \ Total\ \ Assets - Investments\ \ assets + \\ Trading\ \ account\ \ assets + \\ Non\ \ business\ \ loans + \\ other\ \ large\ \ bank\ \ specific\ \ assets) \end{array}}$$

3) As argued by Berger et al. (2007) concerning the denominator problem, large banks are also more capable of expanding and diversifying their lending portfolios. For example, large banks are more capable of providing large loans to other financial institutions that small banks cannot provide. Thus, including those types of loans in the denominator may also shrink the propensity ratio for large banks, showing them as unwilling to lend to small businesses.

We take the concern of Berger et al. (2007) regarding the denominator effect further and eliminate assets that may cause biases in lending propensities between large and small banks. This is the approach used for the empirical work presented below.

This paper, as also asserted by McNulty et al. (2013), does not say that a higher propensity ratio at small banks necessarily implies that small banks provide a larger volume of small business loans than large banks. However, it shows that small banks are more specialised in delivering loans to small businesses, and can pass on the collective benefits of this specialisation if there apropensitsource of data is the Federal Deposit Insurance Corporationy ratio for large banks, showing themre many of them. In other words, several independent small banks are likely together to lend more to small and micro businesses than a single bank whose balance sheet is as large as the sum of the small banks.

4. Data and methodology

Our primary source of data is the Federal Deposit Insurance Corporation (FDIC):

> "The FDIC collects, corrects, updates and stores Reports of Condition and Income data submitted to the FDIC by all insured national and state non-member commercial banks and state-chartered savings banks on a quarterly basis. Reports of Condition and Income data are a widely used source of timely and accurate financial data regarding a bank's condition and the results of its operations" (FDIC).

Our dataset includes all domestically active and inactive U.S. depositary institutions that have reported to the FDIC over the 20 years from 1994 to 2013. From these reports, data on their business loans are available. This gives us a dataset of 14,453 depositary institutions in an unbalanced panel dataset of 173,719 observations.[3] We believe this is the largest, longi-

[3] For simplicity, we use the term "bank" for all types of depositary institutions reporting to the FDIC.

tudinally the longest and, hence, the most representative dataset in the extant empirical literature. Unlike other variables, loans to small businesses are only reported as of June 30; thus we have to use yearly data for all variables. We calculated the ratio of small business loans to total business loans and the ratio of micro business loans to total business loans (SBLTBL and MBLTBL, respectively).

Additionally, as a robustness check, we seek to control for potentially large variations in the competitive environment and specialisation of banks. We thus construct a subsample of banks that specialise in commercial lending only and operate in the largest U.S cities (those with a population of more than 500,000). This leaves us with 912 banks headquartered in 34 cities, which operate in a more homogeneous environment with respect to market and economic conditions. This eliminates any unobserved regional or market effects, which are not captured by the control variables in the main regressions.

4.1. Definition of variables

As noted in the literature review, and taking into consideration the argument of Berger and Udell (2006) concerning the ratio of small business loans to total assets, our key dependent variables to measure the propensity of bank lending to small and micro businesses are:

(1) *the ratio of small business loans to total business loans (SBLTBL), and*
(2) *the ratio of micro business loans to total business loans (MBLTBL).*

Small business loans are defined by the FDIC as the amount of currently outstanding commercial and industrial loans with original amounts less than $1,000,000 held at domestic bank offices. In addition, we consider loans with original amounts of less than $100,000 to be micro business loans. Since the small business definition is based on the size of the loan (Call Reports definition), we name small business loans with original amounts of less than $100,000 as 'micro business loans' (i.e. loans granted to the smallest of the small businesses).

Several researchers have adopted the FDIC definition of small business loans, such as Keeton (1995), Strahan and Weston (1998), Peek and Rosengren (1998), Carter and McNulty (2005), Carter et al. (2004), and Berger and Black (2011). Although, in theory, the data is based on the loan size and not the company size, it is reasonable to interpret this in the way the FDIC and the literature have done: Because of the due-diligence and transactions costs, it is unlikely for large companies to take out very small loans, while small companies cannot take out large loans. Further evidence for the accuracy of this approximation comes from the Community Reinvestment Act (CRA) data, according to which on average 93% of small business loans amount to $100,000 or less.[4] In addition, primary surveys have established a close correspondence between loan size and the size of the borrower.[5]

Our key explanatory variable is the logarithm of total bank assets. It is defined as the sum of all assets owned by the institution, including cash, loans, securities, bank premises and other assets.[6] Since our study is based solely on data about banks' activities, we include a number of explanatory variables to control for other factors which may affect the credit supply to small businesses. These control variables are consistent with previous studies (e.g. Peek and Rosengren, 1998; DeYoung et al., 1999; Carter and McNulty, 2005) and are discussed below.

Regional Bank-Market Characteristics; firstly, we use a variable for regional banking market concentration that is represented by a bank's share in the market for deposits (it indicates a bank presence in the local market). This is computed as the share of deposits that is domestically held by a bank in the state where it is headquartered, as a percentage of all domestically held deposits in the state. Petersen and Rajan (1995) suggest that small banks in less competitive markets have a greater incentive to invest in loan relationships because there is less chance that the borrower will switch to a competing lender. Prior research shows that local market share of large banks is a powerful predictor of the lending bank size (e.g., Berger et al., 2007; Berger and Black, 2011), which suggests that firms may generally choose an institution based on convenience. The effect of market concentration may be either favourable or unfavourable for small business borrowers (e.g., see Scott and Dunkelberg, 2003). Secondly, a dummy variable takes the value of '1' if a bank's headquarters is located in Metropolitan Statistical Area (MSA) and '0' if a bank is not headquartered in the MSA. This variable indicates the level of market competition where banks are active (i.e. urbanised areas, as in MSA, show higher market competition than rural Non-MSA ones). Carter and McNulty (2005) argue that relative to small banks, large banks are more likely to operate in more competitive metropolitan markets, are more likely to be affiliated with a bank holding company, make relatively fewer small business loans but more credit card loans. Moreover, Akhigbe and McNulty (2003) report that 57% of small U.S banks are in non-metropolitan areas, so the typical small bank should have greater investment in small-firm relationships, which could give them an advantage in their lending activities. Accordingly, we expect a negative effect of the MSA variable on SME lending propensities. (Source: Summary of Deposits by the FDIC, 2014).

Regional Economic Characteristics; the logarithm of GDP per capita (the Gross Domestic Product per capita) is added to account for the effect of local economic activities and business cycles on credit demand and supply. Unlike Black and

[4] The CRA requires banks with asset size greater than $300 million to report their small business loans.

[5] For instance, according to the 1989 National Survey of Small Business Finance, 80 percent of loans to businesses with less than $1 million in annual sales amounted to less than $100,000 each (Board of Governors). Additionally, earlier surveys have yielded similar results (Keeton, 1995).

[6] This total does not include off-balance-sheet items.

Strahan (2002) who use the personal income growth, we use the GDP per capita of the state in which the bank is headquartered. The use of state-level GDP per capita and state-level deposit share may not be sufficiently representative of the actual bank local market. However, using county-level or MSA-level data (for Non-MSA areas, a county has to be considered instead) is too small, particularly for those multi-county banks (they form over 50% of the banks included in our dataset). Banks in more developed markets seek large deals with large firms and tend to invest in less costly loans to financially safer firms, while banks are more inclined to issue small business loans in less developed markets, especially through relationship lending. It is expected that large banks would more often lend to firms with high ROE relative to small banks (e.g. Rice and Strahan, 2010; Berger and Black, 2011). Therefore, bank lending propensities to micro and small businesses are expected to be lower in states with higher GDP per capita. (Source: Bureau of Economic Analysis, BEA).

Bank Specific Characteristics; we add a dummy variable for banks that are governed by a multibank holding company. This identifies a bank's autonomy in lending policies, since many holding companies may impose their policies on their smaller subsidiaries. Keeton (1995) argues that small banks affiliated with bank holding companies may act more like large banks, suggesting a lower propensity to lend to micro and small businesses (as this paper hypothesises).

In addition to the above controls, we include the following five variables to control for bank health, performance, and fundamental risk characteristics (all variables are collected from the FDIC, 2014):

1) The ratio of non-performing loans to total loans, defined as loans and leases 90 days or more past due plus loans in nonaccrual status, as a percent of gross loans and leases (e.g. Peek and Rosengren, 1998). A greater share of non-performing loans is expected to have a negative impact on the bank lending policy to small, informationally opaque firms.
2) The leverage ratio, defined as the Tier 1 (core) capital as a percent of average total assets minus ineligible intangibles. A bank that relies more on debt-based capital is less likely to be engaged in risky lending (e.g. SME lending), and more willing to approve loans to large, transparent companies (e.g. Peek and Rosengren, 1998). Thus, the bank propensity to lend to micro and small businesses is expected to decrease as a result of a higher leverage ratio.
3) Bank profitability is measured by the return on assets (ROA) ratio (e.g. Peek and Rosengren, 1998). This variable is defined as net income after taxes and extraordinary items as a percentage of average total assets. Bank profitability is typically used as a control variable to capture any link between bank performance and the local supply of credit (Carter et al., 2004).
4) The ratio of total interest income as a percentage of average earning assets. This ratio is used to control for lending performance (e.g. Carter and McNulty, 2005). Improved lending performance is expected to have a positive impact on the share of small and micro business loans.
5) The logarithm of the bank age, which is calculated by subtracting the year of bank establishment from the current year of observation plus one year, i.e. logarithm (age + 1). To be compatible with the lending date, the first four bank specific control variables are annualised over the past four quarters prior to 30th of June of each year. This measure captures whether a bank changes its small business lending behaviour as it becomes older. This variable allows us to test the extent to which bank age has a negative effect on small business lending (as found by DeYoung, 1998), or whether age is simply a proxy for other influences on the bank. We expect a negative relationship between bank age and small business lending (as also found by DeYoung et al., 1999).

4.2. Descriptive statistics

Table 1, below, provides summary statistics for all variables. The median of total assets ($996 million) indicates that half of the banks in the sample are small, with total assets of less than $1 billion. It is worth noting that there are significant gaps between the mean and median for the SBLTBL ratio (i.e. 85.97 and 99.98) and those for the MBLTBL ratio (i.e. 49.02 and 37.66), respectively. This may be attributed to a general lack of interest by banks in lending to the very small or micro businesses.

To conduct a preliminary descriptive analysis for our dataset, we draw two scatter plots illustrating the correlation between bank size and each of the SBLTBL and MBLTBL ratios. We categorise banks into 9 peer groups based on bank asset size. Next, small business loans and micro business loans are summed up for all banks in each peer group and the ratios of SBLTBL and MBLTBL for each peer group over the period 1994–2013 are computed.

The scatter plots A and B displayed in Fig. 1, below, illustrate a downward slope of the best-fitted line across the plotted points that represent the correlation between the ratio of SBLTBL and bank size. Notably, the nonlinear function (displayed in green colour) is, to large degree, compatible with a linear one. Consistent with our hypothesis, this is indicative of a strong negative correlation between bank size and each of the SBLTBL and MBLTBL ratios.

For robustness, we split banks into 50 peer groups in order to approximate a continuous line by having many more categories. The scatter plots C and D in Fig. 2, below, confirm the strong negative correlations between bank size and each of the SBLTBL and MBLTBL ratios. It is worth mentioning that the negative correlation seems to be slightly stronger between bank size and the very small businesses (i.e. micro businesses). It can be concluded that bank size is highly correlated with small and micro business lending.

Table 1
Summary statistics.

Variable	Description	Mean	Min	Max	Median	St. Deviation
Loan Ratios						
SBLTBL % (SBL < $1000,000)	Ratio of Small Business Loans to Total Business Loans (SBLTBL)	85.967	0.0004	100	99.979	21.577
MBLTBL % (MBL < $100,000)	Ratio of Micro Business Loans to Total Business Loans (MBLTBL)	49.015	0	100	37.657	35.274
Bank Size						
Total Assets*	Total bank assets in billions	1	0.002	1,950	0.996	19.9
Total Business Loans (TBL)*	Total business loans of a bank in billions	0.1164	0.00001	217.7	0.01	2.1492
9 TBL Categories	= nine categories of banks categorised based on the size of their TBL of each bank	5	1	9	5	2.5821
Small Bank (Asset-Based)	= 1 if the bank's total assets are less than 1 billion dollars, = 0 otherwise	0.9391	0	1	1	0.2391
Small Bank (TBLs-Based)	= 1 if the bank's total business loans are less than 1 million dollars, = 0 otherwise	0.9427	0	1	1	0.2325
Regional bank-market characteristics						
Market Deposit Share	Bank deposit share in the local market	0.3812	0	79.909	0.0893	1.7415
MSA Dummy	= 1 if bank's headquarters in MSA, = 0 for non-MSA	0.5493	0	1	1	0.4976
Regional economic characteristics						
Log. GDP Per Capita	Logarithm of gross domestic product per capita by state where bank is headquartered	10.575	9.8318	12.089	10.642	0.2542
Bank Characteristics						
Multi-Bank Holding Company	= 1 if the bank owned by a Multi-Bank Holding Company, = 0 otherwise	0.2311	0	1	0	0.4215
Non-Performing Loan Ratio %	Ratio of non-performing loans to total loans	1.4111	0	89.339	0.7172	2.3408
Leverage %		10.600	−9.7883	294.14	9.3587	6.2890
ROA %	Return on assets	0.8952	−68.610	44.414	1.0350	1.4199
Interest Income/Earning Assets %	Ratio of total interest income as a percent of average earning assets	6.8253	0	69.065	6.9618	1.7214
Business Loans/Total Assets %	Ratio of total business loans as a percent of total assets	9.4009	0.00002	97.750	7.7606	7.4539
Bank Age*	Year of establishment – year of observation.	68.801	1	221	78	41.942
Time Dummies	Twenty dummy variables for the years 1994 – 2013	20	20	20	20	20
No. of Observations		173,719	173,719	173,719	173,719	173,719

Note: *Total Assets and Total Business Loans variables in this table are displayed in thousands, while converted to logarithm when included in the regressions.
* Bank age variable is displayed by the number of years plus one, while converted to logarithm when included in the regressions.

4.3. Model specification

Our model specification examines the extent to which bank size has an effect on the lending propensity to small and micro businesses over 20 years. To do so, we employ a fixed-effects panel data approach presented in the following equation:[7]

$$PROPNS_{it} = \beta_1 SIZE_{it} + \beta_2 NPL_{it} + \beta_3 ROA_{it} + \beta_4 LEV_{it} + \beta_5 MBHC_{it} + \beta_6 MDS_{it} + \beta_7 GDP_{it} + \beta_8 IIEA_{it} + \beta_9 MSA_{it} + \beta_{10} BLTL_{it} + \beta_{11} AGE_{it} + \beta_{12} YD_t + \beta_{13} RD_i + \varepsilon_{it}$$

where, i represents the bank and t the year. The dependent variable is $PROPNS_{it}$ which represents each of the lending propensity ratios (i.e. SBLTBL and MBLTBL ratios). $SIZE_{it}$ is the size of the bank as the main explanatory variable of interest. The rest of the variables are control variables to account for regional bank-market characteristics (i.e. Market Deposit Share (MDS) and Metropolitan Statistical Area (MSA)), regional economic characteristics (i.e. Gross Domestic Product per capita (GDP)), and bank specific characteristics (i.e. Non-Performing Loans (NPL), Return on Assets (ROA), Multi-Bank Holding Com-

[7] Based on our panel data characteristics and statistical tests, a static fixed-effects panel data approach suits the empirical analysis of this paper, and hence, is used to test the relationship between bank size and SME lending propensity. The fixed-effects model is used when the intercepts of the model are not the same for different sections or different time series. In this case, dummy variables can be added to the model to estimate the regression coefficients (e.g. Stock and Watson, 2011, p. 401). The decision on using the fixed-effects model among other static models is taken after the computation of the F-statistic and Hausman tests.

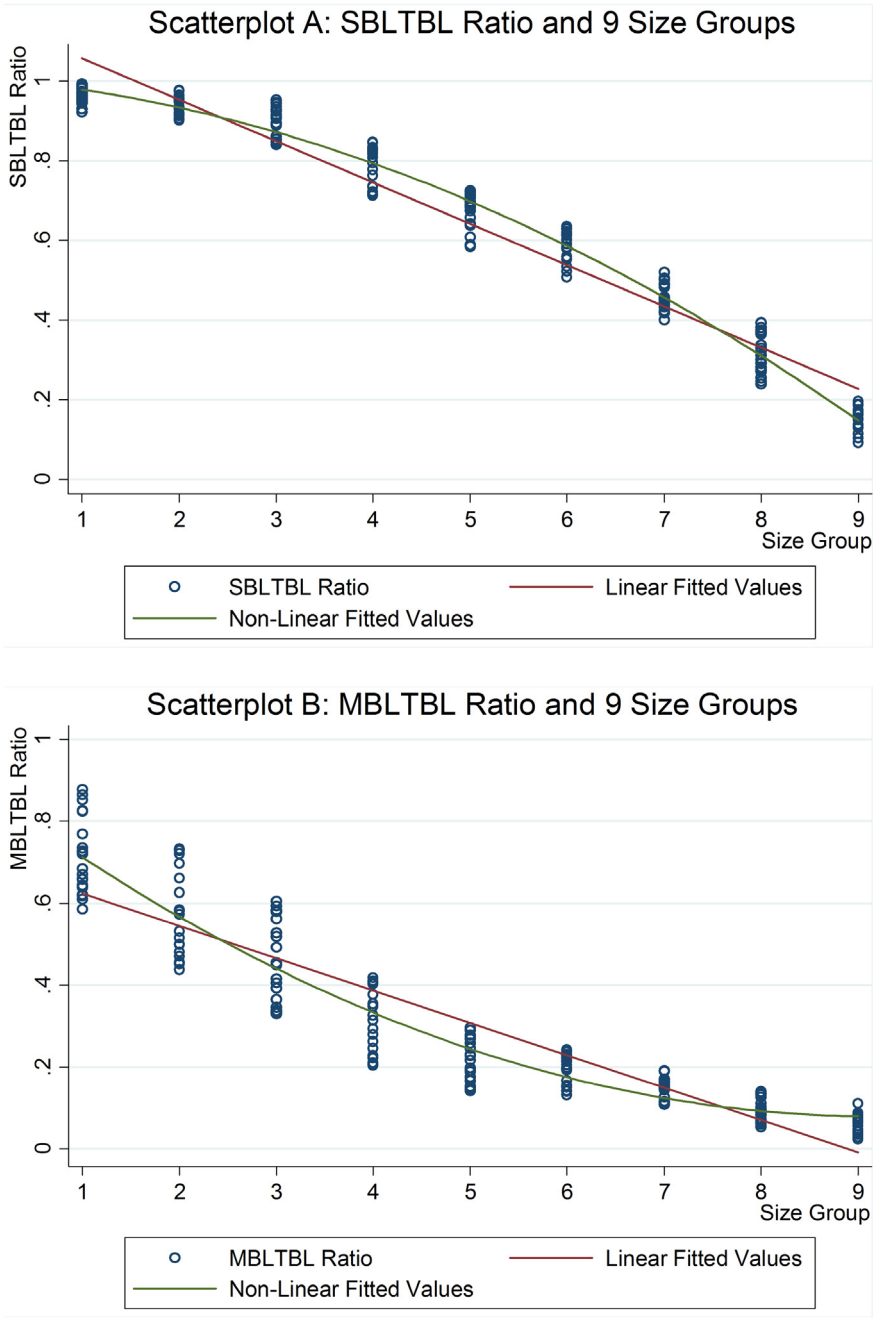

Fig. 1. Correlation between SBLTBL and MBLTBL Ratios and Bank Size for 9 Groups. Note: This figure includes two scatterplots of the relationship between lending propensity and bank size for 9 size groups of U.S banks. The scatterplot A illustrates the relationship between the SBLTBL ratio and bank size. The scatterplot B illustrates the relationship between the MBLTBL ratio and bank size. Each observation (circle) represents the lending propensity of a size group in a specific year. The number of years plotted are 20 years from 1994 to 2013.

pany (MBHC), Interest Income to Earning Assets (IIEA), Business Loans to Total Loans (BLTL), and bank Age (AGE)). YD_t is the set of yearly dummy variables. RD_i is the set of bank dummy variables, and ε_{it} is the error term. The above equation is estimated twice, that is, firstly by using the SBLTBL ratio as a measure of lending propensity to small businesses, and secondly by using the MBLTBL ratio as a measure of lending propensity to microbusinesses. Subsequently, both estimations are also repeated for different sub-periods and subsamples as robustness regressions.

The standard errors are robust, whereas we account for serial correlation by allowing for clustering of the error term at the bank level (see Petersen, 2009). Moreover, the F-statistic and Hausman tests are reported in the regression outcome tables to lend support to our decision to adopt a fixed-effects panel approach over pooled and random-effects approaches.

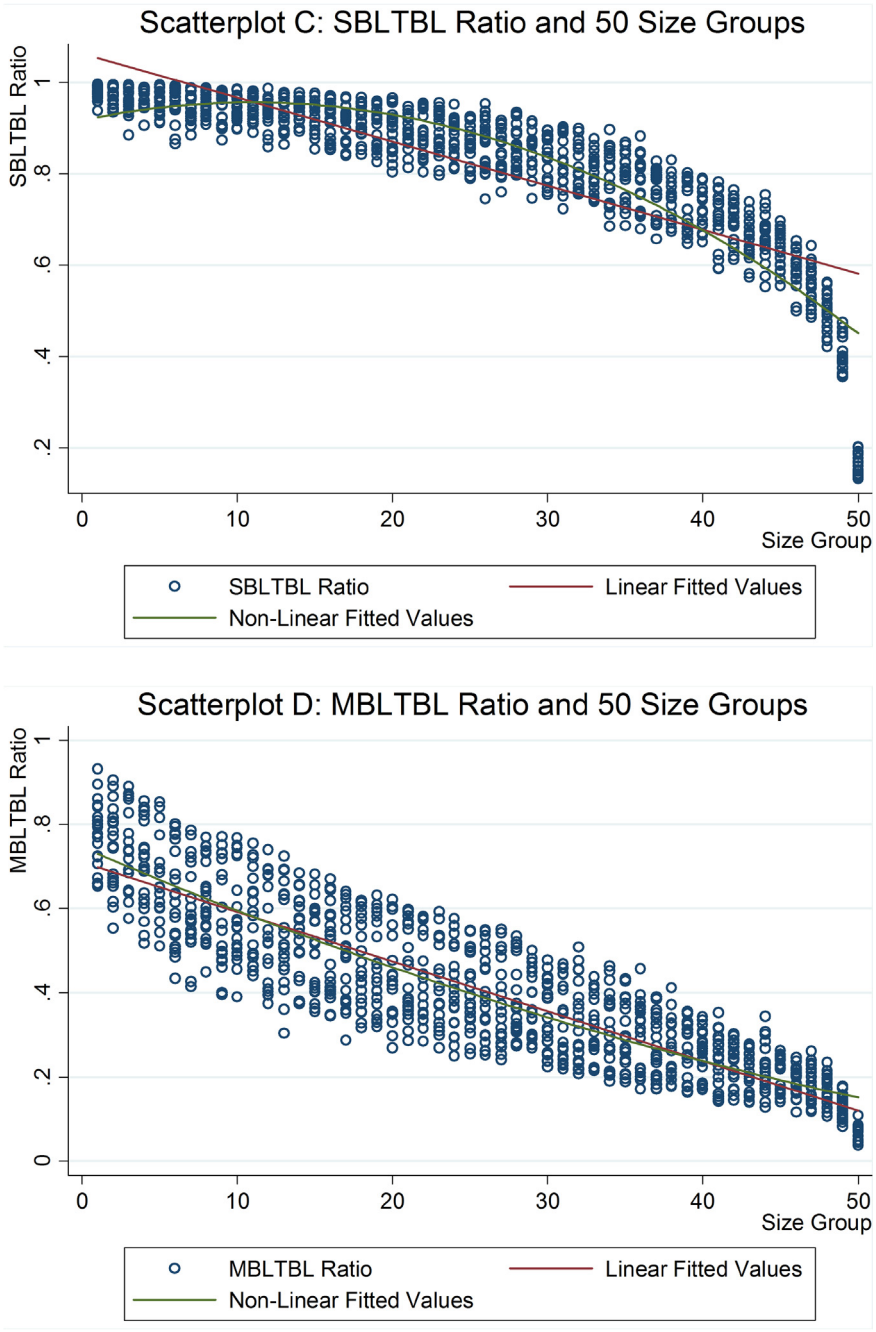

Fig. 2. Correlation between the SBLTBL and MBLTBL Ratios and Bank Size for 50 Groups. Note: This figure includes two scatterplots of the relationship between lending propensity and bank size for 50 size groups of U.S banks. The scatterplot C illustrates the relationship between the SBLTBL ratio and bank size. The scatterplot D illustrates the relationship between the MBLTBL ratio and bank size. Each observation (circle) represents the lending propensity of a size group in a specific year. The number of years plotted are 20 years from 1994 to 2013.

5. Empirical analysis

5.1. Graphical analysis

Before commencing the regression analysis, we consider the *a priori* theoretical propositions in order to hypothesise the expected bank lending behaviour over time. Fig. 3, below, shows a theoretical graph with five lines, each representing the ratio of the SBLTBL or the MBLTBL of each bank size group over the period 1994–2013. As can be seen, the curves do not

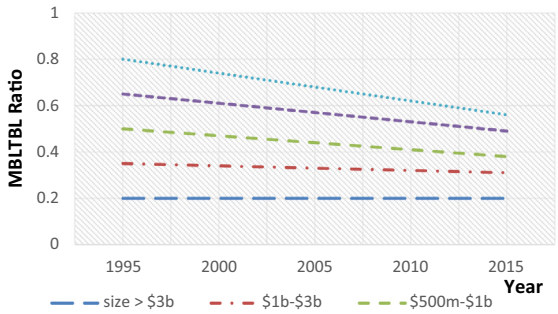

Fig. 3. A theoretical graph of the MBLTBL and SBLTBL ratios for peer groups. Note: This graph illustrates the theoretical behaviour of bank lending to SMEs over time for U.S banks, assuming bigger banks have a lower propensity to lend to small firms. Each line represents the lending propensity of each of five bank size groups over the period from 1994 to 2013.

intersect: The graph shows that larger banks have a lower propensity to lend to small and micro businesses, and as banks become larger (i.e. as we move to the lower lines) the curve is likely to become flatter. This would be expected if our hypotheses are supported that 1) larger banks are less prone to lend to small firms, and 2) as banks grow and merge over time, their propensity to lend to small businesses also declines. The latter effect could be expected to be most pronounced with the very small banks. On the other hand, the largest banks may no longer show a noticeable change, as they no longer increase the share of small business lending. Hence, the line representing their propensity to lend to small and micro businesses should stay largely constant overtime. These propositions are consistent with Peek and Rosengren (1998), who argue that larger banks do not only tend to have, on average, a smaller portfolio share of SME loans, but their share tends to shrink faster over time or grows more slowly.

As for the actual lending behaviour, we use the same categorisation, namely of nine bank-size groups, as already used in the scatter plots in the data section. Our findings are illustrated in Fig. 4, below. As can be seen, when a larger bank size group is considered, the MBLTBL ratio decreases. There is a sharp decline (i.e. over 60%) as bank size exceeds 500 million of assets. In other words, small banks seem to be more interested in dealing with small businesses as they allocate a significantly higher proportion of their business loans to small businesses. Over time, a slight decrease in the MBLTBL ratio for smaller banks may indicate decreased interest in small business lending, as these banks themselves grow over time. Yet, for larger banks, this ratio remains the lowest and stays fairly steady over time, suggesting an unchanged lending policy toward small businesses (being of little interest to large banks).

It should be noted that it is a strong result to find that the order othe same over this 20-year period, and thef the loan propensity schedules shown in Fig. 4, above, remains essentially the same over this 20-year period, and the empirical graph resembles the theoretical one in Fig. 3.

We next consider an important robustness test to meet the potential criticism that our results hide a different picture in the largest US cities. In Fig. 5, below, the microbusiness lending behaviour is shown for five size groups of banks solely specialised in commercial lending and headquartered in the largest 34 cities. As can be seen, the five size groups follow the same pattern shown in Figs. 3 and 4, above. A lower MBLTBL ratio and a steeper decrease by the smaller groups over time can be observed.

The pattern shown in Figs. 3-5, above, is consistent with the findings of DeYoung (1998) and DeYoung et al., (1999) that as banks become larger they begin to behave more like large banks, and also with the findings of Berger et al., (1998), Peek and Rosengren (1998), and Karceski et al. (2005) that the propensity to lend to small businesses for the consolidated institution converges toward the pre-merger ratio of the acquirer. Consequently, it seems an indisputable fact that the lending propensity of small banks declines over time.

5.2. Main regression analysis

The following section reports the regression results of the main model, as introduced above. Prior to regression estimations, we perform a Hausman test to verify the use of the fixed-effects approach. The test results reject the null hypothesis of no difference between the two estimations for all regressions, including robustness regressions (Hausman test statistics and their rejection probabilities are reported in the tables). Accordingly, we can confirm that fixed-effects estimation is consistent, while random-effects estimation is not.

The first regression (Model 1) in Table 2, below, models the effect of bank size on the SBLTBL ratio for loans with original amounts of less than $1 million, while the second regression (Model 2) models the effect of bank size on the MBLTBL ratio for loans with original amount less than $100,000. The key result in both regressions is that bank size has a significant negative effect on the SBLTBL and MBLTBL ratios. That is to say, the bank propensity to lend to small and micro businesses is negatively affected by the bank size. As bank size increases the relative share of small and micro business loans held by the bank diminishes. These results are consistent with the findings of Keeton, (1995), Strahan and Weston, (1998), Haynes et al.

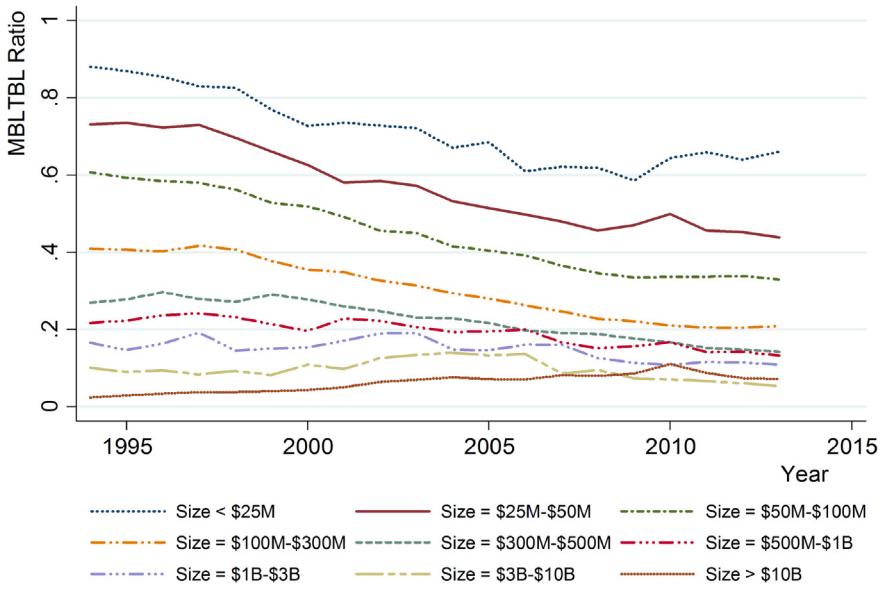

Fig. 4. Actual MBLTBL ratio for 9 peer groups. Note: This graph illustrates the actual behaviour of bank lending to micro businesses over time for U.S banks. Each line represents the lending propensity of each of nine bank size groups over the period from 1994 to 2013. The lending propensity to micro businesses is computed as the ratio of Micro Business Loans to Total Business Loans (MBLTBL) for each size group.

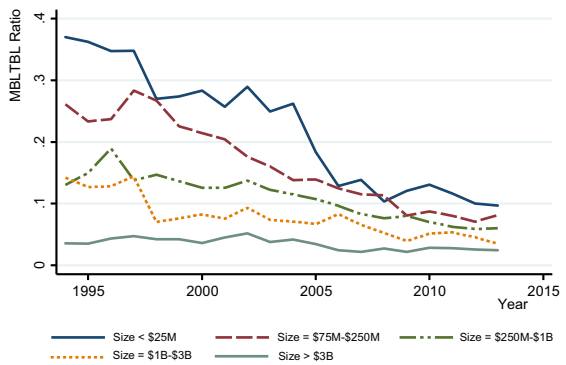

Fig. 5. Actual MBLTBL ratio for 5 peer groups of banks in the largest 34 cities. Note: This graph illustrates the actual behaviour of bank lending to micro businesses over time for U.S banks in the largest 34 U.S cities. Each line represents the lending propensity of each of five bank size groups over the period from 1994 to 2013. The lending propensity to micro businesses is computed as the ratio of Micro Business Loans to Total Business Loans (MBLTBL) for each size group.

(1999), Berger and Udell, (2002), Berger et al. (2005), Mudd (2012), and Gilje (2019), that is, small banks tend to lend more to small businesses and large banks are more advantaged in lending to large businesses. In this line, the findings of this paper also lend support to the claim that bank M&As are detrimental to small businesses by reducing the latters chances to secure funds (e.g. Peek and Rosengren, 1996; Berger et al., 1998; Bonaccorsi di Patti and Gobbi, 2007; Francis et al., 2008; Degryse et al., 2011).

Our findings refute the opposite claims that there is no effect of bank size on small business lending (e.g. Berger and Udell, 2006; Berger et al., 2007, 2014; De La Torre et al., 2010; Berger and Black, 2011), large banks lend more to small businesses than small banks do (e.g. Ongena and Sendeniz-Yuncu, 2011), and bank consolidations help small businesses through increased lending (e.g. Strahan and Weston, 1998; Jayaratne and Wolken, 1999; Black and Strahan, 2002; Erel, 2009; Jagtiani et al., 2016).

What is more, Table 2, below, shows that most of the control variables have the expected signs. For instance, in both models, the multi-bank holding company coefficients show a negative sign indicating that banks are less interested in lending to small businesses when these banks are partially or fully owned by multi-bank holding companies. This can be attributed to a higher level of centralisation that may influence the bank lending decisions, i.e. the lending policy may be imposed by the holding company (e.g. Keeton, 1995) or the acquiring bank (e.g. Peek and Rosengren, 1998; Karceski et al., 2005).

Table 2
Fixed-Effects regressions for model 1 and 2 all-sample.

Variables	Model 1 (Main Model) SBLTBL	Model 2 MBLTBL
Log. Assets	−9.541565***	−7.334459***
	(−90.50)	(−45.76)
Non-performing Loans	−0.1753629***	0.0268057
	(−9.97)	(1.00)
ROA	0.1927039***	0.2050129***
	(6.23)	(4.36)
Leverage	−0.1520507***	−0.0035444
	(−21.28)	(−0.33)
Multi-Bank Holding Company	−1.59743***	−3.54008***
	(−10.16)	(−14.80)
Market Deposit Share	0.0123119	0.5323706***
	(0.27)	(7.75)
Log. GDP per capita	−2.107229***	−2.654262**
	(−3.02)	(−2.50)
Interest Income/Earning Assets	0.497508***	0.0048192
	(11.07)	(0.07)
MSA	−0.7294275*	−6.449522***
	(−1.70)	(−9.86)
Business Loans/Total Assets	−0.4639655***	−0.7759058***
	(−58.12)	(−63.94)
Log. Age	−0.916927***	6.416471***
	(−4.95)	(22.81)
Year Dummies	Included	Included
Bank Dummies	Included	Included
No. Observations	173,692	173,692
No. Banks	14,453	14,453
Prob > F	0.0000	0.0000
Hausman test statistic	973.79	1370.40
Hausman test (Prob > chi2)	0.0000	0.0000
R-sq: within	0.2259	0.3267
R-sq: between	0.5360	0.4612
R-sq: overall	0.4280	0.4250

Note: This table reports results from Fixed-Effects estimations of the effects of bank assets on bank propensities to lend to micro and small businesses. The dependent variables are the measures of the lending propensities to micro and small businesses, i.e. (1) Micro Business Loans to Total Business Loans and (2) Small Business Loans to Total Business Loans. The key independent variable is the logarithm of total bank assets. The period covers the years 1994 to 2013. T-statistics between parentheses. The symbols ***, ** and * indicate the levels of significance, 1%, 5% and 10%, respectively.

We used our large data set to check the influence of non-performing loans on bank lending. Consistent with Peek and Rosengren (1998), we find that a larger proportion of non-performing loans may negatively influence bank lending in general, and small business lending in particular, as NPLs can be expected to increase banks' aversion to risk. Since many banks regard small business lending as risky, they may be more reluctant to lend to small businesses which can be a source of non-performing loans. Similarly, banks with a higher leverage ratio tend to reduce risky loans by lending less to potentially opaque small businesses.

On the other hand, other variables illustrate significant positive coefficients in models 1 and 2. For instance, a higher return on assets increased total interest income to average earning assets, and a larger deposit share in the bank local market are all expected to increase the size of small business lending portfolios. So improved lending performance increases the share of small business loans as Carter and McNulty (2005) find. The positive deposit share variable indicates, as Petersen and Rajan (1995) and Akhigbe and McNulty (2003) argue, that a bank with greater market power is more likely to extend its lending to more small and micro businesses in the local markets. Contrary to Peek and Rosengren (1998), higher profitability, measured by the return on asset ratio, increases the local supply of credit to small businesses. Improved bank profitability may encourage banks to be involved in riskier loans as is the case with small and micro businesses.

Concerning geography, we find that the level of a region's urbanisation (MSA) and level of development (GDP) seem to have a significantly negative impact on bank lending propensity to small and micro businesses. Banks, especially small ones, tend to increase their lending to SMEs in more rural areas, while these SMEs may struggle more to obtain bank finance in more urbanised regions. The negative effect of bank age on the lending propensity to small businesses in Model 1 is consistent with the findings of DeYoung (1998) and DeYoung et al. (1999). This negative impact can be attributed to changes in bank lending behaviour over time. That is, the older banks become larger and begin to behave more like large banks. However, the positive effect of bank age on the lending propensity to micro businesses can be the product of U.S development programmes such as the Community Reinvestment Act (CRA), which requires large banks to allocate a share of their loans

to micro businesses. Therefore, large banks have had to increase their lending to micro businesses during the sample period, i.e. 1994–2013.

5.3. Testing for the lending capacity of small banks and the TBL-based bank size

In this section, we control for the fact that most of the banks in the sample are small and many of them are too small to make large loans.[8] In addition, we examine whether it makes a difference if bank size is measured in terms of Total Business Loans (TBL) or total assets. We confine the analysis in this section to the propensity of granting small business loans, i.e. SBLTBL.

To begin with, we re-estimate "Model 1" of Table 2 after adding a dummy variable named "Small Bank (Asset-Based)" equals 1 if a bank's total assets are less than $1 billion and 0 otherwise.[9] This dummy variable absorbs any potential bias emanating from having too many small banks in our sample. As shown in column 2 of Table 3, the total assets coefficient slightly changes to −8.84, and hence the relationship between the asset-based bank size and the SBLTBL ratio remains significant and negative.

Moreover, researchers might argue that bank size should be measured in terms of TBL instead of total assets. Since the extant literature has not yet used TBL as a measure of bank size, we do so for the first time. Accordingly, we replace the logarithm of total assets (i.e. Log. Assets) by the logarithm of the TBL (i.e. Log. Business Loans) as a measure of bank size. As shown in column 3 of Table 3, the relationship between the TBL-based bank size and the SBLTBL ratio is negative at −5.68 and significant. That is, as total business loans increase, the share of small business loans declines. We do not rely on this result, due to possible endogeneity, but it is in line with the main findings.

Moreover, as robustness check, we include a new variable, "9 TBL Categories", which refers to nine categories of banks categorised based on the size of their total business loans of each bank. As demonstrated in column 4 of Table 3, because of the high correlation (0.7) between the "Log. Assets" and the "9 TBL Categories" variables, the coefficients of two control variables have become statistically insignificant, i.e. "MSA" and "Log. Age". In column 5, we remove the total assets variable because of the high correlation. In both regressions, the relationship between the nine-TBL-categories-based bank size and the SBLTBL ratio remains negative and significant. This is another robustness check of our finding.

In column 6 of Table 3, we include a new size dummy variable based on the TBL for small banks. That is, we add to the "Main Model" a dummy variable "Small Bank (TBL-Based)" equals 1 if a bank's TBL is less than $100 million, and 0 otherwise. In column 7, we replace the logarithm of total assets by the "9 TBL Categories" variable as a measure of bank size. Despite the high correlation (0.57) between "Log. Assets" and "Small Bank (TBL-Based)" variables, the signs and the statistical significance of the control variables are not affected. Most importantly, the negative relationship between bank size and the SBLTBL ratio still holds in regressions 6 & 7.

Notably, the small bank dummy variables have positive effects on the SBLTBL ratio, in columns 2, 6 & 7 of Table 3, regardless of how bank size is measured. That means that small banks have a strong tendency to increase their small business loan share in their loan portfolios. Furthermore, all bank size measures and small bank dummy variables are statistically significant. In conclusion, whether bank size is measured by total assets or total business loans, the relationship between the size of the bank and the bank propensity to lend to small businesses is always negative and significant.

5.4. Testing for the impact of the 2008 crisis

In order to test for the impact of the 2008 banking crisis and to rule out the possibility that the recent financial crisis may be biasing our results, we break the sample period into two sub-periods 1994–2007 and 2008–2013, and then run the same models for each period. Regression results in Table 4, below, show that bank size coefficients change marginally during the period before the credit crisis compared to the all-sample coefficients (i.e. −8.62 and −7.85 respectively). As for the years during the crisis, there are also slight economic changes, where the SBLTBL ratio coefficient decreases by 1.17 while it is slightly more for the MBLTBL ratio, by 1.69. However, the impact of bank size on the two ratios remains statistically significant for pre and post crisis as well as all-sample periods. Therefore, it can be concluded that the results from the all-sample regressions are robust and hence the inverse relationship between bank size and bank propensities toward small and micro business lending seems not to have been substantially influenced by the 2008 credit crisis.

5.5. Other robustness tests

In order to ensure equal exposure of all bank types and sizes to similar market characteristics, we repeatedly re-estimate the same MBL and SBL models after having the dataset restricted to banks with more homogenous market and economic characteristics (i.e. only urban areas) and merely specialised in commercial banking. This sequence of regressions ensures robust conclusions of the impact of bank size on micro and small business lending propensities.

In the first such robustness regression, we exclude all banks that are headquartered in non-MSAs (i.e. rural counties), limiting our dataset to banks headquartered in counties that are part of MSAs, that is, banks headquartered in urban areas. As a

[8] We are grateful to an anonymous referee for the valued suggestions concerning the robustness checks provided in this section.

[9] "Model 1″ in Table 2 is placed as "Main Model" in Table 3 to be used as a benchmark.

Table 3
Fixed-Effects regressions for the relationship between SBL lending propensity and bank size.

Variables	Main Model	Asset-Based Size Dummy (Total Assets < 1b)	Log. TBL Only	9 TBL Categories	9 TBL Categories Only	TBL-Based Size Dummy TBL < 100 m	TBL-Based Size Dummy (TBL < 100 m) & 9 Categories
	1	2	3	4	5	6	7
Log. Assets	−9.541565*** (−90.50)	−8.837415*** (−79.40)	–	−6.020079*** (−51.83)	–	−8.644101*** (−78.76)	–
Small Bank (Asset-Based)	–	5.173495*** (19.53)	–	–	–	–	–
Small Bank (TBL-Based)	–	–	–	–	–	7.193791*** (28.57)	13.61958*** (57.15)
9 TBL Categories	–	–	–	−2.46946*** (−69.91)	−3.254111*** (−101.11)	–	−3.189218*** (−100.04)
Log. Business Loans	–	–	−5.679773*** (−111.81)	–	–	–	–
Non-performing Loans	−0.1753629*** (−9.97)	−0.1684346*** (−9.59)	−0.1886777*** (−10.76)	−0.1843423*** (−10.53)	−0.1924326*** (−10.90)	−0.174906*** (−9.97)	−0.1964301*** (−11.24)
ROA	0.1927039*** (6.23)	0.1743385*** (5.64)	0.1168678*** (3.79)	0.2085507*** (6.77)	0.154945*** (4.99)	0.1656022*** (5.36)	0.1263342*** (4.11)
Leverage	−0.1520507*** (−21.28)	−0.1423157*** (−19.89)	−0.1350442*** (−19.06)	−0.1562681*** (−21.99)	−0.1101043*** (−15.48)	−0.1351962*** (−18.90)	−0.0997591*** (−14.17)
Multi-Bank Holding Company	−1.59743*** (−10.16)	−1.626209*** (−10.35)	−1.110608*** (−7.09)	−1.604979*** (−10.25)	−1.143565*** (−7.25)	−1.560913*** (−9.95)	−1.208101*** (−7.74)
Market Deposit Share	0.0123119 (0.27)	0.0570568 (1.26)	−0.3365242*** (−7.61)	−0.2201122*** (−4.88)	−0.765313*** (−17.30)	0.0665334 (1.47)	−0.5044551*** (−11.46)
Log. GDP per capita	−2.107229*** (−3.02)	−2.041957*** (−2.93)	−1.910878*** (−2.75)	−1.376245** (−1.98)	−2.117993*** (−3.02)	−1.997832*** (−2.87)	−1.36162** (−1.96)
Interest Income/ Earning Assets	0.497508*** (11.07)	0.4847013*** (10.79)	0.6674806*** (15.02)	0.482337*** (10.86)	0.5906083*** (13.21)	0.4728188*** (10.54)	0.5941117*** (13.42)
MSA	−0.7294275* (−1.70)	−0.9746526* (−2.27)	−2.880427*** (−6.76)	−0.5939169 (−1.39)	−3.165732*** (−7.38)	−1.017202*** (−2.37)	−2.665651*** (−6.28)
Business Loans/ Total Assets	−0.4639655*** (−58.12)	−0.4651371*** (−58.34)	–	–	–	−0.4316865*** (−53.68)	–
Log. Age	−0.916927*** (−4.95)	−1.233741*** (−6.65)	−3.42985*** (−19.88)	−0.2165991 (−1.18)	−3.433437*** (−19.74)	−1.044037*** (−5.65)	−2.791257*** (−16.17)
Year Dummies	Included	Included	Included	Included	Included	Included	Included
Bank Dummies	Included	Included	Included	Included	Included	Included	Included
No. Observations	173,692	173,692	173,693	173,693	173,693	173,693	173,693
No. Banks	14,453	14,453	14,453	14,453	14,453	14,453	14,453
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hausman test (Prob > chi2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R-sq: within	0.2259	0.2277	0.2304	0.2330	0.2201	0.2298	0.2357
R-sq: between	0.5360	0.5384	0.4297	0.5287	0.3945	0.5491	0.4839
R-sq: overall	0.4280	0.4307	0.3649	0.4224	0.3342	0.4373	0.3967

Note: This table reports results from Fixed-Effects estimations of the effects of bank size on bank propensity to extend small business loans (SBL). The dependent variable is the measures of the lending propensity to small businesses, i.e. Small Business Loans to Total Business Loans, SBLTBL. The key independent variable in the "Main Model" is the logarithm of total bank assets (i.e. Log. Assets). In column 2, the "Main Model" is re-estimated after including a dummy variable, "Small Bank, Asset-Based", equals 1 if a bank's total assets are less than $1 billion, and 0 otherwise. In column 3, the "Log. Assets" is replaced by the logarithm of the TBL (i.e. Log. Business Loans). In column 4, a variable called "9 TBL Categories" is added to the "Main Model", it has nine categories based on the size of the TBL. In column 5, the "Log. Assets" is removed from the "Main Model" and the "9 TBL Categories" is added. In column 6, a dummy variable, "Small Bank, BL-Based", is add to the "Main Model", it equals to 1 if a bank's TBL is less than $100 million, and 0 otherwise. In column 7, the "Log. Assets" is replaced by the "9 TBL Categories", and the "Small Bank (TBL-Based)" is added. The period covers the years 1994 to 2013. T-statistics between parentheses. The symbols ***, ** and * indicate the levels of significance, 1%, 5% and 10%, respectively.

result, the number of observations declined by approximately 45% with 8,938 banks remaining from the main sample. Secondly, we further limit our sample to banks solely specialised in commercial lending and rerun the same regressions. Finally, we re-estimate the same MBL and SBL models using the subsample of banks in the largest 34 U.S cities. The final subsample consists of 912 banks with 7,188 observations. Since all banks in the robustness regressions are headquartered in MSAs, we drop the MSA variable from the three additional regressions.

Table 4
Fixed-Effects regressions for pre- and post- 2008 credit crisis:

Variables	Model 1 SBLTBL	Model 2 MBLTBL	Model 3 SBLTBL	Model 4 MBLTBL
	1994 – 2007		2008 – 2013	
Log. Assets	−8.62239***	−7.854647***	−7.457246***	−6.169715***
	(−68.31)	(−37.91)	(−19.79)	(−14.11)
Non-performing Loans	−0.0335493	−0.0577149	0.0316545	0.0738509**
	(−1.28)	(−1.34)	(1.08)	(2.17)
ROA	0.1568539***	0.2488841***	0.0229563	0.0265731
	(3.96)	(3.83)	(0.43)	(0.43)
Leverage	−0.1270777***	−0.0202912	−0.0732918***	−0.0060452
	(−16.07)	(−1.56)	(−3.27)	(−0.23)
Multi-Bank Holding Company	−1.728474***	−3.386097***	−1.39424***	−2.349929***
	(−10.13)	(−12.09)	(−2.62)	(−3.80)
Market Deposit Share	−0.0225343	0.6479314***	−0.0048923	0.1447121
	(−0.44)	(7.65)	(−0.04)	(1.07)
Log. GDP per capita	−3.22378***	−2.961471*	−0.7968813	−2.726113*
	(−3.45)	(−1.93)	(−0.57)	(−1.69)
Interest Income/Earning Assets	0.2999385***	−0.0329389	0.4693207***	0.6368938***
	(6.39)	(−0.43)	(3.23)	(3.78)
MSA	1.358602***	−6.832038***	−2.668207*	−4.438309**
	(2.64)	(−8.10)	(−1.76)	(−2.53)
Business Loans/Total Assets	−0.3569564***	−0.764582***	−0.9698446***	−0.8219291***
	(−39.96)	(−52.15)	(−42.42)	(−31.00)
Log. age	−0.0637153	5.895814***	0.4642277	7.323071***
	(−0.26)	(14.93)	(0.70)	(9.56)
Year Dummies	Included	Included	Included	Included
Bank Dummies	Included	Included	Included	Included
No. Observations	129,729	129,729	43,963	43,963
No. Banks	14,133	14,133	8183	8183
Prob > F	0.0000	0.0000	0.0000	0.0000
Hausman test statistic	518.63	601.94	313.72	451.05
Hausman test (Prob > chi2)	0.0000	0.0000	0.0000	0.0000
R-sq: within	0.1610	0.2578	0.0849	0.0663
R-sq: between	0.5027	0.4672	0.4948	0.3437
R-sq: overall	0.4076	0.4104	0.4190	0.3001

Note: This table reports results from Fixed-Effects estimations of the effects of bank assets on bank propensities to lend to micro and small businesses. The dependent variables are the measures of the lending propensities to micro and small businesses, i.e. (1) Micro Business Loans to Total Business Loans and (2) Small Business Loans to Total Business Loans. The key independent variable is the logarithm of total bank assets. The regression models (1) to (2) contain results for the period prior to the 2008 financial crisis, i.e. 1994–2007. Regression models (3) to (4) contain results for the period following the 2008 financial crisis, i.e. 2008–2013. T-statistics between parentheses. The symbols ***, ** and * indicate the levels of significance, 1%, 5% and 10%, respectively.

Tables 5 and 6, below, summarise and compare the outcomes of the baseline regression and the additional three robustness regressions for the effect of bank size on the SBLTBL and MBLTBL ratios, respectively. Table 5 shows that the negative effect of bank size on the SBLTBL ratio remains statistically and economically significant, with a coefficient slightly increasing across the four regressions, from 9.54 to 11.69. Table 6 indicates that although the size effect on the MBLTBL ratio decreases from −7.33 to −2.1, the effect remains negative as well as statistically and economically significant. It is worth noting that as we restrict our sample to banks located in urbanised and denser areas, the effect of bank size on the SBLTBL ratio increases, while it decreases for the MBLTBL ratio. Such patterns can be attributed to two correlated factors: firstly, a smaller presence of smaller banks in the largest, densest cities in the United States. Secondly, smaller banks seem to become more prone, in the denser areas, to increase the size of their small business loans by targeting larger and more secure businesses than micro, opaque businesses. That is, those banks tend to disperse their small business loans less in order to reduce the due-diligence, transactions, and monitoring costs.

The state development initiatives to support small businesses, such as those run by the U.S. Small Business Administration (SBA) and the Federal Financial Institutions Examination Council (FFIEC), introduced in 1953 and 1977, respectively, may have alleviated the negative effect of bank size on micro business loan share at large banks somewhat.

The Community Reinvestment Act (CRA) requires banks with asset size over $300 million to report to the FFIEC their small business loans in order to encourage larger banks to allocate a greater share of their loans to small businesses. One-third of the banks in the subsample have assets greater than $300 million. Therefore, the decline in the coefficient of the effect of bank size on the MBLTBL ratio could be mainly attributed to such initiatives.

From the above robustness tests we know that the regression results from the main sample – that large banks are more prone to issuing large loans to large businesses and small banks more prone to service small firms – remains robust when controlling for different market and economic conditions by focusing on banks in urban areas.

Table 5
Comparison between baseline and robustness regressions for SBL model

Variables	Model 1	Model 2	Model 3	Model 4
Log. Assets	−9.541565***	−9.661569***	−9.848837***	−11.68784***
	(−90.50)	(−65.74)	(−47.62)	(−20.47)
Non-performing Loans	−0.1753629***	−0.1584559***	−0.0694681**	−0.0926968
	(−9.97)	(−6.80)	(−2.35)	(−1.20)
ROA	0.1927039***	0.1722361***	0.2166824***	0.2269533*
	(6.23)	(4.46)	(4.03)	(1.68)
Leverage	−0.1520507***	−0.1364262***	−0.1415178***	−0.2791901***
	(−21.28)	(−15.80)	(−9.66)	(−6.32)
Multi-Bank Holding Company	−1.59743***	−2.312771***	−2.444052***	−4.813207***
	(−10.16)	(−9.89)	(−8.28)	(−5.19)
Market Deposit Share	0.0123119	0.0932253*	0.2947704***	0.7280725***
	(0.27)	(1.83)	(2.59)	(3.17)
Log. GDP per capita	−2.107229***	−2.194682**	−1.359292	−1.31404
	(−3.02)	(−2.26)	(−1.09)	(−0.43)
Interest Income/Earning Assets	0.497508	0.5650747***	0.324623***	0.6744221**
	(11.07) ***	(9.01)	(3.38)	(2.37)
MSA	−0.7294275*	–	–	–
	(−1.70)			
Business Loans/Total Assets	−0.4639655***	−0.4768992***	−0.4719874***	−0.5414475***
	(−58.12)	(−44.01)	(−35.74)	(−15.71)
Log. age	−0.916927***	−0.2736665	2.121389***	1.348041
	(−4.95)	(−1.13)	(6.80)	(1.38)
Year Dummies	Included	Included	Included	Included
Bank Dummies	Included	Included	Included	Included
No. Observations	173,692	95,393	57,128	7188
No. Banks	14,453	8938	6577	912
Prob > F	0.0000	0.0000	0.0000	0.0000
Hausman test statistic	973.79	581.86	258.28	64.86
Hausman test (Prob > chi2)	0.0000	0.0000	0.0000	0.0000
R-sq: within	0.2259	0.2415	0.2706	0.2789
R-sq: between	0.5360	0.5567	0.5340	0.6261
R-sq: overall	0.4280	0.4568	0.4465	0.5499

Note: This table reports results from Fixed-Effects estimations of the effects of bank assets on bank propensities to lend to small businesses. The dependent variable is the measure of the lending propensity to small businesses, i.e. the Small Business Loans to Total Business Loans. The key independent variable is the logarithm of total bank assets. The regression model (1) contains results including banks in all counties. The regression model (2) contains results including banks in MSA Counties only. The regression model (3) contains results including only commercial banks in MSA counties. The regression model (4) contains results including only commercial banks in the largest cities. The period covers the years 1994 to 2013. T-statistics between parentheses. The symbols ***, ** and * indicate the levels of significance, 1%, 5% and 10%, respectively.

6. Conclusions

The objective of this paper was to examine the impact of bank size on the propensity of banks to lend to small and micro businesses in a way that deals with the plethora of contradictory findings and thus resolves this question, at least for the case of the largest banking system in the world, that of the United States of America. We do so by 1) using the so far largest and most representative dataset, consisting of essentially all banks, and over a long time span, covering the two decades from 1994 to 2013; 2) introducing two new measures of the bank propensity to lend to small businesses, namely, the ratio of small business loans to total business loans and the ratio of micro business loans to total business loans, which, surprisingly, had so far not been used in the literature, although being theoretically superior. Given these improvements, prior diverging empirical results could have been due to the biases of the datasets and methods used.

Our findings revealed a clear, consistent and highly significant inverse relationship between bank size and the relative share of small and micro business loans issued by banks. In other words, the propensity of banks to lend to small businesses decreases as the size of the banks become larger, and vice versa. The results hold for the sub-periods before and during the 2008 financial crisis, as well as for banks that are only specialised in commercial lending and operate in a more homogeneous environment with respect to market and economic conditions, proving the robustness of our findings. Since our sample consists of all domestically active and inactive banks which the Federal Deposit Insurance Corporation (FDIC) has insured over the past two decades, the results support the original conventional wisdom on this question, and contrast with Berger et al. (2007), Erel (2009), and Berger and Black (2011). The findings hold for the United States of America, which possesses one of the largest economies in the world and is home to the largest number of banks in any one country. As a result, it is likely that the findings are also relevant for other countries, but further research is needed for confirmation, employing our methodology.

Table 6
Comparison between baseline and robustness regressions for MBL Model

Variables	Model 1	Model 2	Model 3	Model 4
Log. Assets	−7.334459***	−5.172862***	−4.310591***	−2.103479***
	(−45.76)	(−27.56)	(−20.75)	(−4.75)
Non-performing Loans	0.0268057	−0.0122925	0.0140835	0.0318352
	(1.00)	(−0.41)	(0.47)	(0.53)
ROA	0.2050129***	0.0521211	0.165622***	0.076485
	(4.36)	(1.06)	(3.07)	(0.73)
Leverage	−0.0035444	0.0264224**	−0.031319**	0.0007443
	(−0.33)	(2.40)	(−2.13)	(0.02)
Multi-Bank Holding Company	−3.54008***	−2.762401***	−1.539053***	−2.274027***
	(−14.80)	(−9.25)	(−5.19)	(−3.17)
Market Deposit Share	0.532371***	0.3838***	0.844012***	0.528763***
	(7.75)	(5.91)	(7.37)	(2.97)
Log. GDP per capita	−2.654262**	−1.30609	−0.4454841	−3.163668
	(−2.50)	(−1.05)	(−0.36)	(−1.33)
Interest Income/Earning Assets	0.0048192	0.1004549	0.380559***	0.4371092**
	(0.07)	(1.25)	(3.95)	(1.98)
MSA	−6.449522***	–	–	–
	(−9.86)			
Business Loans/Total Assets	−0.775906***	−0.669536***	−0.439123***	−0.338486***
	(−63.94)	(−48.37)	(−33.10)	(−12.67)
Log. age	6.416471***	5.173096***	2.446076***	−0.4213027
	(22.81)	(16.73)	(7.80)	(−0.56)
Year Dummies	Included	Included	Included	Included
Bank Dummies	Included	Included	Included	Included
No. Observations	173,692	95,393	57,128	7188
No. Banks	14,453	8938	6577	912
Prob > F	0.0000	0.0000	0.0000	0.0000
Hausman test statistic	1370.40	1288.07	851.34	95.90
Hausman test (Prob > chi2)	0.0000	0.0000	0.0000	0.0000
R-sq: within	0.3267	0.3115	0.2834	0.2174
R-sq: between	0.4612	0.3621	0.2686	0.3142
R-sq: overall	0.4250	0.3740	0.2811	0.2853

Note: This table reports results from Fixed-Effects estimations of the effects of bank assets on bank propensities to lend to Micro business loans. The dependent variable is the measure of the lending propensity to micro businesses, i.e. the Micro Business Loans to Total Business Loans. The key independent variable is the logarithm of total bank assets. The regression model (1) contains results including banks in all counties. The regression model (2) contains results including banks in MSA counties only. The regression model (3) contains results including only commercial banks in MSA counties only. The regression model (4) contains results including only commercial banks in the largest cities. The period covers the years 1994 to 2013. T-statistics between parentheses. The symbols ***, ** and * indicate the levels of significance, 1%, 5% and 10%, respectively.

The findings are likely to have policy implications for the industrial organisation of the banking sector in the US. It is well-known that the vast majority of firms consists of small and very small firms. These firms also account for the majority of employment, and any given amount of money invested in such small firms tends to create more jobs than the same amount invested in a large or very large firm. Policy-makers have in recent years emphasised the importance of ensuring adequate funding of SMEs in a number of countries. Small firms are not usually able to tap capital markets and are therefore dependent on borrowing from banks. The research presented in this paper shows that such bank funding is only likely to be forthcoming, if the banking industry is characterised by a large number of small banks.

In this paper the largest empirical examination hitherto existing on a fundamental issue concerning the importance of the structure of the banking sector was presented. Should the results of our empirical examination of the largest and most diverse banking sector in the world receive support in other countries, this would imply that banking systems that do not include a significant proportion of small banks, such as that of the U.K, will hamper the growth of small businesses and record weaker job creation than systems, such as that in the U.S. (or indeed Germany), with a large number of small and community banks, which appear more supportive of small firms. On the basis of our findings it is not unreasonable to speculate that a key barrier to growth of SMEs could possibly be overcome by influencing the structure of the banking system such that it is dominated by a large number of small, local banks, as is the case in the U.S and Germany (the latter boasting export volumes rivalling those of China, almost half of which are due to SMEs), but distinctly not so in the United Kingdom. Chinese economic development may be another case in point: When Deng Xiao Ping rose to influence in 1978, the centralistic Soviet system was changed and thousands of small and medium-sized banks (as well as fewer large banks) were newly created, forming a decentralised banking system with many small banks making decisions about the credit creation and allocation locally. Economic growth took off and recorded four decades of double-digit growth (Werner, 2018). Meanwhile, the Soviet Union, sticking to a highly concentrated banking system, collapsed. Such a link between the banking structure and economic performance is not surprising, if the function of banks as creators of the money supply (Werner, 2014,

2016) and the impact of their decision about who to lend to and for what purpose has on economic activity is not ignored (as described by the Quantity Theory of Disaggregated Credit, Werner, 1997, 2005, 2012, 2013).

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