INFORMATION MONOPOLIES AND MONETARY POLICY PASS-THROUGH

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ABSTRACT. We empirically investigate the role of frictions in bank-borrower relationships on the transmission channel of monetary policy. We argue that banks' incentives to pass on reductions in their funding costs depend on the ease at which their borrowers can solicit outside competition for their financing. We test this hypothesis by comparing the loan spreads of small bank-dependent firms with those of group-affiliated and large firms. To limit the impact of the endogeneity of monetary policy to macro conditions, we restrict our analysis to firms which have an investment-grade credit rating. Using a large sample of French firms, we show that following the ECB's monetary policy stimulus in the winter of 2008, the loan spreads (banks' mark-up) of small bank-dependent firms increased by 42 basis points more than those of large and group-affiliated firms. This effect is robust, but at a lower magnitude, when using alternative measures of bank-dependency based on firms' debt concentration with a main lender, and controlling for firm size and group-affiliation. We also show that pass-through is stronger in counties with lower levels of local bank market concentration (HHI), but that this effect only holds for larger (or more diversified) borrowers. We perform several further tests to rule out a risk premium story. First, we find no evidence for a flight-to-quality effect for stand-alone SMEs at this time. Second, we find no similar pricing impact when including in our sample speculative-grade firms and assigning treatment by firms' credit rating. Our evidence is in line with theories which show that banks' information monopoly allows them to charge higher rates to their 'locked-in' borrowers.

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1. Introduction

An important question for monetary policy is how its decisions affect the financing costs of different types of borrowers. One view is that by affecting the net-worth of borrowers, thereby banks' expectations of borrower default, the borrowing costs (external finance premium) of small bank-dependent borrowers should be most sensitive to changes in monetary policy.[1] An alternative view argues that changes in monetary policy also affects banks' ability to adjust the mark-up on their loans. Empirical support for this view has shown that heterogenous pass-through can be explained by the degree of local bank market concentration (Neumark and Sharpe, 1992; Hannan and Berger, 1991; Drechsler, Savov, and Schnabl, 2017). However, informational frictions within bank-firm relationships may also act as an important source of banks' market power. This has led some to suggest that if borrowers face frictions in their ability to substitute their financing, banks will have a lower incentive to pass on reductions in their funding costs (Mester and Saunders, 1995). Yet, while borrower characteristics is often cited as a potential explanation for heterogeneous interest rate pass-through, studies using borrower-loan level data finding such evidence are surprisingly lacking.

In this paper, we empirically investigate how banks adjust their loan rates following a monetary policy easing in a period of economic uncertainty. Our analysis relies on the idea that a borrower's ability to negotiate its loan rate depends on the degree to which it can solicit outside competition for its financing. In the cross-section, we should expect a borrower's outside options to be weaker: the more a borrower is informationally opaque (the higher the information wedge between borrower and lenders); and the more concentrated is its funding sources (the higher the information wedge across lenders). We build on a literature which shows that a borrower's bargaining position (vis-a-vis its bank) is weaker when it is informationally 'locked-in' by its lender. This arises when an informed (inside) lender knows more about the borrower's quality than a less informed (outside) lender (Sharpe, 1990; Rajan, 1992). Our main hypothesis is that due to differences in banks' private information across borrowers, controlling for observable borrower risk, interest rate pass-through should be weaker for small bank-dependent borrowers following a monetary policy stimulus.

To test this hypothesis, we examine French banks' loan pricing around the time of the ECB's monetary policy stimulus between October 2008 and March 2009. We exploit a large dataset of new loan issuances to NFCs based in France for all the major French banks. We employ a difference-in-difference regression and compare the loan spreads of stand-alone SME borrowers with those of (less bank-dependent) group-affiliated and large borrowers in the six quarters before and the six quarters after the ECB decisions.[2]

Given that stand-alone SMEs are generally considered to be more informationally opaque (Berger and Udell, 2002) and, especially in France, are less likely to diversify their funding sources, the outside options (bank and non-bank financing) of these borrowers should be weaker than those of larger more diversified borrowers. In addition to detailed information on the loan

[1]According to the balance sheet channel, monetary policy not only affects the size of interest rates, but also the net-worth of borrowers, and therefore their external finance (risk) premium. Given that agency problems are most acute for low net-worth borrowers, changes to their net-worth will affect their external finance premium more than it will for high net-worth borrowers (Bernanke and Gertler, 1989, 1995; Holmstrom and Tirole, 1997).

[2]While this implies a six month break between windows, it amounts to only losing two months (October 2008 and January 2009) from our estimation period, since we only observe loans in the first month of each quarter.

characteristics, our final dataset includes firm balance sheet information as well as a credit rating assigned by the Banque de France.[3] To alleviate potential concerns that changes in spreads may be due to changes in macro conditions which may affect the risk premium of smaller borrowers, we restrict our sample to investment-grade borrowers.

Our baseline estimate (Table 4) shows that following the ECB's monetary easing of some 375 basis points, the loan spreads of small bank-dependent firms increased by 42 basis points more than they did for (less bank-dependent) group-affiliated and large firms.[4] This result is robust to the inclusion of industry-time, county-time, rating-time and bank-time fixed effects to control for shocks to firms' credit demand as well as shocks to banks' balance sheets and funding conditions.

We conduct several additional robustness tests of our main finding (Table 5). We first add to our model a firm fixed-effect. Second, we address a concern that loans may not be comparable across our two periods, by restricting our sample to those bank-firm relationships which appear in both periods, and taking the firm fixed-effect. Third, we control for any potential duration mismatch across loans, by adjusting the loan spreads to the corresponding maturity risk-free EONIA OIS swap rates. Fourth, we further control for loan demand shocks by using a more granular industry-county-time fixed effect. In all of these specifications our main result holds.

We now show that our measure of bank-dependency is robust to alternative specifications. First, we define a bank-dependent firm as a firm which has a single-bank relationship. Second, we define a bank-dependent firm as a firm that has a main lender, that is a lender which is responsible for over half of the firm's bank debt. When using these measures, and controlling for time-varying heterogeneity related to firm size and group-affiliation, we identify an effect similar to our baseline specification, but with smaller coefficients (Table 6). This also holds when restricting our sample to stand-alone SMEs.

We now turn our attention to the role of local bank market competition on the pass-through of monetary policy to interest rates. To measure banks' market power we use the HHI index of market concentration based on each bank's shares of bank branches at the county level. We find (Table 7) that pass-through is much stronger in counties with low levels of local market concentration (below the median). However, when splitting the samples across our measures of bank-dependency, we show that the HHI only plays a role for larger (and more diversified) borrowers. These results suggest that for smaller, less diversified borrowers, the lock-in effect seems to dominate the effect of local market competition.

We now reject an alternative interpretation of our results. Consistent with the theory of 'flight-to-quality' in economic downturns, the increase in spreads for small bank-dependent borrowers may simply reflect an increase in the agency costs of lending to these borrowers (Bernanke and Gertler, 1995; Bernanke, Gertler, and Gilchrist, 1996) . Our pricing effect may simply reflect, therefore, a reduced credit allocation for smaller borrowers. Using credit register data, we show that this does not hold. Stand-alone SMEs borrowed relatively more than large and group-affiliated borrowers over this period. The combination of a relative increase in

[3]See Mésonnier, O'Donnell, and Toutain (2017) and Cahn, Girotti, and Salvade (2018) for more details about the French loan market and the use of Banque de France credit ratings.

[4]In reality, ECB's total reduction is 400 basis points, since there was a further rate reduction of 25 basis points in April 2009; however, since we use April in our post window, we refer only to the reductions prior to our post window.

spreads and a relative increase in quantities is not consistent with a 'pure' supply effect where higher spreads reflect a reduced willingness-to-lend by banks to smaller borrowers.

However, when analyzing the extensive margin, we find that stand-alone SMEs are less likely to establish new bank relationships over this period relative to larger borrowers. However, to determine whether this is due to a reduced loan supply from outside lenders over this period, we use a bank-firm level regression to estimate the probability for a firm to switch from a main lender. We first show (Table 8) that stand-alone borrowers are on average less likely to switch their funding source relative to larger borrowers, however, this does not change over our sample period. Moreover, this does not change when we employ the within-firm estimator. These results suggest that while ex-ante these borrowers are less likely to switch their funding with a less informed (outside) lender, the timing of our baseline result does not coincide with a shock to stand-alone SMEs' ability to switch their funding source.

We now address a potential concern that the timing of the monetary policy decisions coincide with a structural break in French banks' pricing of credit risk in response to the Lehman Brothers' default. To do this, we compare the loan spreads of speculative-grade firms with those of investment-grade firms, using our same sample period. We first show that the risk premium does increase for speculative-grade firms relative to investment-grade firms over our event windows, but only by 12 basis points (Table 10). However, when controlling for variation in expected loss across credit ratings this effect disappears (see also Figure 6).[5] The evidence suggests that variation in the risk premium across firms, in our sample, is largely explained by variation in observable default risk. Overall this evidence is hard to reconcile with the idea that our baseline effect is driven by a change in the risk premium for smaller firms due to a shock to French banks' pricing of default risk over this period.

Our paper is related to a literature which examines the impact of bank market power in explaining price rigidities in loan and deposit rates. Hannan and Berger (1991) and Neumark and Sharpe (1992) show that deposit rates exhibit upward price stickiness, and that monetary policy pass-through is weaker in more concentrated markets. Mester and Saunders (1995) show that loan rates exhibit downward price stickiness. Mojon (2000) and Van Leuvensteijn et al. (2013) find similar results for the euro area for both deposit and loan rates as well as the role of bank market concentration. A recent contribution Drechsler, Savov, and Schnabl (2017) validate the above findings, using richer identification by exploiting within-bank variation.

We also contribute to a literature on how asymmetric information acts as an important source of bank profitability. Both Sharpe (1990) and Rajan (1992) show that banking relationships might be costly for firms if they become informationally 'locked-in' by their lenders. Empirical validation of these models has generally focused on how borrower's bargaining power is affected by changes in the availability of public information (Pagano, Panetta, and Zingales, 2002; Schenone, 2010; Saunders and Steffen, 2011; Hale and Santos, 2009). In all of these papers, there is an agreement that the information available for public firms reduces banks' information monopoly, thereby reducing borrowers' funding costs. In the paper closest to ours, Santos and Winton (2008) find that bank-dependent firms pay 22 basis points more than firms with access to public debt markets, in recessions compared to normal times. They claim that

[5] We measure expected loss as last years' default rate for each credit rating times the loss given default estimated at 35%.

the increase in the value of banks' private information (monopoly power) during recessions is consistent with the story that banks can extract rents from their 'locked-in' borrowers.

While in the first literature, variation in banks' mark-up pricing arises due to shocks to their funding (marginal) costs; in the second, variation in banks' mark-up pricing arises due to shocks to their monopoly power (private information). By exploiting the marginal cost variation from the first, and using the concept of monopoly power from the second, our results tie together two literatures on bank monopoly pricing which so far remain largely separate. Regarding the first, we provide clear evidence for an alternative source of bank monopoly on the transmission mechanism of monetary policy. Regarding the second, we address a non-trivial question: do ex-ante differences in banks' private information across borrowers, affect banks' ability/incentives to pass on shocks in their marginal costs? We show that it does.

In tying these two literatures together, our findings also contribute to recent studies assessing the heterogenous transmission of loan rates during the recent crisis, in particular the various ways in which the lending channel has been impaired. Several studies have documented a significant increase in loan spreads in Europe since the crisis. Altavilla, Canova, and Ciccarelli (2016) find that bank balance sheet effects are largely responsible in explaining heterogenous pass-through of interest rate changes in the early parts of the euro area crisis. Gambacorta, Illes, and Lombardi (2015) examine the pass-through of policy rates to lending rates for non-financial firms for several advanced countries. They find strong evidence of a structural break in the pass-through after the Lehman Brothers' default, which they claim can be explained by accounting for aggregate measures of bank and borrower risk. In addressing issues of unobserved heterogeneity, by using a rich set of borrower and loan controls, our analysis suggests that some of the 'balance sheet effects' that these studies have identified may also be related to banks' incentives to pass-on interest rates.

Finally, we contribute to recent event studies which examine how loan contracting frictions impacted the transmission of FED monetary stimulus in response to the sub-prime crisis. Beraja et al. (2018) show that households in regions where household equity is lower (those which saw the largest house price declines) faced a greater inability to renegotiate their mortgages to take advantage of the lower rates. Di Maggio et al. (2017) examine the role of adjustable-rate mortgages (ARM). They find that regions with larger shares of ARMs were more responsive in their spending response to lower interest rates, and this effect is stronger for households with lower incomes and housing wealth. In a paper similar to ours, Agarwal et al. (2018) focus on frictions related to asymmetric information in the U.S. credit card markets - a market more reliant on transaction (arm's length) lending. They find that the pass-through of changes in credit limits is lower for less creditworthy borrowers. However, they find that these are the exact borrowers who respond to a credit expansion by increasing their borrowing and spending. We differ in that we use NFCs for which lending is often dominated by banking relationships as opposed to transactional lending often more typical in consumer and mortgage markets. Evaluating distributional effects in our analysis is therefore complicated, since we have to weigh up the costs of higher rates, with the benefits that these contracting innovations provide, such as a stable access to credit.

2. Monopoly Power in Bank-Firm Relationships

Due to their superior ability to screen and monitor borrowers, banks play an important role in mitigating asymmetric problems associated with lending to informationally opaque borrowers. For small and medium-size enterprises engaging in a banking relationship, therefore is viewed as a beneficial way to reduce agency costs and improve their access to external financing.

The literature suggests three broad ways in which banking relationships allow banks to be efficient and informed lenders. The first is related to debt concentration. Diamond (1984) shows that a borrower with many lenders creates two main inefficiencies related to monitoring: duplication of monitoring costs and free-riding by some lenders. By concentrating borrowing with a single lender, both of these cost inefficiencies can be eliminated. The second is the duration of the relationship. Over time the bank is able learn the true quality of the borrower; but moreover, the borrower also develops reputational capital, making the option of default more costly (Diamond, 1991). The third is the scope of the relationship, that is, the different service products that the bank provides. For example, by providing other services such as checking accounts, banks can monitor the sales of their borrowers based on checking account transactions and factoring account receivables (Ongena and Smith, 2000). Given that the precision of this information will be superior when the lender has full access to all the borrowers payment services, the scope dimension provides a further rationale to Diamond (1984) as to why a relationship with a single bank arises as the optimal debt contract for smaller borrowers.

However, while concentrating borrowing with a single bank, may help reduce the information wedge within the lending relationship, it acts to increase the wedge across lenders. This gives rise to a notion of an informed 'inside' lender and uninformed 'outside' lenders. If the borrower faces difficulties in conveying its (superior) quality to the less informed 'outside' lenders, then its ability to substitute its funding sources will be limited given that its debt will be subject to higher agency costs (Sharpe, 1990). However, asymmetric information across lenders give rise to a further problem. Given that the inside lender knows the true quality of its borrowers, the probability that the outside lender wins the bid is higher when the inside bank values the loan less, that is, when the firm is failing (Rajan, 1992). These two asymmetries together imply that certain firms will be pegged as a lemon if they seek to switch their funding source, thereby increasing the inside bank's monopoly power.[6]

A critical component of our empirical strategy is how we measure banks' information monopoly. We construct our measure based on the following three cross-sectional differences which, all else equal, should impact the severity of the 'lock-in' problem. (1) *Firm size*: larger

[6]If the role of banks' private information as source of monopoly power is not obvious to the reader, a basic accounting example may help to demonstrate the point. Let's assume two borrowers of equal quality, but differ in their availability of public information, such that borrower A has more public information than borrower B. Due to borrower A's superior public information it is quoted a financing cost of 4%; whereas borrower B is quoted a financing cost of 5% on public capital markets. The difference in the costs is due to the higher agency costs (asymmetric information) of lending to borrower B. Now let's assume that both borrowers have a bank relationship, such that the bank knows that the true quality of both borrowers is identical. Let's also assume that the bank's funding cost for both borrowers is 3.5%. If the bank prices at marginal cost, it will charge both borrowers at 3.5% generating an additional surplus for borrower A of 0.5% and an additional surplus for borrower B of 1.5%. But if the bank bids just enough to be competitive to win each loan, it will offer borrower A 4% - ε and borrower B, 5% - ε. The difference in the mark-up (bank surplus) across both borrowers, reflects therefore the difference between the bank's private information and the publicly available information.

firms are more likely to have publicly available information and access to public capital markets. (2) *Group-affiliation*: borrowers' access to internal capital markets, implies they can access a source of financing not subject to agency costs. (3) *Debt concentration*: firms with multiple bank relationship may be able to force banks to compete for their loans. Given that these all imply some differences in borrowers' reliance on bank debt or on a main bank, we use the term bank-dependent as our identification measure. We define a bank-dependent firm, therefore, as a stand-alone SME. While this directly captures (1) and (2), it indirectly captures (3). In France, the vast majority of stand-alone SMEs engage in a single-bank relationship, whereas larger firms will generally have multiple relationships. For example, while 80% of NFCs have a single-bank relationship, 84% of the credit is allocated to firms with multiple bank relationships.

However, our measure based on firm size and group-affiliation, may be overly general. We construct two alternative measures of bank-dependency which focus specifically on the role of debt concentration with a main lender. First, we define a bank-dependent firm as a firm which has a single-bank relationship. Second, we define a bank-dependent firm as a firm that has a main lender, that is a lender which is responsible for over half of the firm's bank debt. Finally, we address a potential criticism that our measure ignores the role of duration. The main reason for this is left-censoring of our data, meaning that we can only identify bank-firm relationships one year prior to the start of our event study period. Yet, as shown by Ongena and Smith (2000), firms with single-bank relationships are less likely to end a relationship than those with multiple relationships. It is reasonable, therefore, to believe that for single bank firms, these relationships will be sticky.

3. Data and Event Study Design

3.1. Data Sources

To study the impact of banks' private information on monetary policy pass-through, we employ three proprietary databases of the Banque de France. First, we use individual loan-level data on new corporate loans from the M-Contran dataset. This information is collected by the Banque de France in order to compute quarterly aggregate statistics on the interest rates of new loans. All the main credit institutions report exhaustive information for all new individual loans from their reporting branches issued during the first month of each quarter. In addition to interest rates, the survey provides rich information on a wide range of relevant loans characteristics, such as the size of the loan, the loan's precise purpose (investment, treasury, leasing etc.), its maturity at issuance, and whether it is fixed-rate or adjustable rate.

Second, we use information on firms' credit rating and other balance sheet characteristics from the FIBEN database. FIBEN accounting data are extracted from the individual company accounts collected yearly by the Banque de France and are based on fiscal documents. The data collection covers all companies conducting business in France whose annual turnover exceeds EUR 0.75 million or whose bank debt exceeds EUR 0.38 million. We exploit this database to obtain relevant firm-level variables. Importantly, the FIBEN database includes the in-house credit assessments of individual firms computed by the Banque de France. The Banque de France assigns a full-scale rating to the some 240,000 non-financial companies which report their balance sheets to FIBEN on a yearly basis. However, the Banque de France monitors firms all year round, meaning that positive or negative news, not yet reported in their official balance sheet, can imply credit rating changes at any time. The rating reflects the overall assessment of a company's ability to meet its financial commitments at a three-year horizon.[7]

Third, we use the credit registry of the Banque de France to identify bank-firm relationships. Since, 2006 the French credit registry collects all individual bank exposures to individual non-financial firms above EUR 25 thousand. Prior to 2006, the threshold was EUR 76 thousand. Our data availability also only starts in 2006, meaning that we cannot construct credible measures of relationship duration. However, it allows us to construct alternative measures of relationship intensity based on the level of borrowers' debt concentration across banks. It also allows us to rule out alternative explanations by comparing differences in the credit allocation across treatment groups at this time.

3.2. Summary Statistics

We restrict our sample to non-specialist French financial institutions, with the legal status of 'bank'. Furthermore, we exclude from our sample factoring, hire purchase and consumer loans. Regarding, our selection of firms, we select only investment-grade firms, as rated by the Banque de France. This not only implies that solvency risk is low for these firms; but also, these loans are eligible as collateral for Eurosystem refinancing operations, thereby providing an important liquidity service to the banks which issue them. See Mésonnier, O'Donnell, and Toutain (2017) for details on the impact of central bank collateral eligibility on French banks' loan supply to NFCs. Our baseline sample consists of 23,124 loans to 13,345 firms issued by 38 banks. Table 1 provides definitions of all the variables we use in our analysis. Table 2 provides summary statistics on the main firm and loan characteristics for our baseline sample.

3.3. ECB's monetary policy as a quasi-exogenous shock to banks' mark-up pricing

In response to the Lehman bankruptcy, and the severe liquidity drought in European money markets, the ECB's first major decision was taken on October 8th 2008, which saw the introduction of fixed-rate full allotment refinancing operations.[8] As a result, the sole limitation faced by banks regarding their ability to access central bank liquidity was the after-haircut value of their eligible collateral. The ECB's decision greatly reduced the liquidity risk facing French banks, especially, given that these banks had significant reserves of eligible collateral (consisting of 'illiquid' loans to NFCs). However, the main implication of this change with respect to the ECB's policy rate, was a transition from a corridor system to a floor system. That is prior to the decision, the main refinancing operations (minimum bid) rate (MRO) was the effective policy rate, and after the decision, it was the deposit facility rate (DFR). Applying this rationale, the ECB's policy rate (MRO), as of October 1st, stood at 4.25%, and by March 31st 2009, its policy rate (DFR) had fallen to 0.5%. This implies that the overall reduction in the policy rate over this period was 375 basis points.

Some comments are in order about our choice to use the ECB's monetary policy as a shock to banks' ability to exploit their monopoly power within bank-firm relationships. First, while monetary policy pass-through has traditionally been studied using time-series analysis, the

[7]The Banque de France guide to its credit rating system is now in English and available at: https://www.banque-france.fr/sites/default/files/media/2016/12/29/the-banque-de-france-rating-reference-guide.pdf.

[8]This decision reversed a previous decision, made on the same day, to reduce by 50 basis points the minimum bid rate on the main refinancing operations.

event study approach in assessing the transmission of monetary policy has emerged as a credible alternative (Beraja et al., 2018; Di Maggio et al., 2017; Agarwal et al., 2018). Second, while the French economy was not insulated from the shock hitting Europe at this time, as witnessed by the considerable decline in French GDP, France had emerged from recession relatively intact by the middle of 2009. Third, while French banks were subject to losses at this time, mainly due to exposures on large corporate investments and investment banking activities, losses were very low by European standards. Moreover, French banks' NPL ratios transitioned quite smoothly during this period, implying that there was no excessive build-up of risk prior to the Lehman shock. Fourth, the French banking system, was one of the only banking systems in Europe, which remained profitable during 2008 and 2009. The combination of the relatively strong capital positions of French banks at this time, and the significant reduction in liquidity risk, due to the changes in the ECB's refinancing operations, suggest that French banks were relatively well-equipped to support lending to the French economy at this time.

3.4. Exogeneity Condition for D-i-D Analysis

By no means are we claiming that the ECB's monetary policy was exogenous to the French economy and banking system at this time. In any case, the condition of exogeneity, which difference-in-difference event studies require, does not require that monetary policy is exogenous to macroeconomic conditions; but rather, that the macroeconomic shock is not correlated with treatment status. There are two obvious ways in which this would be violated. First, one of the treatment groups experienced a significantly worse balance sheet shock at this time. Second, conditioning on observables, banks' differentially adjusted their risk tolerance across treatment groups.

We now provide several pieces of evidence to strongly support the exogeneity condition for difference-in-difference estimation to be valid. First, closely following Duffie and Singleton (2003), we use the ratio of downgrades-to-upgrades, using a four quarter moving average, to measure dynamic changes in the credit quality across treatment groups. We construct this using the sample of French firms with credit ratings and which appear in the Banque de France credit register. Figure 2 shows that while both groups experience a significant credit deterioration over this period, the trends are identical. Based on this, it does not seem that French stand-alone SMEs fared any worse over this time.[9] Second, we use the Bank Lending Survey to compare changes in the collateral requirements for new loans across large and small firms as a measure of time-varying risk aversion across groups. Figure 1 shows that while French banks tightened their collateral requirements at this time, there does not appear to be a systematic difference across groups. Third, and specific to our sample of firms, we conduct a balance test of all covariates. Given that we have chosen only investment-grade firms, this already implies, to some extent, a propensity score matching; however, there may still remain significant differences in the main covariates across treatment groups. Table 3 reports summary statistics of the firm and loan covariates by treatment status. In particular, we report for each covariate, the normalized difference in averages by treatment status. This allows us to verify the suitability of our treatment status with respect to how well balanced the covariates are across both groups.

[9] We have also performed other tests using changes in sales, which actually show that stand-alone SMEs performed better during this time.

As we can see from the table the covariates between groups are well balanced: for all variables, with the exception of age, the normalized difference is below one quarter.[10] We address the issue of age in our robustness section, where we remove firms from our sample which are younger than ten years. These three pieces of evidence taken together show that there does not appear to be a systematic difference or change across treatment groups over this period, either in terms of observable credit quality or banks' reported risk tolerance. Based on this evidence the exogeneity criteria for valid difference-in-difference inference does not appear violated.

4. Results

4.1. Baseline model

To test our hypothesis that monetary policy pass-through is weaker for firms which face greater difficulties to substitute their financing, we analyse the spreads on new loans for a representative sample of banks to investment-grade firms over two event windows of six consecutive quarters each, one before and one after the monetary policy decisions between October 2008 and March 2009. We estimate the following standard difference-in-difference regression:

$$Spread_{ijkt} = \alpha + \beta_1 DEPEND_{jt} + \beta_2 POST_t + \beta_3 (DEPEND * POST)_{jt} + \beta_4 X_{it} + \beta_5 Z_{jt} + \beta_{kt} + \varepsilon_{ijt} \tag{1}$$

where $Spread_{ijkt}$ denotes the spread (vis-a-vis the EONIA) of loan i borrowed by firm j from bank k in the first month of quarter t. $DEPEND$ is a dummy variable which takes the value of one when firm j is a stand-alone SME. $POST$ is a dummy variable which takes the value of one when quarter t belongs to the post-monetary policy period from 2009Q2 to 2010Q3. X is a set of loan characteristics: loan purpose, loan size, loan maturity, fixed/variable rate.[11] Z is set of borrower characteristics at time of origination: credit rating, industry, county, firm size category, leverage, liquidity, asset tangibility, profitability, and sales growth. We do not include bank characteristics in our sample, mainly for the reason that in our preferred specification for (1) we will employ bank-quarter fixed effects β_{kt} which controls for time-varying shocks (both observed and unobserved) to banks' balance sheets and funding conditions. The main coefficient of interest in equation (1) is the Diff-in-Diff coefficient β_3. β_3 reads directly as a measure of the impact of banks' monopoly power, due their private information, on the pass-through of monetary policy. Since it corresponds to an increase in the mark-up of the loan spreads of smaller, more opaque, firms relative to group-affiliated and large firms, we expect the sign of β_3 to be positive. Finally, we correct the standard errors of the estimated coefficients for clustering at the bank-period (to allow for correlations across loans issued by the same bank within each period) and the 2-digit sector (to allow for correlations across loans belonging to firms in the same sector) in all our loan spread regressions.

4.2. Univariate Analysis

Figure 3 shows the intuition of our baseline result from a univariate perspective. It shows the average loan rates for both sets of borrowers over our sample period. We include the EONIA

[10]Imbens and Wooldridge (2008) suggest as a rule of thumb a value of the normalized difference below 0.25 is not a cause of concern for the covariate being imbalanced. They argue that the normalized difference should be preferred to the t-statistic to test the balancing of covariates, because its results do not depend on sample size and sample size does not affect the bias in estimated coefficients.

[11]Unfortunately, information as to whether the loan is secured or not, is not available prior to 2010Q4.

rate as our measure of the monetary policy stance. A few observations are in order. First, the parallel trends assumption implicit in the difference-in-difference is largely satisfied. In the pre-period, the loan rates of both sets of borrowers follow very similar trends. Second, while we do not include the Euribor 3M in this graph, the slight increase in the rates in the middle of 2008 that we observe can be fully explained by increase in interbank credit risk at this time. Figure 4 shows the average spreads above EONIA. This allows us to zoom in closer on the divergence in borrowing costs across both sets of borrowers at this time. While changes in loan spreads above EONIA may reflect a change in the risk premium of banks and borrowers, the restriction to investment-grade firms implies that differences across borrowers should reflect more banks' mark-up pricing.

4.3. Multivariate Analysis

To confirm the above preview of our results and quantify the impact of banks' monopoly power on the pass-through of monetary policy, we run multivariate regressions along the lines of equation (1). Specification (1) of table 4 presents the raw measure of the effect, as observed in figure 4 where potential confounding factors are not controlled for. It shows that stand-alone SMEs pay on average 88 basis points more than those of group-affiliated and larger borrowers following the monetary policy actions. In column (2) we introduce controls for loan-characteristics such as the loan maturity, whether the loan has fixed or variable rate. Given that quantities and prices result from an equilibrium process, the size of the loan is an endogenous variable in this regression. While not completely satisfactory, we include therefore loan size bucket fixed effects. This means that we are comparing loans across groups within the same loan size bucket. Importantly, we interact loan purpose with period fixed effects. This is important as the demand for particular loan instruments (investment vs. treasury) across different types of borrowers may change over this period due to the economic uncertainty. This lowers our coefficient to 71 basis points. In column (3) we introduce controls for firm-characteristics. Most of the firm-specific covariates turn out to be significant and affect loan spreads with the expected sign. We also include a dummy for firm size based on four legal categories. While the inclusion of these variables does render insignificant the dummy variable bank-dependency (stand-alone SMEs), it barely impacts our coefficient of interest. This is re-assuring as it suggests changes in borrower quality across groups does not explain the changes in the spreads across borrowers over our event windows. In column (4) we interact vectors of both sector and county with our dummy for post. This helps to further control for differences in shocks to firms' demand. We see that this has a significant impact on our coefficient reducing it to 55 basis points. In column (5) we interact credit rating dummies with the post dummy. This allows us to control for time-varying shocks to borrower creditworthiness which in principle could be correlated with our measure of bank-dependency. This has no impact on the coefficient of interest, which is perhaps not surprising since we have restricted our sample to investment-grade firms, and while also showing that the financial ratios are not significantly different across treatment groups. In column (6), our preferred specification, we introduce a bank-quarter fixed effect in order to control for any bank-specific shocks. This ensures that the control group for each 'treated' firm will always be taken from a set of firms borrowing from the same bank within the same month.[12] Our baseline estimate shows that following the ECB's monetary stimulus

[12] We say month because we observe loans in the first month of each quarter.

of some 225 basis points, the loan spreads of stand-alone SMEs increased by 42 basis points more than they did for (less bank-dependent) group-affiliated and large firms. This estimate is somewhat larger than the result of a comparable study by Santos and Winton (2008) which shows that bank-dependent firms pay 22 basis points more than firms with access to public debt in recessions than in normal times.

4.4. Robustness

We conduct several additional robustness tests of our main finding (Table 5). Column (1) of table 5 simply repeats our preferred baseline result. In column (2) we add to our model a firm fixed-effect. In column (3), we address a concern that the borrowers of both groups may not be comparable across our two periods. We restrict our sample, therefore, to those bank-firm relationships which appear in both periods. We also include here the firm fixed effect. This reduces our sample size to about a quarter of our baseline sample. However, it has a minor impact reducing our coefficient of interest from 42 basis points to 41 basis points. In column (4), we seek to further control for shocks to firms' loan demand by using a more granular industry-county-time fixed effect. This means that we are comparing spreads across treatment groups for firms belonging to the same county and sector in each period. This reduces our sample size by around a third, and our main coefficient is now 38 basis points. However, the small cell sizes associated with this specification (a third of our baseline sample is missing due to belonging to cells with only one observation) suggests that it may be overly restrictive. In column (5), we address a concern that differences in loan maturity across borrowers may mean that loan spreads are not fully comparable. We control for any potential duration mismatch across loans, by adjusting the loan spreads to the corresponding maturity risk-free EONIA OIS swap rates. This actually increases the size of our main coefficient to 44 basis points. Therefore, if anything the bias that may result from duration mismatch works in the opposite direction. In column (6), we address an issue that came up in our balance test of covariates, where we identified a significant difference between treatment groups with respect to age. To eliminate any potential bias that may arise from stand-alone SMEs being over-represented by younger firms, we drop from our sample firms which are younger than ten years. This increases the size of our main coefficient to 44 basis points. The stability of our coefficient of interest across these alternative specifications, especially in spite of significantly reduced sample sizes, is highly reassuring. Moreover, we have provided the most robust test possible by comparing the spreads of new loans for both groups using the same bank-firm relationships which appear in both periods.

4.5. Alternative Measures of Bank Dependency

We now show that our measure of bank-dependency is robust to alternative specifications. As stated above, we measure bank-dependency as stand-alone SMEs because they are considered more informationally opaque and are less likely to diversify their debt. However, our measure based on firm size and group-affiliation, may be overly general, and it is not certain whether differences in banks' market power is driven by differences in the potential for some firms to access alternative sources of financing, such as bonds or internal capital markets, or, holding these fixed, differences related to the concentration of bank debt. We construct two alternative measures of bank-dependency which focus specifically on the role of debt concentration with a main lender. First, we define a bank-dependent firm as a firm which has a single-bank relationship. Second, we define a bank-dependent firm as a firm that has a main lender, that is a lender which is responsible for over half of the firm's bank debt. Moreover, we interact our dummy for stand-alone SMEs with our post dummy. This ensures that we control for other factors, which may explain differences in the loan spreads between stand-alone SMEs and large and group-affiliated firms. Column (1) of table 6 shows that firms which have a single-bank relationship (treated group) pay 32 basis points more than firms with multiple bank relationships (non-treated group) after the monetary policy decisions. In column (2) we compare the change in spreads between firms with a main lender (treated group) and those without (non-treated group). Given that a sizeable portion of these 'treated' firms have multiple bank relationships, we should expect a lower coefficient as some of borrowers will be in a better position to solicit outside competition, thereby improving their bargaining position when negotiating loan rates. We see that this is the case, our main coefficient of interest is now 16 basis points. Importantly in both of these specification we control for time-varying heterogeneity related to our baseline measure of bank-dependency by interacting the dummy for a stand-alone SME with our post dummy. In columns (3) and (4) we repeat the previous two columns, but here we go one step further, and restrict our sample specifically to stand-alone SMEs. The advantage of this more focused sample is that we are isolating the impact of bank debt-concentration on pass-through for a set of borrowers who do not have access to internal capital markets and are unlikely to have easy access to public capital markets. In both of these specifications, the coefficients change very little. The smaller coefficients for these alternative measures of bank-dependency suggest that the availability of non-bank sources of financing potentially available to larger and group-affiliated firms is an important source of competition in the monetary policy transmission channel.

4.6. Local Market Competition and MP Pass-through

So far our analysis has focused on frictions in bank-firm relationships which we argue ought to affect banks' incentives to pass on changes in their funding costs. However, in the literature the more standard analysis has measured the role of banks' market power on the transmission mechanism based on differences in the level of local bank market concentration. One could argue therefore that if our effect is due to differences in banks' incentives to pass on policy rate changes, then we should expect to find similar effects when using the more standard measure of banks' market power. To measure banks' market power at the local market level, we use the HHI index of market concentration based on each bank's shares of bank branches at the county level. Our inclusion of a bank-time fixed effect means that we are comparing the loan spreads across branches of the same banks located in areas of different market concentration. We see in column (1) of table 7 that the effect of local market competition on pass-through plays an important role. We see that loans issued in counties with levels of local market concentration below the median, are on average 19 basis points less than more concentrated markets after the monetary policy changes. We then examine how this effect varies along the dimensions of our three measures of bank-dependency. To do this we split the samples into two groups for each measure of bank-dependency. Column (2) shows the results for group-affiliated and large firms. Here, we identify an effect of 27 basis points for the role of bank competition on pass-through. Columns (4) and (6) show similar effects, respectively, for firms with multiple bank relationships and firms without a main lender. Column (3) show, however, that the role of local market competition has no effect on the pass-through to stand-alone SMEs. Specifications (5) and (7) confirm these results, respectively, for firms with a single bank relationship and firms with a main lender. In addition in columns (4-7) we also control for time-varying heterogeneity related to firm size and group-affiliation by interacting our dummy for stand-alone SMEs with the post dummy. Our results show that the impact of local bank competition on the transmission channel is fully concentrated in the set of larger, and more diversified, borrowers. For smaller, less diversified borrowers, the informational lock-in effect seems to dominate any benefits that may arise by operating in a more competitive local market. This finding suggests that the role of local market competition on the pass-through of interest rates is conditional on borrowers' ability to solicit outside competition in the first place.

4.7. Loan Supply: Intensive Margin

We now reject an alternative interpretation of our results. Consistent with the theory of 'flight-to-quality' in economic downturns, the increase in spreads for small bank-dependent borrowers may simply reflect an increase in the agency costs of lending to these borrowers (Bernanke and Gertler, 1995; Bernanke, Gertler, and Gilchrist, 1996). Our pricing effect may simply reflect, therefore, a reduced willingness-to-lend to smaller, more opaque, borrowers in response to the economic uncertainty at this time. Evidence for the 'flight-to-quality' hypothesis is usually identified in the cross-section by comparing changes in the allocation of credit between large and small borrowers (Gertler and Gilchrist, 1994; Bernanke, Gertler, and Gilchrist, 1996). Support for this hypothesis would require that stand-alone SMEs should borrow less than larger borrowers in response to the economic downturn. To test this we compare changes in the outstanding credit volumes between year-end of 2007 and of 2009 using bank-firm level data from the French credit registry. Column (1) of table 8 provides the first evidence that rejects this alternative hypothesis. There we see that stand-alone SMEs borrowed relatively more (4.1%) than large and group-affiliated borrowers over this period. In columns (2) and (3) we include firm level controls as well as sector and county fixed effects. This lowers the coefficients to (2.8%). In column (4) we introduce a bank fixed effect so as to control for shocks to banks' balance sheet over this period. However, this does not affect the coefficient and suggests that there is little, if any, heterogeneity across banks in their loan supply to large and small borrowers at this time. However, it is possible that by taking the log difference of total credit committed, we are being overly restrictive by excluding bank-firm relationships which are terminated in the post period. If for example, smaller firms were not able to renew loans with their lenders, this may imply a credit commitment of zero in the post period. To account for the possibility of an upward bias in our main coefficient due to potential the credit rationing of smaller borrowers, we replace our dependent variable using the growth rate of total commitment between year-end of 2007 and of 2009. Column (5) shows that using this growth rate actually increases the coefficient to (6.7%). The larger effect suggests that it is rather group-affiliated and larger firms who are more likely to terminate pre-existing bank relationships over this period. Overall, the combination of a relative increase in spreads and a relative increase in quantities is not consistent with a 'pure' supply effect where higher spreads reflect a reduced willingness-to-lend by banks to smaller borrowers. However, it is consistent with banks' ability to exploit their market power by increasing their spreads to their borrowers who can least substitute their financing.

4.8. Loan Supply: Outside Lenders

However, the latter analysis only examines changes in the loan supply of banks to borrowers which have pre-existing relationships prior to 2008. It may be possible that smaller, more opaque, borrowers found it more difficult to establish new relationships over this period. We first check, using a firm-level linear probability model, the change in the likelihood that stand-alone SMEs establish a new bank relationship over our sample period. We use the same twelve quarters that we use in our baseline loan spread sample. Column (1) of table 9 shows that stand-alone SMEs are on average less likely to establish new bank relationships, thus confirming our justification for using this group of borrowers to measure banks' information monopoly. However, we see that this probability does change across our event windows, such that stand-alone SMEs are on average less likely to establish new bank relationships by 1.5%. Column (2) shows that this reduction is 2% when using the firm fixed effect.

However, this finding gives rise to an alternative interpretation of our results. For example, Santos and Winton (2008) find that bank-dependent firms pay 22 basis points more than firms with access to public debt markets, in recessions compared to normal times. They claim that the increase in the value of banks' private information during recessions is consistent with the story that banks can extract rents from their 'locked-in' borrowers. It may the case then that informed inside lenders are able to increase their mark-up due to a reduced loan supply of less informed outside lenders to smaller, more opaque, borrowers. If this is so, it would not be clear whether banks' ability to increase their mark-up to smaller borrowers is due to: reductions in their marginal (funding) costs due to monetary policy stimulus; or to an increase in their information monopoly due a reduced loan supply by less informed (outside) lenders to smaller, more opaque, borrowers. To test for this competing hypothesis, we make the following conjecture: if our effect is driven by an increase in banks' informational monopoly for smaller borrowers, then we should observe that relative to larger borrowers, smaller borrowers have a lower probability to substitute their financing with outside (non-main) lenders in the post-period relative to the pre-period. However, the above analysis using firm level regressions is not sufficient to isolate the loan supply of outside lenders. To isolate movement in the loan supply of outside lenders, two identification challenges need to be met. First, if we include firms which do not obtain a loan at a given date we cannot be sure if the firm could not obtain a new loan or did not need a new loan. We follow Becker and Ivashina (2014) and limit our sample to incidences of new debt issuances, so to ensure that all firms in our sample have a non-zero demand for credit.[13] Second, the probability to switch lender also depends on the loan supply of each firm's main lender. We augment therefore the previous firm level regressions with the identity of each firm's main bank at time t-1. By taking the main bank-time fixed effect, we are ensuring that the probability to switch lenders across different borrowers is not due to shocks to the loan supply of each firm's main lender. These two restrictions allow us to interpret the substitution from loans with a main lender to an outside lender as evidence of a shift in the loan supply curve of outside lenders to stand-alone SMEs.

Column (3) of table 9 first shows that stand-alone borrowers are on average less likely to switch their funding source away from a main lender relative to larger borrowers. However,

[13]Becker and Ivashina (2014) isolate variation in banks' loan supply by estimating the probability of a firm switching between bank financing and bond financing. Crucial to their set-up is that this probability is conditional on firms having a non-zero demand for credit.

unlike the above estimation based on a firm's probability to establish a new relationship in columns (1) and (2), the probability to switch lender does not change over this period. Column (4) which is our preferred specification employs the within-firm estimator and shows that the probability to switch lender across firms is constant over time. These findings, that ex-ante smaller borrowers are less likely to switch their funding with less informed (outside) lenders, and this does not change over time, suggest that our baseline effect cannot be explained by a reduced willingness-to-lend by less informed outside lenders to stand-alone SMEs over our sample period.

4.9. *French Banks' Risk-pricing over our Sample Period*

We now address a potential concern that the timing of the monetary policy decisions coincide with a structural break in French banks' pricing of credit risk in response to the Lehman Brothers' default. We make the following conjecture, if the increase in loan spreads for smaller firms is due to a shock to French banks' pricing of credit risk, we should expect to identify a similar effect when assigning 'treatment' by firms' credit ratings.

To test this we extend our sample to include speculative-grade firms, and compare the changes in the loan spreads of speculative-grade firms with those of investment-grade firms. Column (1) of table 10 shows that the risk premium does increase for speculative-grade firms relative to investment-grade firms over our event windows, but only by 12 basis points. However, it is not clear whether this effect is driven by variation in the default risk of speculative grade firms, or variation in banks' pricing of that default risk. To disentangle these competing mechanisms we introduce a measure of expected loss so as to control for variation in default risk. This allows us to identify therefore a change in the excess risk premium, the correct measure of banks' pricing of default risk. We measure expected loss as the previous years' default rate for each credit rating times the loss given default estimated at 35%. We then use this measure in two ways. In column (2) we include the measure of expected loss as a control variable. Our main coefficient of interest can now be interpreted as the change in the excess (risk) premium, that is, the component of the risk premium which is not due to expected default risk. The results show that when controlling for expected loss there is no change in the risk premium across risk categories over our sample period. In addition, the coefficient for our measure of expected loss is 54 basis points and highly significant. In column (3) we provide an alternative way of estimating changes in the excess (risk) premium by adjusting the dependent variable (loan spread) for expected loss. Again we see no significant change in the excess (risk) premium across borrowers of different credit risk over our sample period.[14] Figure 6 shows the unconditional averages of the risk-adjusted spreads for both groups, and shows that the difference between both groups is constant through time. The evidence suggests that variation in the risk premium across firms, in our sample, is largely explained by variation in observable default risk. It is highly unlikely therefore that our baseline effect is due to a structural break in French banks' pricing of credit risk at this time.

[14]Our estimation of LGD at 35% is based on historical values of LGDs for French NFCs contained in several annual reports of French banks. For column (2), the value of LGD only affects the size of the coefficient of EL, but has no impact on the coefficient of interest. However, for column 3, since LGD plays a role on the left-hand side, it does impact the coefficient of interest. For example, if we use the Basle standard measure of 45% we would in fact see that the excess risk premium actually decreases for riskier firms.

This result is also reassuring with respect to our decision to focus on investment-grade firms. The identifying assumption that we made is that by controlling for the credit risk premium of firms, variation in loan spreads must be due to variation in banks' mark-up. However, in order for this assumption to be valid it must be the case that these ratings are reliable and informative about French banks' perception of credit risk, which these results show is the case.

5. Conclusion

Previous work has shown that banks market power impacts the transmission channel of monetary policy. However, this evidence has been limited to using bank-level data and therefore is silent on how frictions within bank-borrower relationships affect the transmission process. Other work has shown that banks' private information over their borrowers acts as a source of monopoly power. Our main contribution is to bridge these fields by using the necessary bank-firm-loan level data to identify how differences in the relative bargaining power in bank-firm relationships affect monetary policy pass-through. In doing so we also help rationalise recent evidence showing increases in loan spreads in Europe during the recent crisis. Our paper shows that following the ECB's monetary easing of some 375 basis points, the loan spreads of small bank-dependent (investment-grade) firms increased by 42 basis points more than they did for (less bank-dependent) group-affiliated and large firms. Our results are highly statistically and economically significant and are robust to a wide range of specifications such as comparing the loan rates for the same bank-firm relationship across both periods.

The next important question is how important quantitatively is this for aggregate economic activity? While there is a general consensus that monetary policy changes have a disproportionate impact on the financing (premium) of small bank-dependent borrowers, either due to changes in the overall supply of credit (Kashyap and Stein, 2000), or changes in the allocation of credit (Bernanke and Gertler, 1995; Bernanke, Gertler, and Gilchrist, 1996), generally missing from this literature, is the role of bank incentives to pass on changes in monetary policy rates to their most bank-dependent borrowers. Frictions related to bargaining power may introduce a potential asymmetry into the monetary policy transmission mechanism such that the financing costs of small bank-dependent firms are most sensitive to monetary policy tightening (net-worth channel) but least sensitive to monetary policy stimulus (mark-up channel). Recent studies on the redistribution channels of monetary policy suggest that monetary policy is most effective when it benefits most those whose spending decisions reacts most strongly to changes in their net-worth. Arguably, we could think that small bank-dependent borrower's marginal propensity to invest might be more sensitive to changes in their interest burden than larger borrowers. However, we stop short on making such an argument. While the transmission of interest rates is a crucial component in the transmission of monetary policy, the availability of credit is arguably just as important. Any welfare analysis must confront the difficulty in evaluating the costs of a reduced bargaining ability, with the benefits of a stable access to credit that lending relationships provide.

References

Agarwal, Sumit, Souphala Chomsisengphet, Neale Mahoney, and Johannes Stroebel (2018), Do Banks Pass through Credit Expansions to Consumers Who want to Borrow?, *The Quarterly Journal of Economics* 133.1, 129–190.

Altavilla, Carlo, Fabio Canova, and Matteo Ciccarelli (2016), Mending the broken link: heterogeneous bank lending and monetary policy pass-through, Working Paper Series, European Central Bank.

Becker, Bo and Victoria Ivashina (2014), Cyclicality of credit supply: Firm level evidence, *Journal of Monetary Economics* 62.C, 76–93.

Beraja, Martin, Andreas Fuster, Erik Hurst, and Joseph Vavra (2018), Regional Heterogeneity and the Refinancing Channel of Monetary Policy, *The Quarterly Journal of Economics*.

Berger, Allen N. and Gregory F. Udell (2002), Small Business Credit Availability And Relationship Lending: The Importance Of Bank Organisational Structure, *The Economic Journal* 112.477, F32–F53.

Bernanke, Ben, Mark Gertler, and Simon Gilchrist (1996), The Financial Accelerator and the Flight to Quality, *The Review of Economics and Statistics* 78.1, 1–15.

Bernanke, Ben S. and Mark Gertler (1989), Agency cost, net worth and business fluctuations, *American Economic Review* 79, 14–31.

Bernanke, Ben S. and Mark Gertler (1995), Inside the Black Box: The Credit Channel of Monetary Policy Transmission, *The Journal of Economic Perspectives* 9.4, 27–48.

Cahn, Christophe, Mattia Girotti, and Federica Salvade (2018), External Credit Ratings and Bank Lending, Working papers, Banque de France.

Di Maggio, Marco, Amir Kermani, Benjamin J. Keys, Tomasz Piskorski, Rodney Ramcharan, Amit Seru, and Vincent Yao (2017), Interest Rate Pass-Through: Mortgage Rates, Household Consumption, and Voluntary Deleveraging, *American Economic Review* 107.11, 3550–88.

Diamond, Douglas W. (1984), Financial Intermediation and Delegated Monitoring, *The Review of Economic Studies* 51.3, 393–414, ISSN: 00346527, 1467937X.

Diamond, Douglas W. (1991), Monitoring and Reputation: The Choice between Bank Loans and Directly Placed Debt, *Journal of Political Economy* 99.4, 689–721.

Drechsler, Itamar, Alexi Savov, and Philipp Schnabl (2017), The Deposits Channel of Monetary Policy, *The Quarterly Journal of Economics* 132.4, 1819–1876.

Duffie, D. and K. Singleton (2003), *Credit Risk: Pricing, Measurement, and Management*, Princeton University Press.

Gambacorta, Leonardo, Anamaria Illes, and Marco Jacopo Lombardi (2015), Has the Transmission of Policy Rates to Lending Rates Changed in the Wake of the Global Financial Crisis?, *International Finance* 18.3, 263–280.

Gertler, Mark and Simon Gilchrist (1994), The Rigidity of Prices: Evidence from the Banking Industry, *The American Economic Review* 109.2, 309–340.

Hale, Galina and Joao A.C. Santos (2009), Do banks price their informational monopoly?, *Journal of Financial Economics* 93.2, 185 –206.

Hannan, Timothy H. and Allen N. Berger (1991), The Rigidity of Prices: Evidence from the Banking Industry, *The American Economic Review* 81.4, 938–945.

Holmstrom, Bengt and Jean Tirole (1997), Financial Intermediation, Loanable Funds, and The Real Sector, *The Quarterly Journal of Economics* 112.3, 663–691.

Imbens, Guido M. and Jeffrey M. Wooldridge (Aug. 2008), Recent Developments in the Econometrics of Program Evaluation, NBER Working Papers 14251, National Bureau of Economic Research, Inc.

Kashyap, Anil K. and Jeremy C. Stein (2000), What Do a Million Observations on Banks Say about the Transmission of Monetary Policy?, *American Economic Review* 90.3, 407–428.

Mésonnier, Jean-Stéphane, Charles O'Donnell, and Olivier Toutain (2017), The Interest of Being Eligible, Working papers, Banque de France.

Mester, Loretta and Anthony Saunders (1995), When does the prime rate change?, *Journal of Banking Finance* 19.5, 743–764.

Mojon, Benoit (Nov. 2000), Financial structure and the interest rate channel of ECB monetary policy, Working Paper Series, European Central Bank.

Neumark, David and Steven A. Sharpe (1992), Market Structure and the Nature of Price Rigidity: Evidence from the Market for Consumer Deposits, *The Quarterly Journal of Economics* 107.2, 657–680.

Ongena, Steven and David C. Smith (2000), What Determines the Number of Bank Relationships? Cross-Country Evidence, *Journal of Financial Intermediation* 9.1, 26–56.

Pagano, Marco, Fabio Panetta, and Luigi Zingales (2002), Why Do Companies Go Public? An Empirical Analysis, *The Journal of Finance* 53.1, 27–64.

Rajan, Raghuram G. (1992), Insiders and Outsiders: The Choice between Informed and Arm's-Length Debt, *The Journal of Finance* 47.4, 1367–1400.

Santos, Joao A. C. and Andrew Winton (2008), Bank Loans, Bonds, and Information Monopolies across the Business Cycle, *The Journal of Finance* 63.3, 1315–1359.

Saunders, Anthony and Sascha Steffen (2011), The Costs of Being Private: Evidence from the Loan Market, *The Review of Financial Studies* 24.12, 4091–4122.

Schenone, Carola (2010), Lending Relationships and Information Rents: Do Banks Exploit Their Information Advantages?, *The Review of Financial Studies* 23.3, 1149–1199.

Sharpe, Steven A. (1990), Asymmetric Information, Bank Lending, and Implicit Contracts: A Stylized Model of Customer Relationships, *The Journal of Finance* 45.4, 1069–1087.

Van Leuvensteijn, Michiel, Christoffer Kok, Jacob Bikker, and Adrian Rixtel (2013), Impact of bank competition on the interest rate pass-through in the euro area, *Applied Economics* 45.11, 1359–1380.

TABLE 1. Variable Definitions

Variable	Definiton
Dependent	
SPREAD	Loan spread over Eonia at the time of origination.
d_COMMITMENT	the log difference of total credit committed (drawn and undrawn)
Loan	
MATURITY	Duration of the loan measured in years with decimaalised for maturities belows one year.
FIXED	Dummy variable equal to one if the loan has a fixed rate.
Firm	
DEPEND	Dummy variable equal to one if a firm is a stand-alone SME.
TOTAL_ASSETS	Natural log of the total assets of the firm.
AGE	Natural log of firm age + 1.
LEVERAGE	Total debt over total assets.
QUICK	Current assets minus stocks over current liabilities.
LIQUIDITY	Dummy variable equal to one if QUICK is above sector median for each period.
TANGIBLE	Property, plant, and equipment plus inventories over assets.
PROFIT	Profitability measure using the ratio of EBIDTA to SALES.
Bank Dependency	
DEPEND	Dummy variable equal to one if a firm is a standalone SME.
MAIN	Dummy variable equal to one if a firm has a main lender (more than half of its total bank debt)
SINGLE	Dummy variable equal to one if a firm has only one bank relationship.

Note: All continuous explanatory variables are winsorized at 1st and 99th percentile for each period. The only exception is LEVERAGE which is capped at 1. We crop observations at the 1st and 99th percentile in each period for SPREAD. We crop observations at the 2.5 and 97.5 percentile in each period for d_COMMITMENT.

TABLE 2. Summary statistics for key loan and borrower characteristics

	Count	Mean	SD	P1	P25	P50	P75	P99
Panel A: Loan Characteristics								
SPREAD	23134	1.88	1.60	-0.36	0.79	1.50	2.62	8.92
MATURITY	23134	2.67	2.84	0.00	0.10	2.00	4.00	13.00
FIXED	23134	0.51	0.50	0.00	0.00	1.00	1.00	1.00
Panel B: Borrower Characteristics								
FIXED	23120	0.51	0.50	0.00	0.00	1.00	1.00	1.00
LEVERAGE	23120	0.59	0.17	0.16	0.48	0.61	0.72	0.94
TANGIBLE	23120	0.16	0.18	0.00	0.04	0.10	0.22	0.89
LIQUIDITY	23120	0.50	0.50	0.00	0.00	0.00	1.00	1.00
PROFIT	23120	0.11	0.14	-0.18	0.04	0.07	0.13	0.73
GROWTH	23120	0.06	0.18	-0.46	-0.01	0.05	0.12	0.74
AGE	23120	3.05	0.70	1.39	2.64	3.04	3.47	4.73

Note: This table presents descriptive statistics for the variables used in our main analyses.

TABLE 3. Balancing test of observable loan- and firm-level covariates

	Stand-alone SME Mean	Stand-alone SME SD	Large/Grp. Affil. Mean	Large/Grp. Affil. SD	Normalised Difference
MATURITY	2.907	2.643	2.522	2.948	.097
FIXED	.589	.491	.468	.499	.172
LEVERAGE	.589	.155	.594	.177	-.021
TANGIBLE	.157	.142	.169	.205	-.048
LIQUIDITY	.562	.496	.461	.498	.143
PROFIT	.093	.086	.112	.160	-.103
GROWTH	.059	.167	.061	.186	-.008
AGE	2.874	.624	3.150	.727	-.287

Note: This table tests for the balancing of covariates by calculating the normalized difference between treatment groups for each of the main covariates we use in our baseline specification. The normalized difference is the difference between treatment groups in the mean values for each covariate normalized by the square root of the sum of the corresponding variances. Imbens and Wooldridge (2008) argue that the normalized difference should be preferred to the t-statistic to test the balancing of covariates. As a rule of thumb, the authors suggest that a normalized difference smaller than 0.25 should not raise concerns about the covariate being imbalanced.

TABLE 4. The Impact of Banks' Information Monopoly on Monetary Policy Pass-through

	(1)	(2)	(3)	(4)	(5)	(6)
DEPEND	0.353***	0.365***	0.036	0.074	0.071	0.105**
	(0.063)	(0.050)	(0.068)	(0.046)	(0.046)	(0.040)
POST	0.879***					
	(0.176)					
DEPEND_POST	0.880***	0.710***	0.705***	0.553***	0.551***	0.426***
	(0.181)	(0.129)	(0.122)	(0.087)	(0.085)	(0.075)
MATURITY		0.056***	0.052***	0.046***	0.047***	0.037***
		(0.018)	(0.016)	(0.014)	(0.014)	(0.013)
FIXED		0.014	-0.000	-0.030	-0.026	0.077
		(0.129)	(0.113)	(0.105)	(0.105)	(0.135)
LEVERAGE			0.140	0.171*	0.045	0.052
			(0.088)	(0.090)	(0.095)	(0.098)
TANGIBLE			-0.412***	-0.075	-0.085	-0.031
			(0.108)	(0.058)	(0.058)	(0.052)
LIQUIDITY			-0.103**	-0.064*	-0.046	-0.050
			(0.049)	(0.037)	(0.036)	(0.036)
PROFIT			-0.053	-0.228**	-0.160*	-0.143
			(0.105)	(0.098)	(0.092)	(0.087)
GROWTH			0.083	0.084	0.103	0.014
			(0.079)	(0.077)	(0.077)	(0.063)
AGE			-0.095***	-0.094***	-0.084***	-0.072***
			(0.020)	(0.024)	(0.023)	(0.022)
Purpose_Post	No	Yes	Yes	Yes	Yes	Yes
Loan_Size	No	Yes	Yes	Yes	Yes	Yes
Sector_Post	No	No	No	Yes	Yes	Yes
County_Post	No	No	No	Yes	Yes	Yes
Rating_Post	No	No	No	No	Yes	Yes
Bank_Quarter	No	No	No	No	No	Yes
Observations	23134	23134	23120	23116	23116	23092
Adj. R^2	0.210	0.343	0.377	0.412	0.415	0.452

Note: The dependent variable is SPREAD. See Table 1 for variable defininitions. DEPEND_POST is a direct measure of the role of banks' superior bargaining position with smaller borrowers on the transmission of monetary policy to loan spreads. Values in parantheses are robust standard errors and are double clustered at the bank-period and 2-digit sector level. ***, **, * indicate significance of the estimated coefficients at the 1%, 5% and 10% levels, respectively.

TABLE 5. Robustness

	(1)	(2)	(3)	(4)	(5)	(6)
DEPEND	0.295***			0.324***	0.098***	0.085***
	(0.032)			(0.039)	(0.027)	(0.024)
DEPEND_POST	0.431***	0.412***	0.414***	0.379***	0.443***	0.440***
	(0.047)	(0.111)	(0.118)	(0.072)	(0.044)	(0.053)
Loan Controls	No	Yes	Yes	Yes	Yes	Yes
Firm Controls	No	Yes	Yes	Yes	Yes	Yes
Purpose_Post	Yes	Yes	Yes	Yes	Yes	Yes
Sector_Q	Yes	Yes	Yes	No	Yes	Yes
County_Q	Yes	Yes	Yes	No	Yes	Yes
Bank_Q	Yes	Yes	Yes	Yes	Yes	Yes
Rating_Q	Yes	Yes	Yes	Yes	Yes	Yes
Firm	No	Yes	Yes	No	No	No
Sector_County_Q	No	No	No	Yes	No	No
Observations	23092	13890	5921	16782	23092	19442
Adj. R^2	0.436	0.715	0.753	0.471	0.428	0.452

Note: The dependent variable in all columns is SPREAD with the exception of Column (5) which adjusts spreads to the corresponding maturity EONIA OIS (risk-free) rate. Column (1) repeats our baseline result. Column (2) introduces a firm fixed-effect. Column (3) restricts the sample to the bank-firm relationships which appear in both periods, taking the firm fixed effect. Column (4) further controls for firm demand by estimating a sector-county-time fixed effect. Column (5) adjusts the loan spread for duration mismatch by taking the spread over the corresponding maturity risk-free rate. Column (6) restricts our sample to firms which are ten years or older. Values in parantheses are robust standard errors and are double clustered at the bank-period and 2-digit sector level. ***, **, * indicate significance of the estimated coefficients at the 1%, 5% and 10% levels, respectively.

TABLE 6. Alternative Measures of Bank Dependency

	(1)	(2)	(3)	(4)
SINGLE	-0.052		0.050	
	(0.037)		(0.050)	
SINGLE_POST	0.318***		0.275***	
	(0.070)		(0.080)	
MAIN		-0.026		0.067
		(0.023)		(0.044)
MAIN_POST		0.165**		0.175***
		(0.069)		(0.064)
Loan Controls	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes
Sector_Post	Yes	Yes	Yes	Yes
County_Post	Yes	Yes	Yes	Yes
Bank_Q	Yes	Yes	Yes	Yes
Rating_Post	Yes	Yes	Yes	Yes
Depend_Post	Yes	Yes	Yes	Yes
Observations	21999	21999	8016	8016
Adj. R^2	0.451	0.449	0.522	0.521

Note: The dependent variable in all columns is SPREAD. Column (1) SINGLE is a dummy variable equal to one if a firm has only one bank relationship. Column (2) MAIN is a dummy variable equal to one if a firm has a main lender, that is a lender which is responsible for over half of the firm's bank debt. Columns (3) and (4) repeat the first two columns but restricting the sample to stand-alone SMEs. Values in parantheses are robust standard errors and are double clustered at the bank-period and 2-digit sector level. ***, **, * indicate significance of the estimated coefficients at the 1%, 5% and 10% levels, respectively.

TABLE 7. The Role of Local Market Bank Competition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
COMP_post	-0.195**	-0.270***	0.034	-0.219**	-0.021	-0.218**	-0.120
	(0.092)	(0.066)	(0.095)	(0.086)	(0.148)	(0.083)	(0.102)
Loan Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector_Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rating_Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank_Q	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Depend_Post	No	No	No	Yes	Yes	Yes	Yes
Observations	22753	14179	8495	16784	4815	8373	13246
Adj. R^2	0.383	0.363	0.431	0.375	0.457	0.383	0.404

Note: COMP takes a value of 1 if a bank branch operates in a county below the median value of the HHI for local market concentration. The HHI is calcuated using the bank shares of branches in each county. Column (1) shows the difference of pass-through by local market competition. The negative coefficient on COMP_post shows that pass-through is stronger in less concentrated credit markets. Column (2) shows the result for large and group-affiliated borrowers. Column (3) shows the result for standalone SMEs. Column (4) shows the result for firms with multiple bank relationships. Column (5) shows the result for firms with a single bank relationship. Column (6) shows the result for firms without a main lender. Column (7) shows the result for firms with a main lender. Values in parantheses are robust standard errors and are double clustered at the bank-period and 2-Digit Sector level. ***, **, * indicate significance of the estimated coefficients at the 1%, 5% and 10% levels, respectively.

TABLE 8. Changes in Credit Supply at the Intensive Margin

	(1)	(2)	(3)	(4)	(5)
DEPEND	0.041***	0.038***	0.029**	0.028**	0.068***
	(0.014)	(0.013)	(0.012)	(0.012)	(0.005)
LEVERAGE		0.028	-0.001	-0.008	-0.022
		(0.039)	(0.033)	(0.029)	(0.022)
LIQUIDITY		-0.007	-0.020*	-0.020*	-0.051***
		(0.013)	(0.011)	(0.011)	(0.008)
TANGIBLE		0.049	-0.010	-0.028	0.078***
		(0.033)	(0.034)	(0.035)	(0.014)
PROFIT		-0.185***	-0.202***	-0.204***	-0.073***
		(0.026)	(0.029)	(0.032)	(0.013)
GROWTH		0.151***	0.145***	0.154***	0.020**
		(0.027)	(0.024)	(0.023)	(0.008)
AGE		0.031**	0.029**	0.029**	0.018***
		(0.013)	(0.012)	(0.012)	(0.007)
County	No	No	Yes	Yes	Yes
Sector	No	No	Yes	Yes	Yes
Rating	No	No	Yes	Yes	Yes
Bank	No	No	No	Yes	Yes
Observations	47593	46236	45943	45942	131885
Adj. R^2	0.001	0.004	0.010	0.017	0.025

Note: The dependent variable in columns (1-4) is the log difference of total credit commitment (drawn and undrawn) between 2007m12 and 2009m12 and measures changes in the credit allocation across borrowers over this period. The dependent variable in columns (5) is the growth rate of credit. This allows for the identification of any terminations of bank-firm relationships which may due to credit rationing of smaller borrowers. The coefficient of interest in all columns is DEPEND and estimates the change in credit allocation at the intensive margin for stand-alone SMEs relative to larger borrowers. A negative sign would suggest that banks were less willing to lend to smaller borrower in response to the economic situation and could be interpreted as evidence for a 'flight-to-quality' effect. Values in parantheses are robust standard errors and are clustered at the bank and sector level. ***, **, * indicate significance of the estimated coefficients at the 1%, 5% and 10% levels, respectively.

TABLE 9. Probability to Establish New Relationship and Switch Lender

	(1) NEW_REL	(2) NEW_REL	(3) SWITCH	(4) SWITCH
DEPEND	-0.080***		-0.137***	
	(0.010)		(0.015)	
DEPEND_POST	-0.015***	-0.021***	-0.009	0.006
	(0.002)	(0.003)	(0.020)	(0.008)
LEVERAGE	-0.019	-0.275***	0.181***	0.182***
	(0.019)	(0.022)	(0.037)	(0.034)
LIQUIDITY	-0.014**	-0.012***	-0.019**	0.009*
	(0.006)	(0.002)	(0.009)	(0.005)
TANGIBLE	-0.182***	-0.234***	0.111***	0.088***
	(0.038)	(0.014)	(0.037)	(0.025)
PROFIT	-0.078***	0.030	-0.039**	-0.003
	(0.020)	(0.020)	(0.017)	(0.024)
GROWTH	0.031***	0.001	0.064***	0.002
	(0.010)	(0.006)	(0.014)	(0.006)
AGE	0.010**	-0.262***	0.058***	0.203***
	(0.004)	(0.023)	(0.005)	(0.057)
Depart_Post	Yes	Yes	Yes	Yes
Sector_Post	Yes	Yes	Yes	Yes
Rating_Post	Yes	Yes	Yes	Yes
Quarter	Yes	Yes	Yes	Yes
Main_Bank_Q	No	No	Yes	Yes
Firm	No	Yes	No	Yes
Observations	671811	658921	151860	128308
Adj. R^2	0.072	0.400	0.093	0.723

Note: The dependent variable of the firm level regressions in columns (1) and (2) is a binary variable taking the value of 1 if a firm establishes a new bank relationship at time t. The dependent variable of the bank-firm level regressions in columns (3) and (4) is a binary variable taking the value of 1 if a firm switches its borrowing to a non-main (outside) lender at time t, or zero if it obtains a new loan only from its main lender. The switching model restricts therefore the sample to firms with a positive loan demand (obtain a new loan) and those with a main lender. A main lender is defined as a lender who is responsible for over a half of the firm's total bank debt at t-1. The main coefficient of interest in all columns is the interaction term DEPEND_POST. In columns (3) and (4) it can be interpreted as the change in the willingness-to-lend of less informed outside lenders to lend to stand-alone SMEs relative to larger firms over the sample period. Column (3) includes the main bank-time fixed effect so to control for shocks to loan supply of the main lender which may induce borrowers to switch lender and restricts the sample to incidence of positive loan demand. Column (4) employs the within-firm estimator and is our preferred estimate for our switching model and provides a direct measure of the change in the loan supply of less informed (oustide) lenders to stand-alone SMEs relative to larger borrowers over our sample period. Values in parantheses are robust standard errors and are clustered at the sector level for columns (1) and (2) and are double clustered at the bank-period and sector level in columns (3) and (4). ***, **, * indicate significance of the estimated coefficients at the 1%, 5% and 10% levels, respectively.

TABLE 10. Isolating Variation in the Excess Risk Premium in France: speculative-grade versus investment-grade firms

	(1)	(2)	(3)
SPEC_POST	0.125**	0.041	-0.031
	(0.058)	(0.063)	(0.057)
Expected Loss		0.540***	
		(0.109)	
Loan Controls	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes
Credit Rating	Yes	Yes	Yes
Sector_Post	Yes	Yes	Yes
County_Post	Yes	Yes	Yes
Bank_Quarter	Yes	Yes	Yes
Depend_Post	Yes	Yes	Yes
Observations	47046	47046	47046
Adj. R^2	0.438	0.438	0.415

Note: The dependent variable in Columns (1) and (2) is SPREAD. SPEC_Post is the change in the risk premium for specualtive-grade firms relative to investment grade firms over our event windows. Expected loss is defined using the Basle crieteria [EL = Loss Given Default(LGD)*Default probability (DP)]. We estimate LGD as 35% and DP as the previous year's rate of default for each credit rating. Column (3) uses the risk-adjusted spread as the dependent variable. This is the spread minus expected loss. The coefficient in columns (2) and (3) for SPEC_POST can be interpeted as the change in the excess risk premium (part of risk premium not attributable to expected default) for speculative-grade firms relative to investment-grade firms over our event windows. Values in parantheses are robust standard errors and are double clustered at the bank-period and 2-digit sector level. ***, **, * indicate significance of the estimated coefficients at the 1%, 5% and 10% levels, respectively.

FIGURE 1. Credit Rating Transitions

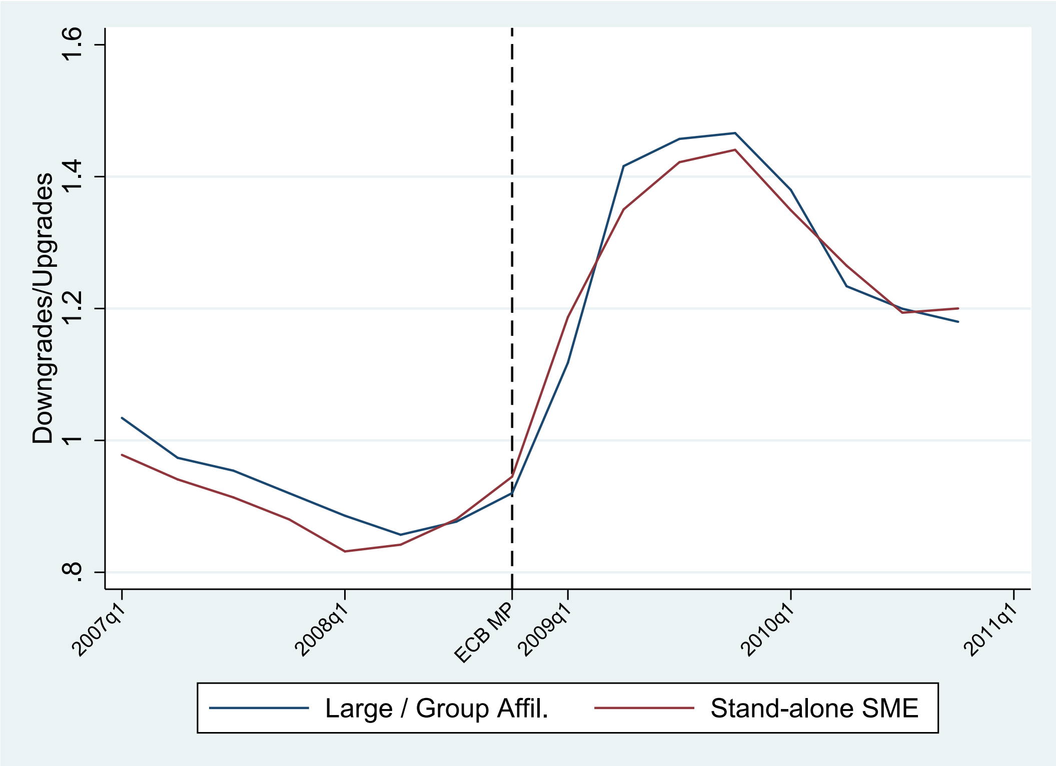
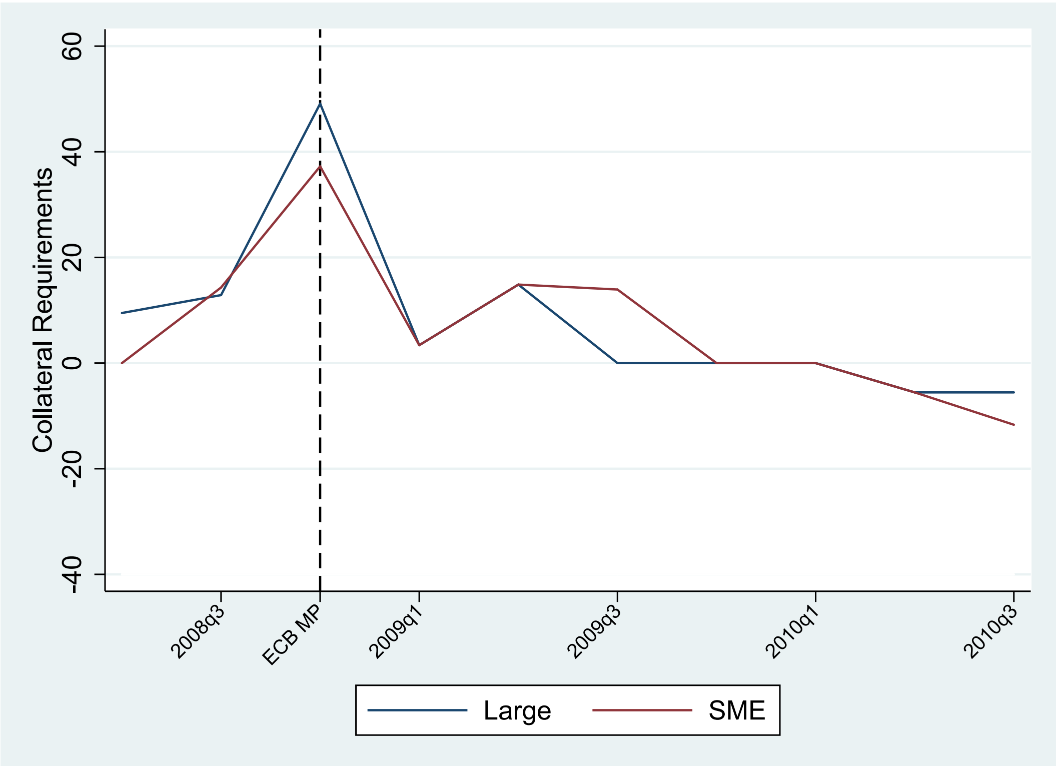


FIGURE 2. Collateral Requirement Net Tightening (BLS)



Note: The first graph shows the ratio of downgrades-to-upgrades, using a four quarter moving average. We take this measure from Duffie and Singleton (2003) (who actually use upgrades-to-downgrades). We use all Frencg firms with a Banque de France credit rating who appear in the Banque de France credit register. The bottom graph reports French banks average responses to the Bank Lending Survey. The values indicate how French banks have tightened their collateral requirements across SME and Large borrowers. The later starting date of this time-series is because the BLS only started collecting information on borrower types in 2008.

FIGURE 3. Monetary Policy and Bank Lending Rates

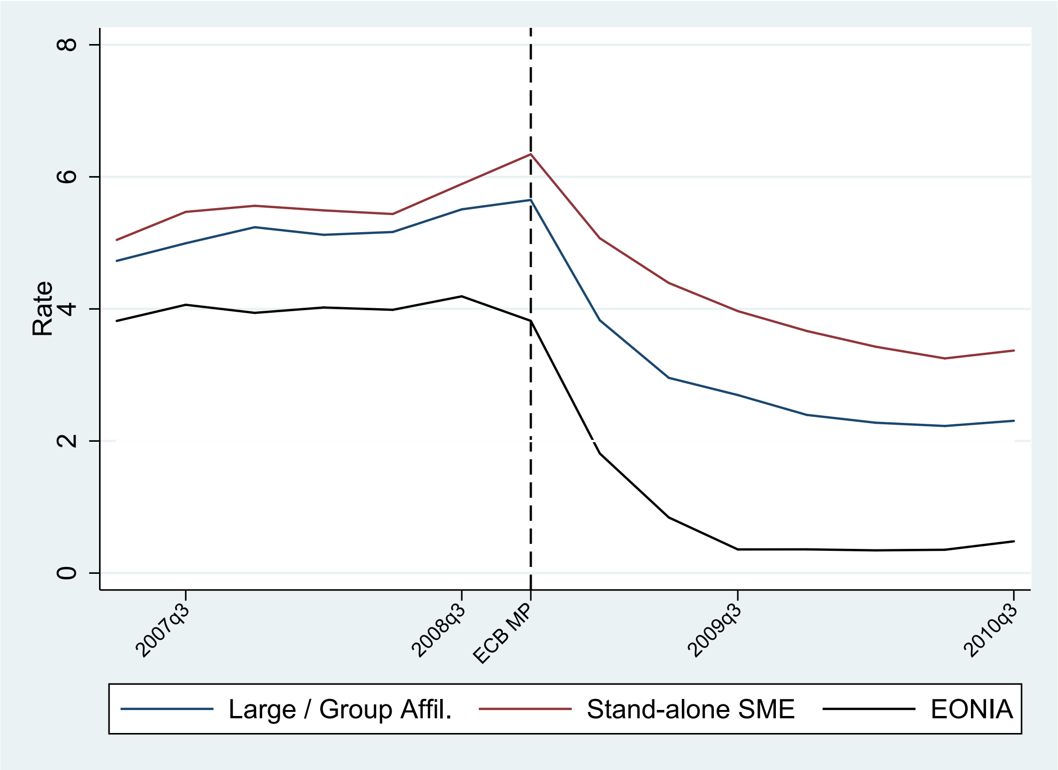
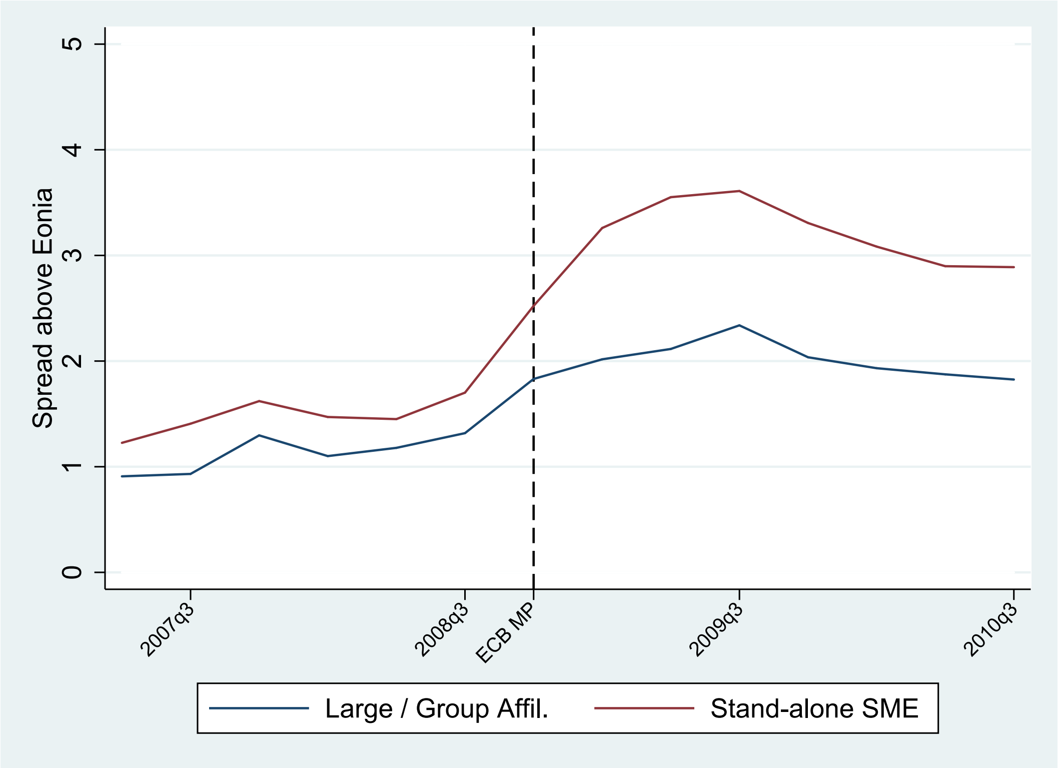


FIGURE 4. Parallel Trends Assumption not Violated



Note: These graphs show the spreads and interest rates for new loans issued in France over this period. The sample corresponds to the sample that we use for our empirical analysis. We see that the parallel trends assumption in the pre-period is well supported. We include the Eonia rate as our measure of the monetary policy stance.

FIGURE 5. Loan Spreads across Risk Categories

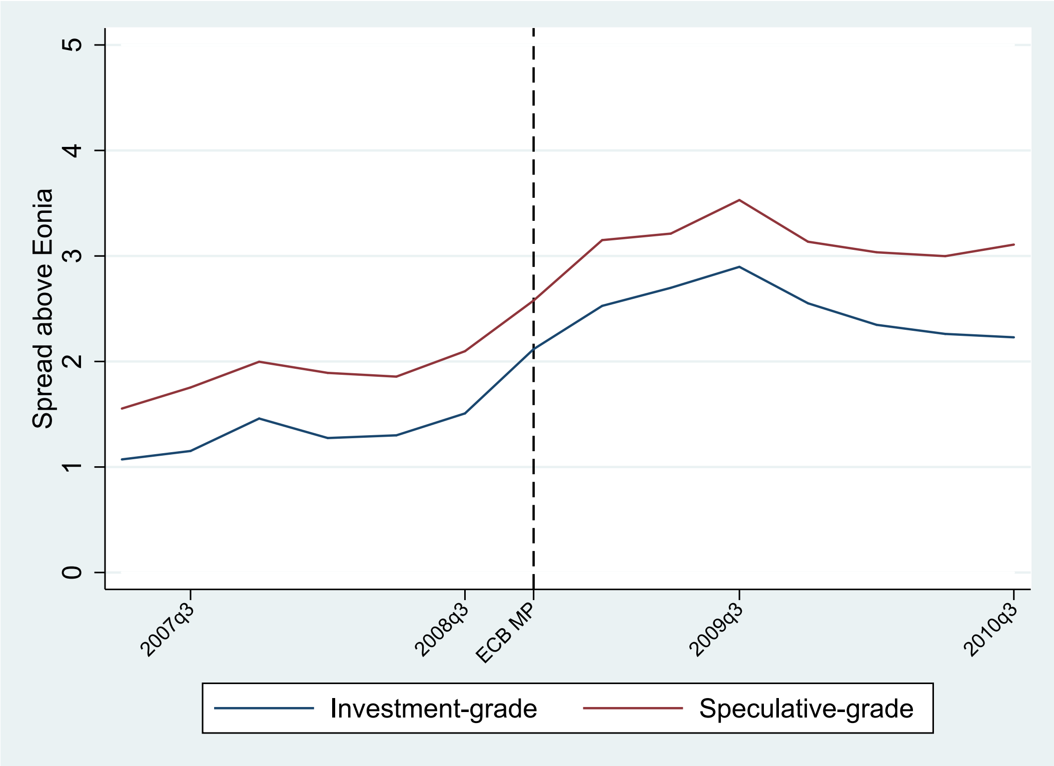
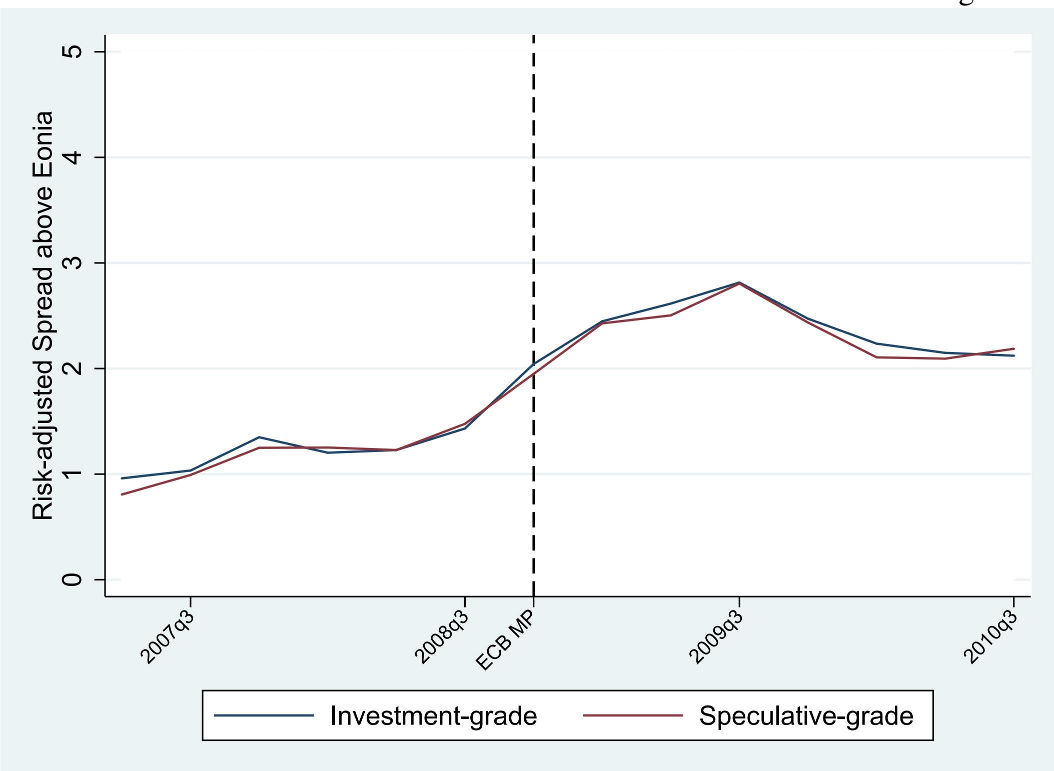


FIGURE 6. No Variation in the 'Excess Risk Premium' across Risk Categories



Note: These graphs show the spreads on new loans issued in France over our period by firms credit rating. The sample corresponds to the sample that we use for our empirical analysis, but now includes specualtive grade firms. The bottom graph adjusts the loan spread for expected loss. We compute expected loss as the previous years default rate (DP) for a given credit rating class times the loss given default (LGD) estimated at 35%. The puropose of these graphs is to show that there seems to be no signifcant shift in banks' risk-pricing across firms of different risk classes. These graphs do not rule out however that French banks did not ration riskier borrowers or increase the non-price terms of their loan contracts.