Lending Relationships and the Collateral Channel

Gareth Anderson*† Saleem Bahaj† Matthieu Chavaz†
Angus Foulis† Gabor Pinter†

September 18, 2018

Abstract

This paper shows that lending relationships insulate corporate investment from shocks to collateral values. We construct a novel database covering the banking relationships of private and public UK firms and their directors. We find that the sensitivity of corporate investment to shocks to real estate collateral value is halved when the length of the bank-firm relationship increases from the 25th to the 75th percentile. This effect holds in booms and busts. Firms with shorter lending relationships are better insulated from collateral shocks if their directors have personal relationships with the same bank. Our findings support theories where collateral and private information are substitutes or complements in mitigating credit frictions over the cycle.

*University of Oxford

†Bank of England. Contact author: matthieu.chavaz@bankofengland.co.uk. We thank Sumit Agarwal, Allen Berger, Steve Bond, Raj Iyer, Farzad Saidi, Rhiannon Sowerbutts, Hirofumi Uchida, Greg Udell, as well as participants at Bank of England, Chicago Financial Institutions conference, Econometric Society winter meeting, and Royal Economic Society meetings for useful comments. This paper contains the views of the authors and not necessarily those of the Bank of England, the MPC, the FPC or the PRC.

1 Introduction

Corporate investment is known to respond strongly to cyclical swings in firms' collateral values. This *collateral channel* is a key source of business cycle amplification.[1]

At first sight, this evidence is consistent with a range of models where collateral is an important determinant of firms' borrowing capacity (Bernanke, Gertler, and Gilchrist, 1996). In these theories, however, collateral is only relevant for investment due to information asymmetries between a firm and its creditors.[2] This suggests that corporate investment over the cycle should not depend mechanically on collateral price fluctuations, but also on the severity of such informational issues.

This paper tests this idea by assembling a dataset that contains both information on firms' investment and collateral holdings, as well as proxies for the degree of informational asymmetries between firms and their lenders. We use both a well-known proxy - the length of relationships between lenders and firms - and novel ones - the length of the corporate and mortgage relationship between lenders and the *individuals* running these firms.

Our key question is: do longer lending relationships amplify or moderate the collateral channel? Existing theories provide two competing hypotheses. Strong relationships could mitigate the collateral channel if they reduce information asymmetries and thus lenders' demand for collateral (Boot, 2000). But strong relationships could also amplify the collateral channel if increased private information helps lenders to monitor the value of collateral better

[1]See Gan (2007); Chaney, Sraer, and Thesmar (2012); Liu, Wang, and Zha (2013); Cvijanovic (2014); Kleiner (2015); Ersahin and Irani (2015); Bahaj, Foulis, and Pinter (2016).

[2]Information asymmetries can arise from different issues depending on models, such as moral hazard (Holmstrom and Tirole, 1997), adverse selection (Stiglitz and Weiss, 1981), or a bankruptcy cost arising from the need to verify debtors' cashflows (Townsend, 1979). But a common prediction across these theories is that the external finance premium faced by the firm and hence, for firms in need of finance, the level of investment, depends on the value of the firm's collateral (Bernanke, Gertler, and Gilchrist, 1996).

(Rajan and Winton, 1995).

Our results provide support for the first hypothesis: longer lending relationships insulate corporate investment from the collateral channel. This is true both for relationships between a bank and a firm, and relationships between a bank and the firm directors.

To our knowledge, ours is the first paper to establish these results. We add to existing knowledge in two main ways. First, lending relationships are known to support firms' investment during downturns;[3] but the role of collateral in that context, and the relevance of these results outside of crises, are less clear. Conversely, the use of collateral in loan contracts is also known to be related lending in cross-sectional studies;[4] yet the role of relationships in determining dynamic response to collateral values has attracted less attention.

Second, a large and inconclusive literature explores the sensitivity of small and young firms to aggregate shocks, including collateral shocks.[5] These papers typically use size or age to proxy for the information frictions that also motivate our study. Exploiting a more direct measure for information asymmetries, we find that longer lending relationships mitigate a firm's response to shocks to asset prices. One key corrolary is that small firms are not "doomed" to suffer more from aggregate fluctuations. Instead they can circumvent cyclical constraints by maintaining strong lending relationships.

Our constructed panel dataset covers UK firms between 2002 and 2013 and has several useful features. First, our sample covers both private and publicly listed firms, allowing us

[3]Jimenez, Ongena, Peydro, and Saurina (2012); Sette and Gobbi (2015); DeYoung, Gron, Torna, and Winton (2015); Bolton, Freixas, and Gambacorta (2016); Banerjee, Gambacorta, and Sette (2017); Beck, Degryse, De Haas, and Van Horen (2018)

[4]Jimenez, Salas, and Saurina (2006); Berger, Frame, and Ioannidou (2011); Degryse, Karapetyan, and Karmakar (2017)). The findings of this literature are inconclusive. For instance, Berger and Udell (1995) find that firms with long relationships post less collateral, while Ono and Uesugi (2009) and Cerqueiro, Ongena, and Roszbach (2016) find that bank monitoring increases with corporate collateral usage and value.

[5]See Moscarini and Postel-Vinay (2012); Kudlyak and Sanchez (2017) and Crouzet, Mehrotra, et al. (2017) for aggregate shocks. See (Adelino, Schoar, and Severino, 2015) and (Adelino, Ma, and Robinson, 2017) for house price shocks.

to test whether the impact of lending relationships on the collateral channel varies across firm types: as one would expect, we find that lending relationships only dampen the collateral channel for private firms, where informational asymmetries are likely to be greater. Second, we are able to match information on a firm's creditors with regulatory banking data, allowing us to not only measure the length of lending relationships but also control for how bank characteristics affect the collateral channel. Third, the dataset also contains detailed information on *company directors,* which we match with administrative data on household mortgage data. This matched dataset allows us to explore the importance of relationships between banks and the individuals running the firms, both in their professional capacity, and through their personal mortgages.

Our main test examines how the length of a firm's lending relationship affects the sensitivity of its investment to changes in the value of its real estate collateral. We focus on the firm's real estate collateral as real estate serves as security for 80% of UK corporate bank loans, providing a clear source of collateral to focus upon. Moreover, there is significant variation in the value of real estate in the UK over this period. Our strategy to identify collateral shocks follows Benmelech and Bergman (2009) and Chaney, Sraer, and Thesmar (2012). Specifically, we measure firms' exposure to these shocks by interacting (i) the value of a firm's real estate at the start of the sample, and (ii) yearly changes in regional real estate prices across 204 local authorities in England, Scotland, and Wales, that are plausibly exogenous to the behaviour of an individual firm. As a robustness check we instrument for regional real estate prices by interacting aggregate mortgage rates with geographical constraints on housing supply, similar to the approach followed in the US using the constructed measures of Saiz (2010).

We then interact this collateral measure with relationship length to test the conflicting hypotheses outlined above. Consistent with Chaney, Sraer, and Thesmar (2012), we find that increasing collateral values are associated with higher corporate investment: a £1 increase in the value of corporate collateral increases investment by around £0.04 on average. However, this effect is materially reduced for firms with longer lending relationships: this sensitivity falls from £0.048 for a firm at the 25th percentile of relationship length (4 years) to £0.025 for a firm at the 75th percentile of relationship length (15 years). More generally, a doubling of the relationship length reduces the strength of the collateral channel by £0.02.

This finding is consistent with lending relationships insulating corporate investment from the effect of collateral values on borrowing constraints, as predicted by models where collateral and private information are substitutes (Holmstrom and Tirole, 1997; Boot, 2000). It suggests that lending relationships can serve as "insurance" against collateral shocks, with more muted investment dynamics during booms being compensated by greater borrowing flexibility in busts.

However, our main result could also be consistent with alternative mechanisms. In particular, a key challenge is that, while the house price shocks we rely on for identification should be plausibly exogenous to individual firms, relationship lengths might be correlated with a range of factors that might also affect the sensitivity of corporate investment to house prices. We explore three such mechanisms.

First, relationship length results partly from a choice by firms, and might thus be correlated with a number of firm characteristics. In turn, firm characteristics such as size (Adelino, Schoar, and Severino, 2015), age (Adelino, Ma, and Robinson, 2017) or credit score (Boot, Thakor, and Udell, 1991) could affect the responsiveness of investment to collateral values.

We find that controlling for these factors and their interaction with collateral values does not change our results; the effect of lending relationships that we document thus seems independent from these mechanisms.

Second, relationship length is also bound to partly reflect a choice by banks, and thus could be correlated with bank characteristics. In turn, some of these characteristics might affect banks' ability or inclination to lend over time - for instance if house price fluctuations alter banks' own balance sheet strength (Gan, 2007; Flannery and Lin, 2016). Since our dataset reports the identity of both firms and their lenders, we can mitigate these channels by introducing bank-year fixed effects. We also find that controlling for the interaction of collateral values and lender characteristics does not affect our conclusions. This insensitivity might partly reflect the fact that 94.1% of single-bank relationships in our sample are with the 'big five' UK banks, and that these banks have similar domestic scale, branch presence and business models. The concentration and homogeneity of the UK domestically-oriented banking system also means that endogenous sorting between banks and firms is less likely to be concern than, for instance, in the US (Schwert, 2018).

Finally, real estate price shocks could affect corporate investment through demand-side channels, such as local investment opportunities (Giroud and Mueller, 2016) or agglomeration effects (Dougal, Parsons, and Titman, 2015). That these channels should affect firms differently depending on their relationship length is perhaps less clear at first sight. At a stretch, however, firms expecting low collateral values to coincide with high demand for their products or services in the future might be more likely to maintain long-term relationships. Our regressions mitigate such demand-side channels by including region-year fixed effects. We also show that our key result remains similar when concentrating on manufacturing firms, which are likely to export their products out of their headquarter region. In doing so, we eliminate firms in the non-tradable sector whose demand is likely to be more affected by local economic conditions (Adelino, Schoar, and Severino, 2015). Finally, our results remain similar when controlling for the interaction of relationship length and a measure of local house prices that does not account for firms' collateral holdings; this contradicts the idea that our main finding is explained by house-price driven demand effects.

In addition to these tests, we document two results consistent with our interpretation, and harder to explain based on alternative mechanisms. First, we run the baseline regression using short-term and long-term corporate borrowing as the dependent variable. We find that lending relationships only mitigate the response of long-term borrowing to changes in collateral values; this is consistent with the idea that long-term debt is more likely to be collateralised, and thus subject to fluctuations in real estate values. Second, we show that lending relationships only significantly mitigate the collateral channel for private firms. This is consistent with the notion that publicly listed firms either circumvent bank lending and collateral constraints by borrowing from capital markets or face smaller informational constraints (Brav, 2009).

Finally, we utilise the information reported on company directors in our dataset to further explore the mechanism. Directors control firms' management and strategic decisions and private information about the skills and conduct of individuals within firms might thus provide lenders with a better view of a firm's riskiness (Karolyi, 2018). Lenders can learn about the individuals running companies in two different ways. First, lenders can learn about directors in their *professional* capacity. Consistent with this idea, we find that long relationships between a bank and a firm's current set of directors mitigates the sensitivity of corporate investment to collateral shocks in a similar way to long relationships with the firm itself. In fact, the effect of relationships with directors can dominate the effect of relationships with firms in some specifications.

Second, lenders can also learn about directors through their *personal* borrowing behaviour. To explore this idea we match the corporate data to a database of all UK mortgages to identify which lender provides the mortgage on a given director's home. We find that the collateral channel is not as sensitive to the length of a firm's banking relationship when the director has their personal residential mortgage with the same bank as the firm. Concretely, corporate investment can still be insulated from the collateral channel if the firm has a short relationship with its bank, but its directors are known to the bank through personal relationship. This result is suggestive of the information a bank learns about the director through originating and servicing their mortgage substituting for information learned from a long relationship with their firm.

Overall, our results highlight significant distributional effects of real estate price shocks across firms. To put our findings into a macroeconomic context consider the following. The total value of corporate collateral is worth about 17% of UK GDP, and business investment is 9% of GDP.[6] For a firm at the 25th percentile of relationship length in our sample (4 years) the sensitivity of investment to collateral is £0.048 and a back-of-the-envelope calculation implies that a 1% increase in real estate prices increases investment by 0.10%. As the relationship length increases to the 75th percentile in our sample (15 years), this elasticity falls in half to 0.05%, significantly dampening the collateral channel.

[6]Here, collateral is defined as the value of owner occupied real estate owned by non-financial corporations, and business investment is investment of private non-financial corporations.

2 Testable Hypotheses and Empirical Strategy

Financial intermediation theory offers two conflicting predictions about the role of banking relationships for the collateral channel.[7]

A first strand of theories suggests that relationships and collateral play a similar role in overcoming adverse selection and moral hazard issues in debt contracts. Relationships mitigate the adverse selection problem to the extent that they provide lenders with private information about a borrower's default risk (Boot, 2000); relationships also reduce moral hazard by reducing monitoring costs after a loan is granted. Similarily, collateral helps lenders to screen otherwise similar prospective borrowers *ex ante* (Bester, 1985; Besanko and Thakor, 1987), and monitor borrowers *ex post* (Boot, Thakor, and Udell, 1991).

If they are a substitute for collateral, stronger banking relationships might dampen the link between firm collateral and firm investment. For example, lenders can require less (more) collateral from firms they are able to monitor more (less) intensively (Holmstrom and Tirole, 1997; Manove, Padilla, and Pagano, 2001). Alternatively, lenders might be willing to abstract from crisis-time drops in the collateral value of firms with which they have ongoing, profitable relationships (Sette and Gobbi, 2015; Bolton, Freixas, and Gambacorta, 2016; Jiangli, Unal, and Yom, 2008). In return for this bad-time"insurance" lenders may be less willing to extend more credit when collateral values rise during booms. Summing up:

Hypothesis 1 *If collateral and lending relationships are substitutes, longer relationships should dampen the link between collateral and investment.*

[7] Collateral and banking relationships can affect corporate investment under three conditions. Firstly, firms' cash inflows should be imperfectly correlated with their investment opportunities, thereby giving the firm a reason to seek external finance (Froot, Scharfstein, and Stein, 1993). Secondly, the firm should face frictions in accessing external finance. Thirdly, collateral and/or banking relationships should act to reduce these frictions (Holmstrom and Tirole, 1997).

Another hypothesis is that collateral and banking relationships are complements, in which case stronger relationships could amplify the link between collateral and investment. For instance, collateral could increase lenders' incentive to monitor borrowers (Rajan and Winton, 1995), or the cost of doing so. Alternatively, collateral might help reducing lenders' inclination to extract rents from ("hold up") firms with which they have long-standing relationships (Sharpe, 1990; Rajan, 1992; Xu, Wang, and Rixtel, 2015). Summing up:

Hypothesis 2 *If collateral and banking relationships are complements, longer relationships should amplify the link between collateral and investment.*

2.1 Empirical Specification

Given these conflicting theories, this paper tests how lending relationships affect the response of corporate investment to shocks to real-estate collateral values. The baseline empirical specification is:

$$\begin{aligned} Investment_{i,t} &= \alpha_i + \chi_{j,t} + \mu_{k,t} + \phi \cdot Firm\,Controls_{i,t} \\ &+ \beta \cdot Collateral_{i,j,t} + \kappa \cdot Relationship\,Length_{i,t} \\ &+ \delta \cdot Collateral_{i,j,t} \times Relationship\,Length_{i,t} + \varepsilon_{i,t}, \end{aligned} \tag{2.1}$$

where:

$Investment_{i,t}$	is a proxy for the investment activity by firm i, located in region j and with relationships with a combination of banks indexed by k at time t
α_i	is a firm fixed effect
$\chi_{j,t}$	is a region-time fixed effect
$\mu_{k,t}$	is a bank combination-time fixed effect
$Firm\,Controls_{i,t}$	are various controls for firm i
$Collateral_{i,j,t}$	measures the value of corporate collateral
$Relationship\,Length_{i,t}$	measures the average length of relationship between firm i and its banks

In Equation 2.1, the coefficient β measures the direct strength of the corporate collateral channel. The coefficient of interest is δ, which measures the impact of *Relationship Length* on the collateral channel. A negative δ would imply that the collateral channel is weaker for firms which have longer relationships with their banks.

Following Chaney, Sraer, and Thesmar (2012), we identify the causal effect of the collateral channel by combining two sources of variation in real estate collateral values. Within regions, the collateral channel is identified by exploiting differences in the initial holdings of collateral. Across regions, we exploit differences in the evolution of real estate prices, as described in detail below.

The fixed effects included in Equation 2.1 address three distinct identification channels. Firm fixed effects (α_i) capture unobserved, time-invariant characteristics that could determine collateral and relationship decisions and investment dynamics; region-time fixed effects ($\chi_{j,t}$) control for unobserved region-specific macroeconomic conditions which could affect corporate investment through demand-side channels; finally, bank-combination-time fixed effects ($\mu_{k,t}$) control for the potential impact of real estate prices on banks' balance sheets and credit supply capacity (Gan, 2007).[8] Our choice of firm-level controls is guided by existing literature, where our data permits it. Following the firm investment literature, (e.g. Hubbard (1998)), we include measure of cash flow as controls. In particular, we include firms' profit margin and cash ratio. We also include other correlates of collateral as controls, in particular firm age (Rajan, 1992; Bolton and Freixas, 2000) and credit score (Berger and Udell, 1995; Brick and Palia, 2007).

3 Data, Sample, and Summary Statistics

3.1 Data Sources

Corporates Our main source of information on UK companies is the Financial Analysis Made Easy (FAME) dataset, provided by Bureau Van Dijk. FAME compiles the financial statements filed annually by all incorporated UK companies registered at Companies House. This registration is mandatory under UK company law. The dataset thus covers all UK firms except unincorporated businesses such as partnerships or sole proprietorships.

FAME reports data on a firm's balance sheet and income statements, directors' identities and addresses, main bank identity, as well as the postcode of each firm's trading addresses, date of incorporation, and industrial sectors (four-digit SIC code). This allows us to identify the region(s) and sector within which a firm operates.

[8] Fixed effects are based on the combination of banks a firm has a relationship with. For example, a firm which banks with "Bank A" and "Bank B" will have the same bank combination fixed effect as another firm which banks with "Bank A" and "Bank B". The fixed effect will differ from that of one bank firms which bank with just "Bank A" or just "Bank B" and from multibank firms which bank with, for example, "Bank A" and "Bank C".

One limitation of FAME is that only large companies are required to report full balance sheet and profit and loss accounts (Evans and Ritchie, 2009). Furthermore, FAME is a live database; information on key variables such as company structure and director information is thus only accurate at the time the database is accessed. To mitigate this issue, we have used discs of the FAME database over time and have archived the database at six-monthly intervals over the January 2005 to August 2015 period to capture information when it is first reported. Using this database, we can start our panel in 2002.

Finally, financial statements collected in FAME are only audited for firms with turnover above £1 million (Brav, 2009) - around 55% of observations in our sample. The fact that our estimate for the collateral channel is similar to the one found for US listed firms by Chaney, Sraer, and Thesmar (2012) suggests that this issue is unlikely to bias the results in a systematic way. Further, our results are robust to excluding firms with unaudited accounts.

Banks We retrieve accounting data for banks from the Bank of England's Historical Banking Regulatory Database (HBRD). The HBRD reports financial statements and confidential regulatory information for all authorized UK banks and building societies (de Ramon, Francis, and Milonas, 2017). We use the consolidated (group) level version of the data.

Real Estate Prices To proxy for collateral values, we use monthly regional repeat-sales house price data for 204 regions in England, Wales and Scotland since 1995 as reported in the Land Registry Price Paid dataset. We match this data to individual companies using the firm's registered office postcode reported in FAME. The variation in the evolution of real estate prices over our sample is substantial; the total change in house price between the start and end of our sample ranges from 21% (Swindon) to 276% (Kensington and Chelsea).

3.2 Variables Measurement

Table 1 reports the detailed definitions of the variables.

Collateral FAME reports the value of a firm's *Land and Buildings*. We do not use this item as our preferred measure of collateral values because the *quantity* of collateral firms chose to hold might be correlated with their investment opportunities. Instead, we follow Benmelech and Bergman (2009), Chaney, Sraer, and Thesmar (2012) and Bahaj, Foulis, and Pinter (2016) and exploit fluctuations in collateral *prices* only. In essence, we measure the value of a firm's *Land and Buildings* at the start of the sample, and iterate this variable forward as a function of changes in local real estate prices. Specifically, our measure is:

$$Collateral_{i,t} = Land\,and\,Buildings_{i,2002}\frac{Land\,Prices_{j,t}}{Land\,Price_{j,2002}} \times \frac{1}{Turnover_{i,t-1}}, \tag{3.1}$$

where $Land\,and\,Buildings_{i,2002}$ is the book value of land owned by the firm at the start of the sample (2002), and $Land\,Prices_{j,t}$ is the real estate price index for the region where a firm has its registered office. We scale our measure of *Collateral* using the *Turnover* of the firm in the previous year.[9] We select 2002 as our base year to preserve a sufficient number of observations. Therefore, a firm must have existed since 2002 to be included our sample; in comparison, Chaney, Sraer, and Thesmar (2012) consider only Compustat firms in existence since 1993.

[9] Following Chaney, Sraer, and Thesmar (2012), we could have used fixed assets instead of turnover as the scaling variable. However, unlike the dataset of Chaney, Sraer, and Thesmar (2012), ours is not limited to listed and relatively large companies, but includes a large number of small companies with potentially small amounts of fixed assets. Using turnover as scaling variable is therefore better suited to our sample, and avoids placing too much weight on smaller companies with small holdings of fixed assets.

Corporate Investment and Controls Our preferred measure of corporate investment is :

$$Investment_{i,t} = \frac{\triangle Fixed\,Assets_{i,t} + Depreciation_{i,t}}{Turnover_{i,t-1}}.$$

We compute the following firm controls: $Cash$ ($\frac{BankDeposits-Overdrafts}{Turnover}$), $Profit$ ($\frac{OperatingProfit}{Turnover}$), Age (log number of months since incorporation), $Size$ (log total assets), and $Credit\,Score$. To measure credit scores, we use the "Quiscore" reported in the FAME dataset. The Quiscore is produced by CRIF Decision Solutions Limited and is designed to reflect the likelihood that the company will fail in the following 12 months. Each firm is assigned a value between 0 and 100, with a larger value indicating a lower probability of failure.[10] To avoid extreme outliers, $Investment$, $Cash$, and $Profit$ are winsorised at the 1st and 99th percentile.

Lending Relationships UK companies are required to report charges and mortgages on their assets (hereafter "charges") to Companies House within 21 days of their creation date. In particular, firms must provide the identify of the charge's holder - typically a bank. We use this information to identify bank-firm relationships. We use a textual algorithm to match registered charges to UK banks and building societies. The dataset reports the charge creation date and whether the charge is outstanding. For firms which have an outstanding charge with a bank, we use the charge creation date to measure:

$$Relationship\,Length_{i,b,t} = log\,(1 + Months_{i,b,t}), \tag{3.2}$$

[10] The scores can be categorised into five bands: 0-20 ("high risk"), 21-40 ("caution"), 41-60 ("normal"), 61-80 ("stable") and 81-100 ("secure"). The Quiscore is produced using a proprietary model which considers a range of factors including the financial performance of the firm, the economic conditions the firm faces and the firm's compliance with audit procedures (see Bo, Lensink, and Murinde (2008) for more details).

where $Months_{i,b,t}$ is the number of months at time t since a charge was first created between firm i and bank b.[11] For firms with outstanding bank charges with more than one bank at a given point in time, we average $Relationship\,Length$ for all of a firm's outstanding banking relationships. We exclude firms which do not have any outstanding bank charges from our analysis. The literature has used proxies for relationship intensity other than duration, such as the number of past interactions or their size (Bharath, Dahiya, Saunders, and Srinivasan, 2009). Our data does not allow us to consider these alternatives. In section 5, we discuss alternative measures based on the duration of the relationship between the bank and the firm's group of directors, as well as that of the mortgage relationship between a bank and individual directors.

Bank Controls In selected specifications, we control for the following bank characteristics: $Bank\,Size$ (log total assets), $Bank\,Losses$ ($\frac{NetCharge-Offs}{TotalAssets}$) and $Bank\,Leverage$ ($\frac{Tier1Capital}{TotalAssets}$).

3.3 Sample and Summary Statistics

Our sample includes all private and public UK companies which report to Companies House between 2002 and 2013. Following Chaney, Sraer, and Thesmar (2012) and Kleiner (2015), we exclude firms in the agriculture, utilities, construction, finance and insurance, real estate and public administration sectors.[12] To avoid double counting, we exclude companies that have a parent with an ownership stake exceeding 50%. We further drop firms without any outstanding banking relationships, or which do not report our key variables. This screening

[11] The archiving of FAME discs at a six-monthly frequency does not affect the accuracy of our relationship length measure. Since firms must report the date on which charges are created, we can accurately calculate the length of the relationship as the difference between the charge creation date and the statement date of their accounts.

[12] The UK 2003 SIC codes we exclude are: mining (1010-1450), utilities (4011-4100), construction (4511-4550), finance and insurance (6511-6720), real estate (7011-7032), and public administration (7511-7530).

excludes a substantial number of observations from the original FAME data (Panel A in table 2). While *Total Assets* and *Fixed Assets* are reported in 96% and 85% of observations, respectively, *Land and Buildings* and *Turnover* are reported in 59% and 18% of observations only. Around 15% of firms report a banking relationship.

Our final sample contains 115,284 firm-year observations covering 27,572 firms (Panel B in table 2). Almost 90% of these observations have outstanding charges with just one bank (henceforth "single-bank firms"). Just over 10% of the observations have outstanding charges with more than one bank (”multiple-bank firms"), a large majority of which have two relationships. The sample is representative of the UK economy despite these screenings. Table 3 shows the distribution of employment across our selected industries in (i) the overall FAME dataset, (ii) our final dataset, and (iii) aggregate UK employment statistics from the Office for National Statistics (ONS). Overall, the distribution of employment across industries in our final sample is similar to that of the other two datasets.[13]

Table 4 reports summary statistics for our final sample, for three different groups of firms sorted by their average lending relationship length.

4 Lending Relationships and the Collateral Channel

4.1 Baseline Results

Collateral Channel We begin by assessing the strength of the collateral channel - that is, the relationship between the value of a firm's collateral and its investment. Column 1 of Table

[13]Relative to the aggregate data, the share of employment in education and health and social care is very small in our sample, since we focus on employment within UK companies. The share of employment in manufacturing is notably higher in our sample relative to the aggregate data.

5 reports the results of a regression where the only control is our preferred set of fixed effects. The results suggest that a £1 increase in the value of corporate collateral increases investment by around £0.04. This finding is of a comparable magnitude to the evidence presented by Chaney, Sraer, and Thesmar (2012), which suggests that US public firms increase investment by around \$0.06 in response to a \$1 increase in the value of collateral.

In column 2, we add our preferred set of firm controls: *Relationship Length*, *Cash*, *Profit*, *Age*, *Credit Rating*, and *Total Assets*. Following Chaney, Sraer, and Thesmar (2012), we also include the interactions of *Age*, *Profit* and *Total Assets* (measured in 2002) with *Land Prices*. We do so because *Land Prices* is used to measure *Collateral*, which creates a potential omitted variable problem for the identification of the collateral channel. These additional controls leave the estimate of the collateral channel unchanged.

Lending Relationships and the Collateral Channel In column 3 of Table 5, we test our preferred specification by including the interaction of *Collateral* with *Relationship Length*. For ease of comparison with columns 1 and 2, we measure *Relationship Length* in deviation from its sample average. Therefore the coefficient on *Collateral* (β in Equation 2.1) estimated in this specification captures the magnitude of the collateral channel for a firm with *Relationship Length* equal to the sample mean.

The estimated coefficient on *Collateral* $\times$ *Relationship Length* suggests that longer banking relationships are associated with a significantly weaker collateral channel. Specifically, the estimated coefficient (δ in Equation 2.1) suggests that a doubling in relationship length reduces the strength of the collateral channel by around £0.02.[14] To provide some context to these results, a firm with a relationship length equal to the 75th percentile (15.4 years)

[14]Recall that *Relationship Length* is measured in natural logarithms, as described in Equation 3.2.

increases investment by around 50% less than a firm in the 25th percentile (4.2 years) in response to a collateral shock of the same value. This result suggests that longer relationships insulate firms from the impact of fluctuations in collateral values on their investment behaviour. Concretely, a bank faced with a decision to grant or extend credit might be willing or able to abstract from cyclical fluctuations in the borrower's collateral value if substantial private information about the firm has been accumulated over the course of a long lending relationship. Alternatively, a firm might be more willing to request a loan in that case.

Private vs. Public Firms The key result above is consistent with models in which collateral and private information perform a similar role of mitigating contracting frictions over the cycle. If this interpretation is correct, the mechanism whereby lending relationships insulate investment from collateral shocks should be stronger for firms for which private information is more relevant. To test this notion, we compare public and private firms. Since publicly listed firms are required to disclose more information, they are typically less susceptible to informational asymmetries associated with bank lending contracts. In addition, public firms can more readily access market-based funding, and can thus circumvent frictions in access to bank finance.

In columns 5-6 of Table 5, we report the results of the baseline regression run separately for private and public firms. Consistent with our prior, the interaction between relationship and collateral is only statistically significant for private firms. This reinforces our preferred interpretation of the key result: since private information matters less for transparent firms, long relationships do not play any role in insulating investment from the collateral channel for public firms. In contrast, the dichotomy between public and private firms would be harder to explain by alternative mechanisms such as the effect of house prices on the demand for firms' products. We further rule out such demand-side explanations below.

Corporate Borrowing Our preferred interpretation of the key result is that firms with long lending relationships are insulated from the effect of collateral shocks on their ability or willingness to borrow from banks. If this interpretation holds, the interaction of lending relationships should not only affect firm investment (as our baseline regression shows) but also their borrowing.

To test this idea, we re-estimate our baseline model using long-term and short-term debt issuance as dependent variables. We separate these two types of borrowing because long-term loans cannot be renegotiated regularly and hence are typically thought to face lenders with more acute information issues (Flannery, 1986).

The results in table 5 are consitent with this prior. The coefficient for *Collateral* suggests that firms lower (increase) their long-term and short-term borrowing when the value of their collateral declines (rises). But the parameter estimate for $Collateral \times Relationship\,Length$ shows that longer relationships insulate long-term borrowing from this effect. However, consistent with the idea that long-term debt exacerbates information issues, this effect is only significant for long-term borrowing (column 8) and not for short-term borrowing (column 7). This finding reinforces our interpretation. In contrast, this result seems harder to explain by alternative mechanisms such as changes in the demand for firm products.

Crisis vs. Normal Times Several studies have found lending relationship to insulate corporate investment during the recent financial crisis.[15] Our key result is distinct from

[15] Jimenez, Ongena, Peydro, and Saurina (2012); Sette and Gobbi (2015); DeYoung, Gron, Torna, and Winton (2015); Bolton, Freixas, and Gambacorta (2016); Banerjee, Gambacorta, and Sette (2017); Beck,

these findings because it focuses on the specific role of fluctuations in collateral values, as opposed to that of economic downturns. However, one important question is whether our main finding is driven by crisis-time effects only, or whether it operates throughout the cycle. To find out, we repeat the main regression for (i) the 2007-2010 period and (ii) all other years. We do so because in the aggregate, UK house prices ave fallen during the crisis period, and increased during other years.

The results indicate that our key finding is visible during both the crisis (column 9) and non-crisis (column 10) periods. In other words, longer relationships do not only insulate corporate investment from house price falls during aggregate downturns. They also limit the propensity for firms to boost investment during times of rising collateral prices. This symmetry is consistent with the theories that motivate our study and suggest that both positive and negative shocks to the balance sheets of firms subject to information frictions can give rise to a "financial accelerator" (Bernanke, Gertler, and Gilchrist, 1996). This effect points to lending relationships as a form of insurance, whereby firms are protected from negative shocks in exchange for more muted investment dynamics in "good" times.

4.2 Identification Issues

Following Benmelech and Bergman (2009) and Chaney, Sraer, and Thesmar (2012), our identification exploits shocks to house prices across regions and time. We then test how these shocks impact corporate investment depending on a firm's lending relationship length at the shock time, as captured the parameter *Collateral* $\times$ *Relationship Length*.

This identification makes *Collateral* plausibly exogenous to individual firms. And be-

Degryse, De Haas, and Van Horen (2018).

cause *Relationship Length* is lagged, we can also rule out the possibility that *Collateral* × *Relationship Length* might be biased by issues of reverse causality. This said, the key remaining challenge is that *Collateral* × *Relationship Length* might be plagued by ommitted variable issues. We now discuss two key potential types of ommitted variables, before further assessing the exogeneity of house price shocks with an instrumental variable approach.

4.2.1 Endogeneity of Relationship Length to Firm and Bank Characteristics

A first challenge is that *Relationship Length* could be correlated with a number of firm and bank characteristics. If these characteristics also affect corporate investment, our results could be explained by mechanisms other than our preferred interpretation, whereby collateral and private information are substitutes in mitigating credit frictions over the cycle.

If these alternative mechanisms drive our results, controlling for relevant proxies and their interaction with *Collateral* and *Relationship Length* make our key parameter *Collateral* × *Relationship Length* insignificant. We now test this idea, reporting results in Table 6; column 1 reproduces our baseline specification for ease of comparison.

First, *Relationship Length* could be correlated with firms' age and size, and these factors could also determine the sensitivity of investment to cyclical factors. The results in columns 2 to 3 indicate that adding these controls does not affect our key conclusion. Second, riskier firms might also differ in their collateral usage and the nature of their lending relationships. The results in column 4 suggest that controlling for firms' credit rating does not affect the main result either.

Second, *Relationship Length* might also reflect characteristics of banks or of the bank-firm pair (Schwert, 2018), and these characteristics might also affect corporate investment.

This issue is arguably less problematic in our context than in the US given the concentration and homogeneity of the UK market for corporate lending. In our sample, 94.1% of single-bank lending relationships are with one of 'Big 5' banks. Still, to test this idea, we separately add interactions between *Collateral* and *Relationship Length* and controls for the bank's: size, leverage, and non-performing loans.[16] The results in columns 5 to 7 show that none of these additional controls change our main result.

4.2.2 Demand

Firm investment could be affected by house prices regardless of whether firms own commercial property, for instance because higher real estate prices might increase the demand for a firm's products or services. In our baseline regression, this channel is controlled for through region-time fixed effects. So, if anything, demand-side factors can only explain if house price shocks should affect corporate investment in a way that is systematically correlated with *Relationship Length* In column 4 of Table 5, we directly test for this possibility by controlling for the interaction between *Land Prices* and *Relationship Length*. This leaves both the coefficient for the collateral channel and its interaction with relationship length unchanged. Below, we also show that our results are unchanged when only considering manufacturing firms, whose products are unlikely to be sold only in their home region.

4.2.3 Instrumental Variable Approach

Next, we seek to instrument real estate prices with a variable plausibly uncorrelated with the unobserved error term $\varepsilon_{i,t}$. This approach provides further reassurance against two

[16]Following the approach taken to measure *Relationship Length* for multiple-bank firms, we average *Bank Size*, *Bank Leverage* and *Bank Losses* across all the relationships of a given bank and year. We also demean all of the variables which we interact with *Collateral*.

identification issues. First, investment by large companies in a given region might affect real estate prices in that region, raising an issue of reverse causality.[17] Second real estate prices may be correlated with omitted variables, for example local demand shocks might reflect local economic shocks, which might affect firm investment. An instrumental variables approach addresses this issue by only exploiting variation in house prices which is credibly exogenous to firm behaviour and local economic activity.

We adapt the approach of Saiz (2010) and Chaney, Sraer, and Thesmar (2012) to our sample; specifically, we instrument for real estate prices in region j by interacting a measure of mortgage demand with a measure of geographic constraints on the supply of housing in region j. Our preferred measure of mortgage demand is the change in the interest rate on the most common UK mortgage product - a two-year 75% Loan-To-Value loan - as collected by the Bank of England. We use a measure of local housing supply constraints constructed by Hilber and Vermeulen (2016), which considers the share of developable land that was developed in 1990. For regions with a more inelastic supply of housing, a given shift in demand should have a larger impact on real estate prices.

The initial regression for our instrumental variables approach is:

$$Land\,Prices_{j,t} = \chi_j + \mu_t + b \times Elasticity_j \times Mortgage\,Rate_t + \epsilon_{j,t}, \tag{4.1}$$

where:

[17] Arguably the problem of reverse causality is likely to be less severe for our sample, which is dominated by relatively small firms, compared to studies focused on larger firms such as Chaney, Sraer, and Thesmar (2012).

δ_j	is a region fixed effect
μ_t	is a year fixed effect
$elasticity_j$	measures the constraints on land supply in region j
$Mortgage\ Rate$	is the average rate on a 2-year 75%-LTV mortgage during year t
$\epsilon_{j,t}$	is an unobserved error term

We then use the estimate for the parameter b in equation 4.1 to compute a measure of predicted land prices in a given region-year. We then use this proxy to produce our *Collateral* measure, as described by Equation 3.1. Finally, we use this measure and its interaction with *Relationship Length* to instrument for *Collateral* and *Collateral* $\times$ *Relationship Length*, respectively.

The results of the second-stage IV regression are shown in column 2 of Table 7. For comparability, column 1 shows the baseline OLS results. The estimated coefficient on the interaction of *Collateral* with *Relationship Length* is significant and slightly more negative than in the OLS regression.

4.3 Robustness

Variable Definitions We now perturb our key measures; results are reported in Table 7. First, because we fix the value of *Land and Buildings* in 2002, firms must be active in 2002 to be included in our sample. To check whether this biases our results, we fix *Land and Buildings* at $t-5$ instead, and iterate this measure forward using changes in the regional real estate prices between time $t-5$ and t to calculate *Collateral*. The results, presented in column 3 of Table 7 show that our key finding remains qualitatively unchanged.

Second, we re-estimate *Collateral* using Commercial Real Estate (CRE) prices from the

Investment Property Databank. Unlike the local authority-level residential house prices used in our baseline measure, CRE prices are only available for major UK cities. Despite the smaller sample, the results in column 4 of Table 7, remain comparable to our baseline findings.

Third, banks may break relationships with firms which have poor investment opportunities; in turn, investment opportunities might be correlated with the firm's collateral values. To mitigate this concern, we lag *Relationship Length* by two years. The results in column 5 of Table 7 are qualitatively unchanged from the baseline specification. Finally, we consider different definitions of our dependent variable. Column 6 excludes depreciation from our measure of *Investment*, and column 7 uses investment in tangibles only. The interaction of collateral and relationship length is significant using both of these alternative measures.

Sample of Firms Our measure of *Collateral* uses house prices in the region where a firm has its registered office. In Column 1 of Table 8, we exclude firms with multiple trading addresses; our results are unchanged. Next, we exclude firms likely to be internationally active, and for which we might thus mismeasure investment, collateral holdings, and lending relationships.[18] Our key result is unchanged (column 2 of Table 8).

Third, we consider in column 3 of Table 8 whether our results differ when considering only firms which operate in the manufacturing sector. Since these firms are likely to produce tradable goods, they are likely to be relatively insensitive to local demand conditions (Adelino, Schoar, and Severino, 2015). The key results remain unchanged. Finally, to assess the possibility of biases in unaudited data, we exclude all firms without audited accounts -

[18] We identify UK-focused firms as those whose total rurnover equals their UK turnover. Since some firms do not report this variable, we are unable to identify all UK focused firms using this approach.

those with annual turnover below £one million. The results reported in column 4 of Table 8 show that our finding remains similar.

5 Relationships with Firm Directors

In line with previous literature (Petersen and Rajan, 1994), our focus thus far has been on the length of the relationship between a firm and its bank. However, personal relationships between financial intermediaries and firms' individual directors might also help to mitigate corporate borrowing constraints.

Our dataset has two key features in that context. First, FAME reports the identity of a given firm's director(s) - that is, the individual(s) who have a statutory obligation to run and contribute to the success of the company. Second, we can use the directors' residential address reported in FAME to identify the potential holder of the mortgage on the director's house, as reported in the Financial Conduct Authority's Product Sales Database.[19]

5.1 Relationship with Corporate Directors

First, we measure the length of the relationship between banks and the firm's current director(s). In the UK, each company must have at least one director. Directors' legal responsabilities involve "running the company and making sure company accounts and reports are properly prepared." An extensive literature shows that directors play a key role for firms' business decisions and financial reporting. This is either because they monitor managers, or

[19]See Bahaj, Foulis, and Pinter (2016) for a detailed explanation of the matching process. The FCA Product Sales Data includes regulated mortgage contracts only, and therefore excludes other regulated home finance products such as home purchase plans and home reversions, and unregulated products such as second charge lending and buy-to-let mortgages.

because they bring expertise and business connections to the firm (Fama and Jensen, 1983; Monks and Minow, 1996; Anderson, Mansi, and Reeb, 2004). From the creditor's perspective, a long-term relationship with a firm's current director(s) could thus convey additional or even superior private information on the firm's riskiness, relative to a relationship with the firm itself (Karolyi, 2018).

To test this idea, we construct two variables. First, *Board Majority* is the length of the lending relationship with the majority of current directors. Second, *Board Longest* is the length of the relationship with the entire current set of directors. We then add these variables to our baseline empirical model; Table 9 reports the results.

In columns 1 and 3, we substitute the baseline *Relationship Length* measure with the two board relationship length proxies. The findings show that longer relationships with directors mitigating the collateral channel. The parameter estimates are similar to those we obtain in the baseline regression. Thus, relationship with directors seem to insulate corporate investment from collateral value shocks to a same degree as relationships with the firm itself. In columns 2 and 4, we include both the baseline and board relationship measures. For one of our two measures, we find that only *Board Relationship Length* $\times$ *Collateral* is significant. At face value, this is consistent with the notion that knowing about the individuals running a firm might be more important than knowing about the firm itself.

5.2 Personal Mortgage Relationships

We then consider the interplay between bank-firm (or bank-board) relationships and directors' personal mortgage relationships. Personal mortgage relationships are relevant to our key question because they might provide the bank with information about the personal repayment behaviour of an individual, and this information might help this bank assessing the risk of this individual's firm.[20]

A priori, it is unclear how personal mortgage relationships and firm relationships should interact. On the one hand, the information a bank can gain from observing repayment on a mortgage might appear more credible and easier to assess relative to the information coming from the accounts of a firm, given that a mortgage puts the director's personal property at risk (Voordeckers and Steijvers, 2006; Brick and Palia, 2007). Personal relationships could thus act as a substitute for corporate relationships, and personal (outside) collateral could constitute a substitute for corporate (inside) collateral. But instead, personal and corporate relationships could also provide different, complementary information to creditors. In this case, a common personal relationship might reinforce the effect of a lengthy corporate relationship.

We create three variables to confrtont these ideas: (i) *Common Personal Relationship Dummy* - 1 for firms with common bank-firm and bank-director relationships, and 0 otherwise; (ii) *%(Common Personal Relationships)* - the share of a firm's current director with an ongoing mortgage relationship with the firm's bank; and (iii) *Common Personal Relationships* - the average number of relationship months for firms with common bank-firm and bank-director relationships, and 0 for other firm.

Our main interest is in the interaction between these variables and *Collateral* × *Relationship Length*. This coefficient should be be positive if the additional information and/or collateral stemming from the director-bank relationship diminishes the importance of the

[20] Company owner-directors can also use their own house as collateral for their firm - particularly for SME loans (Avery, Bostic, and Samolyk, 1998; Voordeckers and Steijvers, 2006; Ono and Uesugi, 2009), and they can re-mortgage their house and inject equity into their firms (Bahaj, Foulis, and Pinter, 2016). But it is less clear that this channel should only operate if the personal mortgage is with the bank that also lends to the director's firm - the main focus on our tests.

firm's information and collateral. It would be positive if these features complement firm ones, as opposed to being a subtitute for them.

The results reported in Table 10 show that the interaction of *Collateral* × *Relationship Length* and the three proxies for personal mortgage relationships are positive and statistically significant. This holds true both when measuring *Relationship Length* using the baseline (columns 1-3) and board (colums 4-6) relationship length measures. This suggests that our key mechanism whereby corporate lending relationships insulate investment from fluctuations in collateral values is substantially weaker for firms whose directors also maintain personal relationships with their firm's banks. In other words, corporate relationships only act as a substitute for collateral for firms in which there is no common firm-director banking relationship. The bottom line is that personal relationships seem to be a substitute for corporate relationships.

6 Conclusion

This paper shows that the collateral channel diminishes in strength when firms and their executives maintain long-term relationships with a bank. Concretely, UK firms' investment is less responsive to changes in the value of their real estate collateral when their ongoing lending relationships are longer. This finding is consistent with seminal theories arguing that collateral and private information are two complementary ways to mitigate similar contracting frictions (Holmstrom and Tirole, 1997); it contradicts alternative models presenting collateral and private information as complements (Rajan, 1992).

The notion of self-reinforcing swings in asset prices and economic activity has led to calls for macroprudential policies aimed at curbing cycles in real estate price, such as loan-to-value limits and counter-cyclical buffers. Our results suggest that the transmission of these interventions to corporate investment is likely to depend on the intensity of firms' lending relationships. Understanding how the nature of corporate borrowing might evolve in a context of sweeping technological and structural changes in banking and financial markets could help informing policies aimed at taming future credit cycles.

References

Adelino, M., S. Ma, and D. Robinson (2017): "Firm Age, Investment Opportunities, and Job Creation," *Journal of Finance*, 72(3), 999–1038.

Adelino, M., A. Schoar, and F. Severino (2015): "House Prices, Collateral, and Self-Employment," *Journal of Financial Economics*, 117(2), 288–306.

Anderson, R. C., S. A. Mansi, and D. M. Reeb (2004): "Board characteristics, accounting report integrity, and the cost of debt," *Journal of accounting and economics*, 37(3), 315–342.

Avery, R. B., R. W. Bostic, and K. A. Samolyk (1998): "The role of personal wealth in small business finance," *Journal of Banking & Finance*, 22(6-8), 1019–1061.

Bahaj, S., A. Foulis, and G. Pinter (2016): "The Residential Collateral Channel," Discussion Papers 1607, Centre for Macroeconomics (CFM).

Banerjee, R., L. Gambacorta, and E. Sette (2017): "The real effects of relationship lending," *Unpublished*.

Beck, T., H. Degryse, R. De Haas, and N. Van Horen (2018): "When arm's length is too far: Relationship banking over the credit cycle," *Journal of Financial Economics*, 127(1), 174–196.

Benmelech, E., and N. K. Bergman (2009): "Collateral pricing," *Journal of financial Economics*, 91(3), 339–360.

Berger, A., and G. Udell (1995): "Relationship Lending and Lines of Credit in Small Firm Finance," *The Journal of Business*, 68(3), 351–81.

Berger, A. N., W. Frame, and V. Ioannidou (2011): "Tests of ex ante versus ex post theories of collateral using private and public information," *Journal of Financial Economics*, 100(1), 85–97.

Bernanke, B., M. Gertler, and S. Gilchrist (1996): "The Financial Accelerator and the Flight to Quality," *The Review of Economics and Statistics*, pp. 1–15.

Besanko, D., and A. Thakor (1987): "Collateral and Rationing: Sorting Equilibria in Monopolistic and Competitive Credit Markets," *International Economic Review*, 28(3), 671–89.

Bester, H. (1985): "Screening vs. Rationing in Credit Markets with Imperfect Information," *American Economic Review*, 75(4), 850–55.

Bharath, S. T., S. Dahiya, A. Saunders, and A. Srinivasan (2009): "Lending relationships and loan contract terms," *The Review of Financial Studies*, 24(4), 1141–1203.

Bo, H., R. Lensink, and V. Murinde (2008): "Credit Ratings and Corporate Investment: UK Evidence," *SOAS Centre for Financial and Management Studies, Discussion Paper*, Discussion Paper 95.

Bolton, P., and X. Freixas (2000): "Equity, Bonds, and Bank Debt: Capital Structure and Financial Market Equilibrium under Asymmetric Information," *Journal of Political Economy*, 108(2), 324–351.

Bolton, P., X. Freixas, and L. Gambacorta (2016): "Relationship and Transaction Lending in a Crisis*," *Review of Financial Studies*.

Boot, A. (2000): "Relationship Banking: What Do We Know?," *Journal of Financial Intermediation*, 9(1), 7–25.

Boot, A. W. A., A. V. Thakor, and G. F. Udell (1991): "Secured Lending and Default Risk: Equilibrium Analysis, Policy Implications and Empirical Results," *Economic Journal*, 101(406), 458–72.

Brav, O. (2009): "Access to capital, capital structure, and the funding of the firm," *The Journal of Finance*, 64(1), 263–308.

Brick, I. E., and D. Palia (2007): "Evidence of jointness in the terms of relationship lending," *Journal of Financial Intermediation*, 16(3), 452–476.

Cerqueiro, G., S. Ongena, and K. Roszbach (2016): "Collateral damage? On collateral, corporate financing and performance," Working Paper Series 1918, European Central Bank.

Chaney, T., D. Sraer, and D. Thesmar (2012): "The Collateral Channel: How Real Estate Shocks Affect Corporate Investment," *American Economic Review*, 102(6), 2381–2409.

Crouzet, N., N. R. Mehrotra, et al. (2017): "Small and Large Firms Over the Business Cycle," *Unpublished*.

Cvijanovic, D. (2014): "Real Estate Prices and Firm Capital Structure," *Review of Financial Studies*, 27(9), 2690–2735.

de Ramon, S., W. Francis, and K. Milonas (2017): "An overview of the UK banking sector since the Basel accord: insights from a new regulatory database," *Unpublished*.

Degryse, H., A. Karapetyan, and S. Karmakar (2017): "To Ask or Not To Ask? Collateral versus Screening in Lending Relationships," *Unpublished*.

DeYoung, R., A. Gron, G. Torna, and A. Winton (2015): "Risk overhang and loan portfolio decisions: small business loan supply before and during the financial crisis," *The Journal of Finance*, 70(6), 2451–2488.

Dougal, C., C. A. Parsons, and S. Titman (2015): "Urban Vibrancy and Corporate Growth," *The Journal of Finance*, 70(1), 163–210.

Ersahin, N., and R. M. Irani (2015): "Collateral Values and Corporate Employment," Working Papers 15-30, Center for Economic Studies, U.S. Census Bureau.

Evans, P., and F. Ritchie (2009): "UK company statistics reconciliation project," *Department for Business, Enterprise and Regulatory Reform*.

Fama, E. F., and M. C. Jensen (1983): "Separation of ownership and control," *The journal of law and Economics*, 26(2), 301–325.

Flannery, M., and L. Lin (2016): "House prices, bank balance sheets, and bank credit supply," *Working Paper*.

Flannery, M. J. (1986): "Asymmetric information and risky debt maturity choice," *The Journal of Finance*, 41(1), 19–37.

Froot, K., D. Scharfstein, and J. Stein (1993): "Risk Management: Coordinating Corporate Investment and Financing Policies," *Journal of Finance*, 48(5), 1629–58.

Gan, J. (2007): "Collateral, debt capacity, and corporate investment: Evidence from a natural experiment," *Journal of Financial Economics*, 85(3), 709–734.

Giroud, X., and H. M. Mueller (2016): "Firm Leverage and Unemployment during the Great Recession," *Quarterly Journal of Economics*, (Forthcoming).

Hilber, C. A. L., and W. Vermeulen (2016): "The Impact of Supply Constraints on House Prices in England," *Economic Journal*, 126(591), 358–405.

Holmstrom, B., and J. Tirole (1997): "Financial Intermediation, Loanable Funds, and The Real Sector," *The Quarterly Journal of Economics*, 112(3), 663–691.

Jiangli, W., H. Unal, and C. Yom (2008): "Relationship Lending, Accounting Disclosure, and Credit Availability during the Asian Financial Crisis," *Journal of Money, Credit and Banking*, 40(1), 25–55.

Jimenez, G., S. Ongena, J.-L. Peydro, and J. Saurina (2012): "Credit Supply and Monetary Policy: Identifying the Bank Balance-Sheet Channel with Loan Applications," *American Economic Review*, 102(5), 2301–26.

Jimenez, G., V. Salas, and J. Saurina (2006): "Determinants of collateral," *Journal of Financial Economics*, 81(2), 255–281.

Karolyi, S. A. (2018): "Personal lending relationships," *The Journal of Finance*, 73(1), 5–49.

Kleiner, K. (2015): "Collateral and Small Firm Labor," *Kelley School of Business Research*.

Kudlyak, M., and J. M. Sanchez (2017): "Revisiting the behavior of small and large firms during the 2008 financial crisis," *Journal of Economic Dynamics and Control*, 77, 48–69.

Liu, Z., P. Wang, and T. Zha (2013): “Land-Price Dynamics and Macroeconomic Fluctuations,” *Econometrica*, 81(3), 1147–1184.

Manove, M., A. J. Padilla, and M. Pagano (2001): “Collateral versus Project Screening: A Model of Lazy Banks,” *RAND Journal of Economics*, 32(4), 726–44.

Monks, R. A., and N. Minow (1996): *Watching the watchers: Corporate governance for the 21st century*. Blackwell.

Moscarini, G., and F. Postel-Vinay (2012): “The contribution of large and small employers to job creation in times of high and low unemployment,” *American Economic Review*, 102(6), 2509–39.

Ono, A., and I. Uesugi (2009): “Role of Collateral and Personal Guarantees in Relationship Lending: Evidence from Japan’s SME Loan Market,” *Journal of Money, Credit and Banking*, 41(5), 935–960.

Petersen, M. A., and R. G. Rajan (1994): “ The Benefits of Lending Relationships: Evidence from Small Business Data,” *Journal of Finance*, 49(1), 3–37.

Rajan, R. (1992): “Insiders and Outsiders: The Choice between Informed and Arm’s-Length Debt,” *Journal of Finance*, 47(4), 1367–400.

Rajan, R., and A. Winton (1995): “Covenants and Collateral as Incentives to Monitor,” *Journal of Finance*, 50(4), 1113–46.

Saiz, A. (2010): “The Geographic Determinants of Housing Supply,” *The Quarterly Journal of Economics*, 125(3), 1253–1296.

Schwert, M. (2018): “Bank capital and lending relationships,” *The Journal of Finance*.

Sette, E., and G. Gobbi (2015): “Relationship lending during a financial crisis,” *Journal of the European Economic Association*, 13(3), 453–481.

Sharpe, S. (1990): “Asymmetric Information, Bank Lending, and Implicit Contracts: A Stylized Model of Customer Relationships,” *Journal of Finance*, 45(4), 1069–87.

Stiglitz, J., and A. Weiss (1981): “Credit Rationing in Markets with Imperfect Information,” *American Economic Review*, 71(3), 393–410.

Townsend, R. M. (1979): “Optimal contracts and competitive markets with costly state verification,” *Journal of Economic Theory*, 21(2), 265–293.

Voordeckers, W., and T. Steijvers (2006): “Business collateral and personal commitments in SME lending,” *Journal of Banking & Finance*, 30(11), 3067–3086.

Xu, B., H. Wang, and A. V. Rixtel (2015): “Do banks extract informational rents through collateral?,” BIS Working Papers 522, Bank for International Settlements.

A Tables

Table 1: VARIABLES DEFINITIONS

Variable	Description	Source
$Investment_{i,t}$	$\frac{\triangle Fixed\, Assets_{i,t} + Depreciation_{i,t}}{Turnover_{i,t-1}}$	FAME.
$Collateral_{i,t}$	$Land\, Holdings_{i,2002} \times \frac{Land\, Price_{j,t}}{Land\, Price_{j,2002}} \times \frac{1}{Turnover_{i,t-1}}$	FAME, Land Registry.
$Cash_{i,t}$	$\frac{Bank\, Deposits_{i,t} - Overdrafts_{i,t}}{Turnover_{i,t-1}}$	FAME.
$Profit_{i,t}$	$\frac{Operating\, Profit_{i,t}}{Turnover_{i,t-1}}$	FAME.
$Age_{i,t}$	log(1+Months Since Incorporated$_{i,t}$)	FAME.
$Credit\, Score$	$Quiscore$	FAME.
$Short-Term\, Debt_{i,t}$	$\frac{Short\, Term\, Loans_{i,t} + Overdrafts_{i,t}}{Turnover_{i,t-1}}$	FAME.
$Long-Term\, Debt_{i,t}$	$\frac{Long\, Term\, Debt_{i,t}}{Turnover_{i,t-1}}$	FAME.
$Relationship\, Length_{i,b,t}$	log(1+Months since charge first created between firm i and bank b).	FAME.
$Bank\, Size_{b,t}$	$log(Total\, Assets_{b,t})$	HBRD.
$Bank\, Leverage_{b,t}$	$\frac{Tier\, 1\, Capital_{b,t}}{Total\, Assets_{b,t}} \times 100$	HBRD.
$Bank\ Net\ Chargeoffs_{b,t}$	$\frac{Net\, Chargeoffs_{b,t}}{Total\, Loans_{b,t}} \times 100$	HBRD.
$Common\ Personal\ R'ship\ Dummy_{i,t}$	1 for firms with common bank-firm and bank-director relationships, 0 otherwise.	FAME, PSD.
$\%\ Common\ Personal\ R'ships_{i,t}$	Share of current directors with a common relationship with the firm's bank.	FAME, PSD.
$Length\ Common\ Personal\ R'ships\ _{i,t}$	log(1+average number of common months)	FAME, PSD.
$Public\, Company_{i,t}$	1 for publicly listed firms, 0 otherwise.	FAME.
$Board\, Majority_{i,t}$	log(1+min{Months of service of majority of directors})	FAME.
$Board\, Longest_{i,t}$	log(1+min{Months of service of longest serving director})	FAME.

Notes - The table reports variable definitions and sources. PSD: Product Sales Database. FAME: Financial Analysis Made Easy. HBRD: Historical Bank Returns Database.

Table 2: Summary Statistics

	(1)	(2)	(3)
Sample:	**FAME Dataset**		**Final Sample**
Panel A: Coverage			
	% of Observations Reporting	Median Value	Median Value
Total Assets (£000s)	96%	51	1,004
Fixed Assets (£000s)	85%	8	284
Tangible Assets (£000s)	84%	6	224
Land and Buildings (£000s)	59%	0	55
Turnover (£000s)	18%	100	1,574
Number of Employees	5%	22	73
Banking Relationship	19%	0	1
Panel B: Number of Observations			
Total Firm-Year Observations	11,194,476		115,284
of which:			
Multiple Bank			13,635
Single-Bank Firms			101,649
Single-Bank Firms in Relationship with a "Big-5" Bank			95,698

Notes - This table reports key characteristics of the original FAME dataset (columns 1-2) and our final sample (column 3). Columns 1-2 use all observations for active firms which report at an annual frequency, except those active in industries listed in section 3.3. Column 3 use observations used for our baseline regression, covering the period 2002-2013. Our final sample excludes firms with an ownership stake greater than 50%, those operating in industries listed in section 3.3, and those not reporting the main variables of interest for our baseline regression. Column 1 gives the percentage of observations in the FAME Dataset which report the given variables. Column 2 gives the median value of the given variables in FAME. Column 3 gives the median value of the given variables in our selected sample.

Table 3: Employment In Selected Industries (% total workforce)

	Agriculture, Hunting, Forestry, Fishing	Manufacturing	Wholesale and Retail	Hotels and Restaurants	Transport, Storage, Communications, Business Activities	Education	Health and Social Work	Other Community, Social, Personal Activities	Activities of Private Households	Total Employment
2003										
Sample	3%	33%	22%	7%	31%	0%	2%	3%	0%	1,373,160
FAME	2%	36%	23%	10%	26%	0%	1%	3%	0%	8,000,945
ONS	1%	14%	20%	8%	27%	10%	13%	7%	1%	25,098,000
2008										
Sample	1%	26%	24%	6%	37%	0%	3%	3%	0%	1,343,630
FAME	1%	28%	24%	8%	33%	0%	2%	3%	0%	8,880,385
ONS	1%	11%	19%	8%	29%	10%	14%	7%	1%	26,193,750
2013										
Sample	1%	22%	28%	8%	32%	0%	4%	3%	0%	899,776
FAME	1%	24%	22%	10%	37%	0%	2%	4%	0%	9,584,456
ONS	1%	10%	18%	8%	30%	11%	15%	7%	0%	26,751,500

Notes - The Table shows the share of all UK employees active in a given industry included in (i) our final sample ("Sample"), (ii) the "FAME Dataset", and (iii) aggregate UK data from the Office of National Statistics (ONS). The final column shows the total number of employees in a given industry and sample. Industry definitions are based on UK 2003 Standard Industrial Classification (SIC) codes. We exclude firms operating in utilities (2003-SIC: 4011-4100), construction (2003-SIC: 4511-4550), finance and insurance (2003-SIC: 6511-6720), real estate (2003-SIC: 7011-7032), public administration (2003-SIC: 7511-7530), and mining (2003-SIC: 1010-1450).

Table 4: Summary Statistics, by Terciles of Relationship Length

Relationship Length Tercile:	Low	Middle	High
Firm Characteristics			
Investment (% Turnover$_{t-1}$)	0.08	0.055	0.053
	(0.31)	(0.24)	(0.23)
Collateral (% Turnover$_{t-1}$)	0.56	0.61	0.78
	(2.1)	(2.1)	(2.4)
Cash (% Turnover$_{t-1}$)	0.025	0.031	0.083
	(0.31)	(0.32)	(0.41)
Profit (% Turnover$_{t-1}$)	0.021	0.034	0.02
	(0.27)	(0.24)	(0.24)
Total Assets (£000s)	21,284	12,942	7,327
	(289,126)	(163,011)	(37,040)
Credit Score	59	62	69
	(27)	(25)	(24)
Age (Months)	191	224	397
	(207)	(188)	(220)
Relationship Length (Months)	43	111	260
	(28)	(36)	(113)
Bank Size (Log Total Assets)	13	13	13
	(1.1)	(1.1)	(.96)
Bank Leverage (% Total Assets)	4.4	4.4	4.2
	(1.1)	(1.1)	(1.1)
Bank Losses (% Total Assets)	0.6	0.61	0.61
	(0.42)	(0.43)	(0.42)
Short Term Debt (£000s)	2062	1393	846
	(26669)	(20467)	(4454)
Long Term Debt (£000s)	7158	5140	1514
	(100530)	(77656)	(12299)
Public Company (Dummy)	0.095	0.082	0.059
	(0.29)	(0.27)	(0.23)
Firm Director Characteristics			
Common Relationship (Dummy)	0.069	0.071	0.066
	(0.25)	(0.26)	(0.25)
Common Relationship (%)	0.024	0.025	0.021
	(0.1)	(0.1)	(0.092)
Director Relationship (Months)	2.2	2.6	2.4
	(11)	(13)	(12)

Notes - This table shows the average and standard deviation (in parentheses) of a given variable for three groups of firms sorted by their relationship length. The sample includes 2002-2013 yearly observations for all UK companies with at least one banking relationship, are active in 2002, and report data for all the included controls - except firms in sectors specified in Table 3.

Table 5: Lending Relationships & the Collateral Channel

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent Var.:	Investment						Short-Term Debt	Long-Term Debt	Investment	
Included Firms:	All				Private	Public	All		2007-10	Other years
Collateral	0.04***	0.04***	0.04***	0.04***	0.04***	0.05**	0.01***	0.01**	0.04***	0.04***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.02)	(0.002)	(0.005)	(0.003)	(0.003)
R'ship Length		-0.03***	-0.02***	-0.05***	-0.03***	-0.03***	-0.004**	-0.02***	-0.02***	-0.02***
		(0.003)	(0.003)	(0.01)	(0.003)	(0.01)	(0.001)	(0.002)	(0.003)	(0.003)
Collateral × R'ship Length			-0.02***	-0.02***	-0.02***	-0.01	-0.0001	-0.02***		
			(0.002)	(0.002)	(0.003)	(0.01)	(0.002)	(0.003)		
Land Prices × R'ship Length				-0.02***						
				(0.002)						
Firm Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.21	0.23	0.23	0.23	0.24	0.22	0.07	0.08	0.27	0.24
Observations	107,649	107,649	107,649	107,649	99,014	7,634	56,601	56,601	24,706	77,018

Notes - The table reports the results of annual panel OLS regression. *Investment* is ((Fixed Assets$_t$+Depreciation$_t$)/Turnover$_{t-1}$) *Collateral* is $(Land\,and\,Buildings_{i,2002}\frac{Land\,Prices_{j,t}}{Land\,Price_{j,2002}} \times \frac{1}{Turnover_{i,t-1}})$. *Relationship Length* is 1+log months since relationship start. *Short-Term Debt* is short-term loans and overdrafts over $Turnover_{t-1}$. *Long-Term Debt* is total debt liabilities due at balance-sheet year + 1 over $Turnover_{t-1}$. Controls included in all columns except column 1 but not reported are: $Cash_{t-1}$, $Profit_{t-1}$, Age_{t-1}, $Credit\ Rating_{t-1}$, $Land\ Prices_t{*}Age_{2002}$, $Land\ Prices_t{*}Profits_{2002}$ and $Land\ Prices_t{*}Total\ Assets_{2002}$. The sample includes 2002-2013 yearly observations for all UK companies with at least one banking relationship, are active in 2002, and report data for all the included controls - except firms in sectors specified in Table 3. Standard errors clustered by region are reported in parentheses. Stars indicate statistical significance at 1% (***), 5%(**), and 10%(*).

Table 6: Lending Relationships & the Collateral Channel: Additional interactions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Baseline							
X is:		Firm Age	Firm Size	Credit Rating	Bank Size	Bank Leverage	Bank Losses	Multiple Bank
Collateral	0.04***	-0.06***	0.05***	0.04***	0.04***	0.04***	0.04***	0.04***
	(0.003)	(0.016)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
R'ship Length	-0.02***	-0.03***	-0.02***	-0.03***	-0.03***	-0.02***	-0.02***	-0.02***
	(0.003)	(0.010)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Collateral × R'ship Length	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Collateral * X		-0.004	0.0129***	-0.0001*	-0.01***	0.0003	0.003	-0.004
		(0.004)	(0.002)	(0.000)	(0.002)	(0.002)	(0.003)	(0.006)
R'ship Length * X		0.03***	0.001	0.0002***	0.008***	0.0001	0.0003	0.003
		(0.003)	(0.001)	(0.000)	(0.002)	(0.001)	(0.001)	(0.007)
Adjusted R^2	0.23	0.24	0.24	0.23	0.23	0.23	0.23	0.23
Observations	107,649	107,618	107,646	107,649	107,649	107,649	107,649	107,649

Notes - The table reports the results of annual panel OLS regression. The dependent variable is *Investment* ((Fixed Assets_t+Depreciation_t)/Turnover_{t-1}). *Collateral* is $(\mathit{Land\,and\,Buildings}_{i,2002}\frac{\mathit{Land\,Prices}_{j,t}}{\mathit{Land\,Price}_{j,2002}} \times \frac{1}{\mathit{Turnover}_{i,t-1}})$. *Relationship Length* is 1+log months since relationship start. *Firm Age* is log number of months since firm creation; *Firm Age* is log total firm assets; *Credit Score* is the firm's Quiscore; *Bank Size* is the lag log(Total Assets) of the firm's bank; *Bank Leverage* is the lag ratio of total Tier 1 capital to total assets; *Bank Losses* is the lag ratio of net loan loss write-offs (gross write-offs less recoveries) to total loans; *Multiple Bank* is 1 for firms with outstanding charges with more than one bank, 0 otherwise. Controls included in all columns but not reported are: Cash_{t-1}, Profit_{t-1}, Age_{t-1}, $\mathit{Credit\ Rating}_{t-1}$, $\mathit{Land\ Prices}_t * \mathit{Age}_{2002}$, $\mathit{Land\ Prices}_t * \mathit{Profits}_{2002}$ and $\mathit{Land\ Prices}_t * \mathit{Total\ Assets}_{2002}$. The sample includes 2002-2013 yearly observations for all UK companies with at least one banking relationship, are active in 2002, and report data for all the included controls - except firms in sectors specified in Table 3. Standard errors clustered by region are reported in parentheses. Stars indicate statistical significance at 1% (***), 5%(**), and 10%(*).

Table 7: Corporate Relationships & the Collateral Channel: Robustness Checks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Baseline	IV	*Collateral* measure:		Lag *Relationship*	*Investment* measure:	
			At t-5	Based on CRE prices		ex-Depreciation	Tangibles only
Collateral	0.04***	0.06***	0.01***	0.06***	0.03***	0.02***	0.03***
	(0.00)	(0.02)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)
Collateral ×	-0.02***	-0.02***	-0.01***	-0.03***	-0.01***	-0.02***	-0.02***
R'ship Length	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Adjusted R^2	0.23	0.23	0.22	0.25	0.22	0.15	0.24
Observations	107,649	97,989	76,239	49,909	94,347	11,7967	10,7347

Notes - The table reports the results of annual panel OLS regression. The dependent variable is *Investment* ((Fixed Assets$_t$+Depreciation$_t$)/Turnover$_{t-1}$), unless specified otherwise. *Collateral* is ($Land\,and\,Buildings_{i,2002}\frac{Land\,Prices_{j,t}}{Land\,Price_{j,2002}} \times \frac{1}{Turnover_{i,t-1}}$). *Relationship Length* is 1+log months since relationship start. Controls included in all columns but not reported are: $Cash_{t-1}$, $Profit_{t-1}$, Age_{t-1}, $Credit\ Rating_{t-1}$, $Land\ Prices_t$*Age_{2002}, $Land\ Prices_t$*$Profits_{2002}$ and $Land\ Prices_t$*$Total\ Assets_{2002}$. The sample includes 2002-2013 yearly observations for all UK companies with at least one banking relationship, are active in 2002, and report data for all the included controls - except firms in sectors specified in Table 3. Standard errors clustered by region are reported in parentheses. Stars indicate statistical significance at 1% (***), 5%(**), and 10%(*).

Table 8: Lending Relationships & the Collateral Channel: Different Samples

	(1)	(2)	(3)	(4)
Subset of Firms:	Single-Region	UK-Focused	Manufacturing	Audited Firms
Collateral	0.04***	0.04***	0.03***	0.04***
	(0.00)	(0.01)	(0.01)	(0.01)
Collateral ×	-0.02***	-0.02***	-0.01*	-0.01**
R'ship Length	(0.00)	(0.00)	(0.01)	(0.01)
Adjusted R^2	0.24	0.25	0.20	0.21
Observations	78,919	33,510	22,421	59,721

Notes - The table reports the results of annual panel OLS regression of corporate *Investment* ((Fixed Assets$_t$+Depreciation$_t$)/Turnover$_{t-1}$) against *Collateral* (Real-estate holding market value in 2002 * *Land Prices* in the company's headquarter region in a given year), *Relationship Length* (1+log months since relationship start in a given year) and other controls, unless otherwise specified. The sample includes 2002-2013 yearly observations for all UK companies with at least one banking relationship, are active in 2002, and report data for all the included controls - except firms in sectors specified in Table 3. Controls included in all columns but not reported are: *Cash Ratio*, *Profit Margin*, *Firm Age*, *Credit Rating*, as well the interaction of *Land Prices* with *Firm Age*, *Profit Margin* and *Total Assets* as measured in 2002. Control definitions are reported in Table 4 notes. Standard errors clustered by region are reported in parentheses. Stars indicate statistical significance at 1% (***), 5%(**), and 10%(*).

Table 9: BOARD RELATIONSHIPS & THE COLLATERAL CHANNEL: (PRIVATE FIRMS ONLY)

	(1)	(2)	(3)	(4)
X is:	Board Majority		Board Longest	
Collateral	0.04***	0.04***	0.04***	0.04***
	(0.004)	(0.004)	(0.003)	(0.003)
R'ship Length		-0.02***		-0.02***
		(0.003)		(0.003)
Collateral * R'ship Length		-0.01***		-0.003
		(0.004)		(0.005)
Board R'ship Length	-0.02***	-0.005*	-0.02***	-0.005
	(0.002)	(0.003)	(0.003)	(0.005)
Collateral * Board R'ship Length	-0.02***	-0.005	-0.02***	-0.02***
	(0.002)	(0.004)	(0.002)	(0.005)
Adjusted R^2	0.23	0.24	0.24	0.24
Observations	98,887	98,887	98,887	98,887

Notes - The table reports the results of annual panel OLS regression of corporate *Investment* ((Fixed Assets$_t$+Depreciation$_t$)/Turnover$_{t-1}$) against *Collateral* (Real-estate holding market value in 2002 * *Land Prices* in the company's headquarter region in a given year), *Relationship Length* (1+log months since relationship start in a given year) and other controls. *Firm Age* is 1 for firms more than 10 years old, 0 otherwise; *Small* is 1 for firms in the bottom 50% of the distribution of Total Assets in a given year, 0 otherwise; *Credit Score* is the firm's Quiscore; *Bank Size* is the lag log(Total Assets) of the firm's bank; *Bank Leverage* is the lag ratio of total Tier 1 capital to total assets; *Bank Losses* is the lag ratio of net loan loss write-offs (gross write-offs less recoveries) to total loans; *Multiple Bank* is 1 for firms with outstanding charges with more than one bank, 0 otherwise. The sample includes 2002-2013 yearly observations for all UK companies with at least one banking relationship, are active in 2002, and report data for all the included controls - except firms in sectors specified in Table 3. Controls included in all columns but not reported are: *Cash Ratio*, *Profit Margin*, *Firm Age*, *Credit Rating*, as well the interaction of *Land Prices* with *Firm Age*, *Profit Margin* and *Total Assets* as measured in 2002. Other controls definitions are reported in Table 4 notes. Standard errors clustered by region are reported in parentheses. Stars indicate statistical significance at 1% (***), 5%(**), and 10%(*).

Table 10: PERSONAL RELATIONSHIPS & THE COLLATERAL CHANNEL

	(1)	(2)	(3)	(4)	(5)	(6)
Relationship Length is:	Relationship Length with Firm			Relationship Length with Board Majority		
Collateral	0.0386***	0.0385***	0.0385***	0.04***	0.004***	0.04***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Relationship Length	-0.0247***	-0.0244***	-0.0248***	-0.016***	-0.016***	-0.016***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Collateral * Relationship Length	-0.0188***	-0.0185***	-0.0184***	-0.017***	-0.017***	-0.017***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Collateral * Relationship Length	0.0159**			0.015**		
* Common Personal Relationship Dummy	(0.006)			(0.007)		
Collateral * Relationship Length		0.027*			0.032**	
* % (Common Personal Relationship)		(0.014)			(0.015)	
Collateral * Relationship Length			0.03*			0.04**
* Length Common Personal Relationship			(0.002)			(0.002)
Adjusted R^2	0.23	0.23	0.23	0.23	0.23	0.23
Observations	107,649	107,518	107,649	107,518	107,518	107,518

Notes - The table reports the results of annual panel OLS regression of corporate *Investment* ((Fixed Assets_t+Depreciation_t)/Turnover_{t-1}) against *Collateral* (Real-estate holding market value in 2002 * *Land Prices* in the company's headquarter region in a given year), *Relationship Length* (1+log months since relationship start in a given year) and other controls, unless otherwise specified. The sample includes 2002-2013 yearly observations for all UK companies with at least one banking relationship, are active in 2002, and report data for all the included controls - except firms in sectors specified in Table 3. Controls included in all columns but not reported are: *Cash Ratio*, *Profit Margin*, *Firm Age*, *Credit Rating*, as well the interaction of *Land Prices* with *Firm Age*, *Profit Margin* and *Total Assets* as measured in 2002. Control definitions are reported in Table 4 notes. Interaction terms included but not reported: *Collateral * Common Personal Relationship Dummy* and *Relationship Length * Common Personal Relationship Dummy* (columns 1,4); *Collateral * %(Common Personal Relationship)* and *Relationship Length * %(Common Personal Relationship)* (columns 2,5); *Collateral * Length Common Personal Relationship* and *Relationship Length * Length Common Personal Relationship)* (columns 3,6). Standard errors clustered by region are reported in parentheses. Stars indicate statistical significance at 1% (***), 5%(**), and 10%(*).