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The Effects of Bank Market Power in Short-Term and Long-Term Firm Investment

By *Santiago Carbó-Valverde, José Manuel Mansilla-Fernández and Francisco Rodríguez-Fernández*

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SANTIAGO CARBÓ-VALVERDE
Bangor Business School
Bangor University, Bangor,
Gwynedd LL57 2DG, UK.
E-mail: s.carbo-valverde@bangor.ac.uk
Tel: +44 012 483 88852

JOSÉ MANUEL MANSILLA-FERNÁNDEZ
University of Granada
Department of Economics
Campus Cartuja s/n
E-18071 Granada, Spain
E-Mail: jmmansilla@ugr.es
Tel: +34 958 249 606

FRANCISCO RODRÍGUEZ-FERNÁNDEZ
University of Granada
Department of Economics
Campus Cartuja s/n
E-18071 Granada, Spain
E-Mail: franrod@ugr.es
Tel: +34 958 248 346

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1. Introduction and motivation

Bank market structure constitutes one of the most important questions for firms in building an adequate relationship with banks, and therefore in carrying out the subsequent investment in fixed assets. The nature of the main implications of bank market structure for firm financing have been subject to a broad range of theoretical and empirical financial literature, but recent research has mainly been focused on analysing the effects of bank market concentration on bank-firm relationships and credit availability. This paper attempts to take one step forward by analysing the effects of market power on firm investment in the short and long-term.

Recently, some papers have tested, mostly by using measures of market concentration rather than market power in the strict sense, that the existing relationship between bank concentration and credit availability is closely related to the creation of informational rents (Ogura, 2010, 2012; Petersen and Rajan, 1995). Other studies have found a positive association with relationship lending by investing specific resources in relationships with borrowers (see Berger, 1995; Boot and Thakor, 2000; Degryse and Ongena, 2007; Elsas, 2005; Presbitero and Zazzaro, 2011). By contrast, there also exist other studies finding the opposite results, suggesting that in more competitive environments the relationship between banks and firms would be damaged, and then banks' investment in soft information would also be reduced (Degryse and Cayseele, 2000; Degryse and Ongena, 2001; Degryse et al., 2011; Farinha and Santos, 2002; Canales and Nanda, 2012). In conclusion, the financial literature finds solid theoretical foundations to demonstrate that the composition of bank market structure determines the relationship between banks and enterprises, and consequently lending technologies, and finally credit availability. In this way, Carbó et al. (2009) extend the literature and show that bank market power could reduce bank lending availability and thereby create financial constraints for small and medium enterprises (hereafter SMEs). Furthermore, empirical evidence shows that bank market concentration is a restrictive factor for the creation of new firms by reducing credit availability (Black and Strahan, 2002; Bonaccorsi di Patti and Dell'Ariccia, 2004; Bonaccorsi di Patti and Gobbi, 2004, 2007). Cetorelli (2004) and Cetorelli and Strahan (2006) find evidence that bank market concentration reduces company size. Degryse et al. (2011) complete this analysis by introducing the long-term effects of bank concentration, finding evidence of discontinuation and even a decline in the relationship between banks and firms following mergers. Other recent studies extend the analysis by suggesting that bank concentration leads to an increase in spreads (Panetta et al., 2009; Canales and Nanda, 2012), and therefore in the cost of business financing.

We extend the existing studies in four ways. Firstly, financial literature has comprehensively shown that bank market concentration leads to a reduction of bank credit availability and to financial constraints. We propose in this paper that this effect could be extended to a reduction of firm investment, especially in the case of tangible assets. Secondly, we also widen the financial literature by analysing the effects of bank market power in the short and long-term. In addition, the majority of authors usually base their conclusions on concentration measures, e.g. HHI or CRn; in this paper, we employ the Lerner index as the principal measure of bank market power, since we consider it to be the most appropriate indicator of market power, in line with the latest literature on industrial organisation. Moreover, we also extend our analysis by performing the Granger causality test to demonstrate the existence of directional causality between bank market power and firm investment. Finally, we also test for the existence of cash flow sensitivity to the Lerner index and also to bank concentration measures.

The main findings of this paper are the following: (i) bank market power exerts a negative influence on firm investment rate in the short run; (ii) the effects of bank market power are greater in the short run than in the long run, and the investment rate is recovered in the long run. The results are robust when we employ alternative investment variables such as asset growth or investment over assets, and even when we substitute the Lerner index for measures of bank loan concentration; (iii) the Granger causality test shows that bank market power causes business investment, but not inversely, and finally, (iv) we also find the existence of cash flow sensitivity to investment when considering bank market power environment. In particular, we find evidence for SMEs rather than larger firms, which means that bank market power makes SMEs more conservative in the short run, but this effect may be relaxed in the long run.

The remainder of the paper is structured as follows. Section 2 offers the background for the theoretical and empirical literature on different firm investment methodologies and approaches to bank market structure. Section 3 presents the methodology. Section 4 is dedicated to the description of the data. Section 5 offers the main results. Finally, Section 6 presents the main conclusions.

2. Background literature on bank competition and company financing and growth

The economic literature has recognised the importance of the availability of bank credit for SMEs (Berger and Udell, 1998, 2002, 2006), and alternatively to determine access to other financial resources, such as trade credit (Fisman and Love, 2003; Fisman and Raturi, 2004; Petersen and Rajan, 1997). These difficulties take shape in access to external finance, which is reflected in asymmetric information, and even SMEs may face severe financial constraints which hamper growth or cause company closure (Canales and Nanda, 2012).

Much financial literature has also shown that bank organization is an important determinant of firms' financial conditions. We discuss several positions which advocate that a strong competitive position can be positive, or on the other hand negative, for company financing (Berger, 1995; Berger and Udell, 2002; Berger and Black, 2011; Boot and Thakor, 2000; Carbó et al., 2009; Cetorelli and Gambera, 2001; Cetorelli, 2004; Elsas, 2005; Ogura, 2010, 2012; Sapienza, 2002; Scott and Dunkelberg, 2003, 2010; Zarutskie, 2006)[1]. In this vein, the economic literature offers several arguments to defend the thesis that bank concentration means an obstacle for firms in the obtaining of external finance, especially in countries with poor institutional development or with financial restrictions (Beck et al., 2004) and in particular for the most vulnerable SMEs (see Craig and Hardee, 2007). Cosccorese (2008) finds that banking consolidation might give rise to an inverse relationship in the long run, and that economic expansion tends to reduce concentration in favour of competitors. Agostino and Trivieri (2008, 2010) show, for Italian firms, the negative effect of local bank market power on firms' access to bank finance. Scott and Dunkelberg (2010) find that increases in bank competition improve both bank and non-bank financing availability. Canales and Nanda (2012) analyse the effects of bank deregulation and competition on the amount and price of loans offered to firms. They show that decentralized banks tend to lend more to firms, particularly SMEs, thereby increasing entrepreneurial activity, as well as attending to lending terms. Financial institutions offer more attractive terms to firms in competitive environmental markets, but are in a better position to select the healthiest firms and restrict credit in areas where they have the necessary market power.[2]

[1] Berger et al. (2004) offer an extensive overview of the effects of bank concentration on firm financing, particularly for the case of SME financing, and offer a future research agenda as well.

[2] In a close paper, Erel (2011) shows that after mergers, market overlap increases cost savings, and then lowers the spreads, but on the other hand, when the overlap is large enough, spreads increase as a consequence of the bank market power effect.

Researchers have expanded their agenda to include the analysis of bank market structure, competition and bank-company concentration, with particular emphasis on relationship lending. We find solid arguments demonstrating that bank market power may be perceived by financial institutions as a necessary tool to extract information from borrowers (Ogura, 2010; Petersen and Rajan, 1994, 1995; Rajan, 1992). The seminal work presented by Petersen and Rajan (1995, 2002) concludes that better access to information is not necessarily conditional upon hard information concerning borrower creditworthiness, since this allows banks to lend to increasingly distant firms without compromising their ability to underwrite or monitor those credits, In turn, Petersen and Rajan (1994, 1995) provide a theoretical framework to show that competition in credit markets is a key question in determining the value of the lending relationship.[3] On this subject, they establish that competition and long-term relationships are not necessarily compatible, that banks are less able to retain borrowers, and that increased bank market power has a positive association with credit availability since lenders are able to capture a larger share of future loan interest surpluses from borrowers. On the other hand, recent financial literature recognises that financial institutions not only employ statement information as transactional lending as a whole, but also that information technology could be employed for the smallest firms as fixed-asset lending, asset-based lending, credit scoring and the soft technology proper to relationship lending (Berger and Udell, 1998, 2002, 2006)[4]. Dell'Ariccia (2000) shows that the effect of banking competition on screening give rise to certain ambiguities resulting in a prisoners' dilemma in which banks must decide between relationship and

[3] This branch of financial literature has motivated numerous studies on the importance of the impact of bank-borrower distance on credit availability, loan pricing and borrower-lender performance (see Agarwal and Hauswald, 2006, 2010; Berger and De Young, 2006; Brevoort and Hannan, 2006; De Young et al., 2008, 2011; Degryse and Ongena, 2001, 2005; Uchida et al., 2012).

[4] Recent empirical papers have made important progress by confirming the possibility of banks using hard technology to expand SMEs or improve their information set to other minor customers. The comparative advantage of large banks in hard information technologies do not appear to be monotonically increasing with firm size (see Berger et al., 2005a, b; Berger and Black 2011; Frame et al., 2001).

transactional lending. Boot and Thakor (2000) show that bank competition reduces the profitability of transactional lending in relation to relationship lending. Thus, the authors find that the profit that each bank gains by investing in knowledge decreases as income increases, so the income per unit of relationship lending decreases. Degryse and Ongena (2001) find that profitability is higher if firms maintain only one bank relationship, whilst firms having relationships with more than one bank are generally smaller and younger than companies which do not.[5] Carbó *et al.* (2012) find that firms with more intense relationships throughout their lifespan and a lower number of banks enjoy greater credit availability and are less likely to be credit constrained. In the same line, Kano (2011) finds that the bank-borrower relationship depends on three factors, identified by the economic literature as: verifiability of information, bank size and complexity, and bank competition. Based on a Japanese database, the authors find evidence that longer relationships benefit borrowers and smaller banks in terms of reduced loan interest rates and credit availability, although they find that bank competition has little effect on the benefits derived from relationship lending.

Building on this analysis, we find other papers which document the existence of a U-shaped effect of market concentration and bank-firm relationship (Degryse and Ongena, 2007; Ogura, 2010, 2012; Ongena et al., 2012; Presbitero and Zazzaro, 2011). Elsas (2005) indicates, for company borrowing from five major German banks, the existence of a U-shaped relationship between banking concentration in a local credit market and the likelihood of a relational bank-firm tie. Those results demonstrate that the stronger the concentration of a credit market, the lower is the probability of a bank assuming *Hausbank* status, with a marginal increase in concentration. Degryse and Ongena (2007) confirm the U-shaped relationship between market concentration and the

[5] See also Goddard and Wilson (2009); Goddard et al., (2007, 2011) for a complete overview of New Industrial Organization approaches as profit hypotheses, as well as different methodological aspects.

likelihood of bank branches providing bank credit. This result confirms that the non-monotonic effect of market concentration is robust to controlling for the presence of local credit markets for banks with multiple contacts. Presbitero and Zazzaro (2011) extend their analysis by suggesting that this non-monotonicity can be explained by examining the organisational level of local credit markets. Moreover, the authors provide evidence that a marginal increase in bank competition is detrimental to relationship lending in markets where *Hausbank* are dominant. Ongena et al. (2012) explore the determinants of creditors' concentration by using an extensive bank-firm database for German enterprises. They show that bank borrowing is often concentrated in a *Hausbank*, which plays an important role in determining creditor concentration. On this point, bank market power might play a role "on the intensive margin" (see Ongena, 2012:845). Related to the above papers, Ogura (2012) predicts that bank market power, measured as the price-cost margin, improves credit availability, in particular for younger firms, although in the second step of his analysis, the results reveal that the adjusted price-cost margin is negatively correlated to the share of nationwide larger banks; he also provides evidence for the positive impact of the price-cost margin, as a measure of bank market power, on credit availability for new firms, as well as indirect evidence that higher bank market power is likely to be generated by relationship banking. Ogura (2012) also shows that the price-cost margin is inversely U-shaped, consistent with the argument presented by the theoretical model of Dinc (2000).

As explained in this section, competition in banking markets might prove to be an influential factor in the relationships between banks and firms and therefore, lending availability and even the terms of such loans. In this paper the main research question is whether bank market power is also a determinant factor for the firm investment rate in the short and long-term. We find in the financial literature several authors who demonstrate that bank market structure could be extended through firm creation and growth (Black and Strahan, 2002; Cetorelli and Gambera, 2001; Cetorelli, 2004; Cetorelli and Strahan, 2006; Degryse et al., 2011; Bonaccorsi di Patti and Dell'Ariccia, 2004; Bonaccorsi di Patti and Gobbi, 2007). Black and Strahan (2002) examine the effects of bank market concentration on the constitution of new firms, and find a strong negative relationship between bank market concentration and new business formation. These results support the traditional view that banks with higher market power limit the supply of loans to potential entrepreneurs, and therefore that bank market power is unable to help new firms by increasing the rewards to the formation of long-term relationships between banks and firms. Bonaccorsi di Patti and Dell'Ariccia (2004) find the existence of a bell-shaped relationship between bank market concentration and company creation. Moreover, these authors also find evidence that bank competition might prove less favourable to the creation of new firms in the industrial sector, where informational asymmetries are more important. This argument is consistent with previous theoretical models that explicitly consider asymmetric information between lenders and borrowers, and predicts that bank competition might reduce the availability of credit to more informationally opaque firms. In the same research line, Zarutskie (2006) examines the impact of bank competition on bank credit and business investment, concluding that in competitive bank environments younger firms invest less, suggesting that competition increases company financing constraints, diminishing the effects in the long run. This result is in line with Rice and Strahan (2010), who find that firms in a more competitive environment are more likely to borrow from banks at a lower cost. Other papers also relate bank market concentration and business size. Cetorelli (2004) finds that improving market competition leads to the removal of financial barriers to new firms, as well as possibly helping to increase company size in terms of added value or employment. Closely related with the present study, Bonaccorsi di Patti and Gobbi (2007) find that firms borrowing from banks involved in a process of M&A have a higher investment rate after the merger, whilst Degryse et al. (2011) criticise Bonaccorsi di Patti and Gobbi(2007) for failing to find a larger mergers effect for firms less dependent on banks.

3. Methodology

This section presents the main theoretical and empirical approach used in this paper to show the existing relationship between bank market power and firm investment. Subsequently, we formulate our hypotheses.

3.1. Theoretical approach

In this section, we develop the theoretical foundations which will serve as a basis to relate firm investment and bank market power. In our theoretical model, we consider a firm which produces a perishable product, employing an initial amount of investment, fixed capital, and the labour force. Secondly, in proposing our model we take into account that firms differ in their managers' skills in seeking favourable credit conditions, and that firms also differ in the information available to them and in their credit risk. These features enable us to isolate the investment price, since each firm pays a different price for its capital depending on bank interest rates, financial expenses and the company's risk premium. Thirdly, the risk premium to be paid by the enterprise is a factor which depends fundamentally on banks' risk aversion, as well as credit availability and bank market structure. Subsequently, we can consider risk aversion as bank-specific and use it as a nexus variable to link company characteristics and bank market structure or, in other words, bank market power.

We base our theoretical framework on the Euler equation model *à la* Bond and Meghir (1994), in order to relate firm investment variables and firm investment costs. Thus, we consider a firm whose net present value at the beginning of the period *t*, in the absence of taxes, is given by the following Bellman equation:

$$V_t(K_{t-1}) = \max_{L_t, K_t} \{\Pi(K_t, L_t, I_t) + \beta'_{t+1} E[V_{t+1}(K_t)]\} \quad (1)$$

$$\text{s.t.} K_t = (1-\delta)K_{t-1} + I_t \quad (2)$$

where $\Pi(K_t,L_t,I_t)$ represents the net revenue function in which L denotes costless adjustable factors and I represents gross investment at the beginning of the period and is immediately productive, but the firm faces strictly convex adjustment costs in changing its capital stock (K), which evolves according to the equation of motion (2), while parameter δ denotes the depreciation rate. The expectation operator E[·] is conditional on information available at the beginning of period *t* and expectations are based on future interest rates, input and output prices and technology. We assume symmetric information and that the company objective is to maximize the wealth of its shareholders. We define r_t as the firm's nominal required rate of return between periods *t* and *t+1*, while $\beta'_{t+1} = 1/(1+r_t)$ is the company's discount factor. To obtain an empirical model of investment we represent the firm's revenue function by

$$\Pi_t = p_t F(K_t, I_t) + p_t G(K_t, I_t) - wL_t - p^I I_t \quad (3)$$

In the previous expression, we introduce $G(I_t, K_t) = \frac{1}{2} b K_t \left(\left(\frac{I}{K}\right)_t - c\right)^2$ as a symmetric cost adjustment function which is linearly homogeneous in investment and capital. The parameter c represents the bliss point, and $b > 0$ denotes the cost parameter determining the curvature function and represents the magnitude of the investment cost. The term $\left(\frac{I}{K}\right)_t$ represents the investment rate variable and corresponds to the objective variable of this paper. Finally, the term $F(K_t,I_t)$ denotes a constant return to scale production function, p_t is the price of company output, w_t is the vector of prices for variable inputs L and P_t^I is the price of investment goods.

Company financing is associated with the transaction costs incorporated in our model by introducing the cost function associated with the obtaining of credit, represented by P_t^I. This function denotes loan arrangement fees and commissions, and implicit costs such as the cost of verification of financial status. Thus, for the sake of simplicity, we can assume that all the explicit and implicit costs increase linearly with the level of borrowing, namely $P_t^I(B_t) = \theta B_t$, $\theta > 0$. Since the firm employs bank loans and internal funds to finance its investment, we assume that $P_t^I(B_t)$ is a linear function of investment costs associated with the factors explained above.

$$P_t^I = \beta_0 + \beta_1 r_t^B + \beta_2 RP_t + \beta_3 FE_t \qquad (4)$$

where the intercept (β_o) denotes the quantity of internal funds the firm employs in investment; it is specified as independent because we are concerned only with banking market analysis. The term r_t^B represents the interest rate paid by the firm, the risk premium (RP_t) is the additional amount of money paid by the firm for risk, and finally, financial expenses (FE_t) are the expenses associated with the obtaining of bank credit. All the coefficients are expected to be positive. Solving the Bellman equation, we obtain the following final expression:

$$\left(\frac{I}{K}\right)_{t+1} = c(1-\phi_{t+1}) - \frac{1}{(1-\delta)\beta'_{t+1}b\alpha p_{t+1}}P_{it}^I - \frac{1}{b\alpha p_{t+1}}P_{it-1}^I + (1+c)\phi_{t+1}\left(\frac{I}{K}\right)_t + \frac{\phi_{t+1}}{b\alpha}\left(\frac{CF}{K}\right)_t \phi_{t+1}\left(\frac{I}{K}\right)_t^2 - \frac{(1+r_t)\nu_t}{(1-\delta)b\alpha}\left(\frac{B}{K}\right)^2 \qquad (5)$$

The second step of our analysis consists of obtaining the value of RP_t in order to link bank market power, as well as bank characteristics, to firm investment.[6] In the present paper, the bank is viewed as a risk-averse dealer in the credit market acting as

[6] This step of our analysis is based on the seminal work of Ho and Saunders' (1981).

an intermediary between those demanding and supplying funds.[7] The bank has three components in its portfolio. The first component is its initial wealth (W_0) which is invested in a diversified portfolio. The second component is a net credit inventory (I). It is assumed that deposits (D) and loans (L) have the same maturity period. The difference in the market value of deposits and loans defines the bank's credit inventory (I = L – D). Finally, the third component is the bank's short-term net cash flow or money market position (M). The bank sets the loan rate and charges a premium to compensate for credit risk. The bank's initial wealth is determined by the difference between the portfolio (I_0) and the money market position (M_0)

$$W_0 = L_0 - D_0 + M_0 = I_0 + M_0 \qquad (6)$$

Thus, the bank's maximization problem can be formulated as:

$$\mathrm{Max}_{RP} EU(\Delta W) = (\alpha_L - \beta_L * RP)\Delta EU(W_L) \qquad (7)$$

Finally, solving the expression (6) we obtain the variable RP:

$$RP = \frac{1}{2}\frac{\alpha_L}{\beta_L} + \frac{1}{2}\frac{C(L)}{L} - \frac{1}{4}\frac{U''(\overline{W})}{U'(\overline{W})}\left[(L + 2L_0)\sigma_L^2 + (L - 2M_0)\sigma_M^2 + 2(M_0 - L_0 - L)\sigma_{LM}\right] \qquad (8)$$

The final expression (8) reflects the elasticity of the demand for loans (β_L); the less elastic the demand the greater the risk premium the bank will be able to apply. Therefore, the ratio (α_L/β_L) represents the bank's market power, (α) being the intercept. The risk aversion [$-U''(\overline{W}) / U'(\overline{W})$] results in an expression greater than zero, meaning the greater is the risk aversion for which banks charge, the higher is the risk premium to firms. The volatility of money market interest rates (σ_M^2) and the credit risk (σ_L^2) increase the risk premium as well (σ_{LM}^2). The total volume of credit is given by (L + $2L_0$). For a

[7] The bank's utility function is a Von Newmann-Morgenstern utility function which is continuous and doubly differentiable $U' > 0$ and $U'' < 0$ and therefore the model ensures that the bank is risk-averse.

given value of the money market interest rate or credit risk a large operation would mean a potential loss, and thus the bank requires a greater risk premium.[8]

Having revised the economic literature on firm investment and bank market power, and based on the theoretical framework presented above, we propose the following two hypotheses:

Hypothesis 1: *There is an inverse relationship between bank market power and the firm investment rate. As bank market power increases, the firm investment rate declines.*

Hypothesis 2: *The impact of bank market power is greater in the short run than in the long run. Therefore, we can predict that the effects of bank market power will gradually ease.*

3.2. Empirical specification and the approximation of variables

In this section, we introduce the main empirical equation to be estimated, as well as the empirical measures of the theoretical variables obtained in the previous section. Thus, based on equation (5), the empirical investment equation to be run is given as:

$$\left(\frac{I}{K}\right)_{i,t+1} = \varphi_0 + \varphi_1 P^I_{it} + \varphi_2 P^I_{it-1} + \varphi_3 \left(\frac{I}{K}\right)_{it} + \varphi_4 \left(\frac{CF}{K}\right)_{it} + \varphi_5 \left(\frac{I}{K}\right)^2_{it} + \varphi_6 \left(\frac{Y}{K}\right)_{it} + \varphi_7 \left(\frac{B}{K}\right)^2_{it} + \varphi_8 MA_{jt} + \varphi_9 Crisis_t + \sum_{h=1}^{H} \varphi_h IND_h + \sum_{l=1}^{L} \varphi_l REG_l + \varepsilon_t \qquad (9)$$

The next step relates the investment specification presented above to the cost of firm investment (P^I_{it}) which includes the measure of bank market power ($LERNER_{it}$) and, in addition, the cost of company financing:

[8] See also Allen (1988), Angbanzo (1997), Carbó and Rodriguez (2007), Maudos and Fernández de Guevara (2004), McShane and Sharpe (1985) and Saunders and Schumacher (2000) among others, for several extensions of the model.

$$P_{it}^{I} = \gamma_0 + \gamma_1 \left(\frac{FE}{TA} \right)_{it} + \gamma_2 \left(\frac{r^B}{TA} \right)_{it} + \gamma_3 LERNER_{jt} + \gamma_4 \left(\frac{C(L)}{L} \right)_{jt} \quad (10)$$

Finally, introducing (9) into (8), we obtain the main empirical specification to test our hypotheses.

The main endogenous variable to measure firm investment is the ratio of investment to company capital $(I/K)_{it}$, represented in expressions (5) and (9). Firm investment (I_{it}) will be proxied as the fixed capital stock available to the firm *i*, corrected by capital depreciation (δ) considered as a constant equal to 0.1, computed according to the capital motion equation represented in expression (2), while company capital (K_{it}) represents *the firm's fixed assets* on its balance sheet. We include two alternative variables to measure firm investment and control for robustness in our results.[9] Firstly, we include asset growth ($\Delta A_{it}/A_{it-1}$), measured as the change in a firm's total assets over its lagged total assets. This variable predicts future abnormal returns. Secondly, we also include the ratio of investment to total assets $(I/A)_{it}$.

The ratio of cash flow over capital $(CF/K)_{it}$ controls for cash flow-investment sensitivity (see Bond and Soderbom, 2010; Kaplan and Zingales, 1997, 2000). Cash flow (CF_{it}) is measured as *profit before tax* plus *depreciation*. Company debt $(B/K)_{it}$ will be proxied as the SABI items *Non-current liabilities: long-term debt* and *Current liabilities: loans* over *the firm's fixed assets*. The firm's financing investment could be undertaken by an increase in internal funds over the life of the firm. Thus, we could add to the model the output term to control for imperfect competition and eliminate it from the Euler equation under perfect competition; otherwise the coefficient for this term is positive. We measure output $(Y/K)_{it}$ as sales generated by the firm over *the firm's fixed assets*. Finally, the variable $Crisis_t$ is a temporal dummy to control for the effect of the financial crisis; it takes the value of one from 2007 to 2009, and zero otherwise.

[9] See *Huang* et al. *(2011).*

Expression (9) reports the components of the cost of investment. However, the ratio $(FE/TA)_{it}$ is measured as the firm's financial expenses over its total assets, while the ratio $(r^B/TA)_{it}$ represents the interest the company pays over total assets. The following three variables are related to the link between the firm and its corresponding bank. Thus, the variable $(C(L)/L)_{it}$ represents the bank cost of loans and is measured as the ratio of the bank's average operating cost over the bank's total loans.

3.3. Measuring bank market power: Lerner index, HHI, C3, and C5

The market structure (α_L/β_L) shown in expression (8) is proxied by the Lerner index ($LERNER_{jt}$) as our main indicator of market power. We employ the Lerner index based on the Monti-Klein imperfect competition model given by:

$$LERNER_{jt} = \frac{r_{jt} - r_t - C'_{jt}}{r_{jt}} = \frac{p_{jt} - C'_{jt}}{p_{jt}} \qquad (11)$$

where r_{jt} is the interest rate that the bank j charges to borrowers, and r_t is the interest rate of the inter-bank market, as noted above, and C'_{jt} is the bank's marginal cost. The margin ($r_{jt} - r_t - C'_{jt}$) determines market power, whereas p_{jt} is the ratio of *interest income* plus *other operating income* to *the bank's total assets*.

As a robustness check we substitute the $LERNER_{jt}$ for the Hirschman-Herfindhal index (HHI_{jt}) and the concentration index $C3_{jt}$ and $C5_{jt}$ in expression (10). We now present a brief methodological discussion about the four indicators presented above. Carbó et al. (2009), in a close empirical approach, find evidence that the Lerner index and the HHI produce opposite results when bank market power and credit availability are related. Specifically, the authors find that, on the one hand, the Lerner index indicates that stronger bank market power is associated with stronger financial constraints; on the other hand, the HHI indicates that bank market power is related to weaker financial constraints. Other related papers rely more on the HHI than the Lerner index as a measure of bank market power, especially those related with the so-called structure-conduct-performance hypothesis. Closely related to our paper, Black and Strahan (2002) employ the HHI, while Beck et al. (2004, 2006a) use the asset concentration of the three largest banks to find that bank market concentration constitutes a financial obstacle to firms. Bonaccorsi di Patti and Dell'Ariccia (2004) and Bonaccorsi di Patti and Gobbi (2007) also employ the HHI as a measure of bank market power to relate bank market power and the creation of businesses. In addition, Ongena et al. (2012, p. 837) explain that HHI could be overestimated for smaller firms, and offer a correction for total HHI loans.

On the other hand, the Lerner index has been extensively used by the so-called New Empirical Industrial Organisation approach, in which techniques to estimate the parameters of a firm's behavioural equation are employed, and then measures of marginal cost are also obtained (see Schmalensee, 1989). Aghion et al. (2005) show that the Lerner index is preferable to the HHI, arguing that in the former test the gap between marginal cost and prices (the mark-up) constitutes a firm-by-firm measurement, and does not depend on regional distribution, as does the latter.[10] Based on this theoretical argument, we consider the Lerner index to be the best measure of bank market power in our research; and then we consider that the HHI, C3 and C5 might be the best robustness measure of bank market power.

3. 4. Testing the Granger causality test

We use the Granger causality test to study the direction between the Lerner index and firm investment, controlling for the other financial measures. We employ four

[10] In a related paper, Ogura (2012) uses the price-cost margin as a measure of bank market power.

lags (l) of the variables in order to capture the long-term effects of bank market power (and concentration) measures on firm investment rates. Since our sample consists of panel data, the empirical specification follows Holtz-Eaking et al. (1988) considering fixed effects (f_i), N firms (i = 1,…, N), and T periods (t = 1,…, T). Finally, the statistical significance of the Granger causality test is measured using an F-test. We expect two plausible results:

Case 1: We expect bank market power to be statistically significant and to affect the firm investment rate:

$$\left(\frac{I}{K}\right)_{it} = \beta_0 + \sum_{l=1}^{L} \beta_l \left(\frac{I}{K}\right)_{i,t-l} + \sum_{l=1}^{L} \gamma_l Lerner_{j,t-l} + \varphi_t f_i + u_{it} \qquad (12)$$

Case 2: We expect the firm investment rate not to influence bank market structure:

$$Lerner_{jt} = \beta_0 + \sum_{l=1}^{L} \beta_l \left(\frac{I}{K}\right)_{i,t-l} + \sum_{l=1}^{L} \gamma_l Lerner_{j,t-l} + \varphi_t f_i + u_{it} \qquad (13)$$

4. Data

The main data source for the firm-level data is the *Bureau van Dijk's* SABI (2010) database. SABI contains comprehensive information on balance sheets, financial statements and financial ratios for around 1 million Spanish and Portuguese firms for the period 1998 to 2009. Our sample consists of 61,174 firms, representing a data panel consisting of 578,188 company-bank observations.

For each company SABI reports the principal bank with which each firm operates as a variable. Therefore, this characteristic allows us to complement company information with the parameters of its corresponding bank balance sheet and financial statement for each period; in other words, we are able to link company and bank information in a single database. Thus, the second set of variables consists of bank information. We construct the bank dataset from the financial statements provided by the Spanish Banking Association (AEB), the Spanish Savings Banks Association (CECA), and the National Union of Credit Cooperatives (UNACC).[11] After constructing company and bank panel data, we are able to merge both datasets. To our knowledge, merging company and bank databases in a single database is the best methodology to study how the phenomena derived from banking markets are derived from banking markets are transmitted to firms. Table 1 contains the definition of and explanatory comments on the variables employed in this paper. To alleviate the effects of outliers, we winsorize the whole variables at 5% before including them in our results.

5. Results

5.1. Summary statistics and parametric and non-parametric tests

Table 2 reports the summary statistics of the variables employed in this study. Regarding investment variables we show in Panel A that the firm investment rate $(I/K)_t$ displays a mean of 0.28, ranging from -0.24 to 1.98, while asset growth ($\Delta A_{it}/A_{it-1}$) and the investment to assets ratio show a mean value of 0.13 and 0.0001, respectively. Regarding control variables, the ratio of cash flow over capital $(CF/K)_{it}$ displays a mean of 0.89, while the ratio of leverage over capital $(B/K)_{it}$ has a mean of 2.32. The Lerner index (LERNER_t) is the variable of interest, showing a mean value of 0.22 and ranging between 0.001 and 0.68, while the mean value for the HHI is 1.29 per cent, and C3 and C5 0.48 and 0.34 per cent, respectively. Panel B reports the mean values of investment variables, cash flow and leverage divided by four quartiles of the Lerner index. This first statistical test shows that $(I/K)_{it}$ ranges from 0.33 in the first quartile to 0.28 in the fourth quartile, whilst $(I/A)_{it}$ ranges from 0.00018 in the first quartile to 0.00016 in the

[11]The acronyms correspond to the Spanish denominations: *Asociación Española de Banca* (AEB), *Confederación Española de Cajas de Ahorros* (CECA), and *Unión Nacional de Cooperativas de Crédito* (UNACC).

fourth quartile. This result reveals, initially, that investment variables decrease as bank market power increases.

To complement the above results we perform a two-sample Kolmogorov-Smirnov test and test for comparison of means, as shown in Table 3. In the first step, we create the dummy variable Lerner_D_{jt} which takes the value of one for values of LERNER_{it} from the third quartile in order to proxy for an environment of high bank market power. The Kolmogorov-Smirnov test rejects the null hypothesis (H_0: $F(z) - G(z) = 0$) and confirms the existence of significant differences in distribution of all our investment variables at one per cent ($p = 0.000$). Since the Kolmogorov-Smirnov test only reports differences in distribution but not the sign adopted by variables, we should therefore perform the parametric test for comparison of means in order to know where the sign of each variable lies. We show that the parametric test rejects the null hypothesis (H_0: mean(0) – mean(1) = 0) for all our investment variables, and further show that the alternative hypothesis is confirmed for $(I/K)_{it}$ and $(I/A)_{it}$ for an environment with a lower level of bank market power at one per cent (H1: mean(0) – mean (1) > 0). Contrary to our expectations, the asset growth ($\Delta A_{it}/A_{it-1}$) variable displays higher values in an environment of high bank market power. Regarding $(CF/K)_{it}$, we show that firms tend to maintain higher liquidity levels in higher bank market power environments, which reveals a conservative attitude of firms regarding investment. The other interest variable is leverage $(B/K)_{it}$, which demonstrates that it is easier for firms to obtain bank financing in a more competitive banking market, as well as $(r^B/TA)_{it}$ which shows that in a more competitive banking market it is cheaper to obtain bank financing. Considering the results obtained as a whole, we could conclude that in the presence of bank market power firms are less able to obtain bank financing since credit availability is also restricted. Additionally, we find that the cost of bank financing is also higher in environments of higher bank market power. This result is consistent with previous papers, which show that an increase in bank market concentration leads to a lessening of the availability of loans and a subsequent increase in the interest rates banks charge firms (see Canales and Nanda, 2012; Erel, 2011; Kano et al., 2011; Rice and Strahan, 2010 and Panetta et al., 2009). Thus, given these results, we are able to show that firm investment is also negatively affected by bank market power (see Zarutskie, 2006). Firms need to finance their capital investment using bank financing, and so the presence of bank market power might drive banks to reduce relationship lending (see Presbitero and Zazzaro, 2011), and financial resources could be reduced in the form of financial constraints (see Beck et al., 2004, 2006b; Carbó et al., 2009); as a result, firms have fewer financial choices to carry out the necessary investment in fixed assets.

5.2. The baseline model

The estimation of the expressions (9) and (10) are shown in Table 4 by using the Arellano and Bond (1991) GMM estimator in order to test our hypotheses. The results suggest that an increase in bank market power, measured as LERNER_{jt} , has a twofold effect on firm investment. In accordance with our hypotheses, we find that an increase in bank market power leads to a reduction of firms' investment rate $(I/K)_{it}$ in the short-term (-0.0585); on the other hand, we find that the firm investment rate recovers in the long run (0.0702), when the entire sample is considered. These results are robust whether we substitute $(I/K)_{it}$ for asset growth $(\Delta A_{it}/A_{it-1})$ and investment over assets ratio $(I/A)_{it}$ as the dependent variable. Accordingly, we find very similar results if we consider $(\Delta A_{it}/A_{it-1})$ as the dependent variable instead of $(I/K)_{it}$, returning a coefficient of -0.0475 for LERNER_{jt-1} and 0.0586 for LERNER_{jt-2}. On the other hand, the results for

$(I/A)_{it}$ are qualitatively similar in sign and significance but display lower values, attaining -0.000080 and 0.0000590, for LERNER_{jt-1} and LERNER_{jt-2}, respectively.

We are also interested in studying whether the effect of bank market power has a similar effect on large, medium and small firms. We obtain the expected signs for all three types of firms but also find that the effect of bank market power is higher and significant at 1 per cent for SMEs (-0.0587) than for large companies (-0.0326). Moreover, we find that the correction for firm investment is also higher for SMEs (0.0745) than for large firms (0.0320). These results prove to be consistent when we introduce the variable MA_{jt}, since we obtain positive and significant coefficients for the whole sample (0.004), being significant for SMEs (0.005) suggesting that bank merger processes have a stronger influence on smaller firms than larger ones. The above results are robust concerning the asset growth and investment over assets specifications.

Discussion of the results presented above proceeds as follows. The estimations demonstrate a dual behaviour of bank market power regarding firm investment. In an initial period, firms are unable to obtain the bank finance required to undertake their necessary investments. Consequently, in the short-term bank market power can restrict business investment in fixed capital. Subsequently, in a second period, firms are capable of adapting themselves to the new situation of increased bank market power, and can therefore recoup their levels of investment. Our result should be interpreted on the supply side of the banking market, since we are considering as a determinant a strictly exogenous factor (bank market power), which is an independent factor for firms, as will be demonstrated in the following subsection. However, the results presented in this section are a second step to connecting our theory with those studies supporting the idea that greater bank market power means lower bank financing. It should be noted that the majority of the most recent financial literature analysed shows the effects of bank market power over firms, based on static analysis (see Beck et al., 2004, 2006b; Bonaccorsi di Patti and Dell'Ariccia, 2004; Carbó et al., 2009, 2012, among others). Our paper takes a further step forward and extends the financial literature by analysing the effects of bank market power in the long-term. Although the authors listed above agree that bank market power leads to a subsequent financial constraints effect, to the best of our knowledge there are no papers extending the analysis to the firm investment rate. Nevertheless, these papers are in line with our first result, which shows that bank market power reduces firm investment. Moreover, our results show that the firm investment rate is recovered in the long-term. This result means that, in the long-term, the bank-firm relationship also improves during subsequent periods, and, in addition, bank financing recovers in the long-term (see Ogura, 2012). Furthermore, a similar methodology can be found in Bonaccorsi Di Patti and Gobbi (2007: 691), which also relates the business credit issued by banks involved in M&A to the firm investment rate. In line with our finding, banks also show an increase in firms' investment rate in the long-term for enterprises borrowing from banks involved in M&A processes.

We also find that this effect is stronger for SMEs which are more financially constrained, due to problems derived from information asymmetry. The financial literature has demonstrated that a less competitive environment might dampen relationship lending for SMEs, and even diminish credit availability, in favour of transactional lending to the more transparent and largest firms. Therefore, in the light of our results it is logical to conclude that the impact of bank market power on firm investment might be higher for SMEs than for the largest firms.

The rest of the control variables show the expected signs. We find that the crisis dummy presents a negative and significant sign (-0.0151), indicating that during the recent crisis period firms significantly decreased the investment process, and subsequently economic growth was sharply reduced. Regarding the debt variable $(B/K)^2_{it-1}$, the sign is negative and significant; this would appear to be correct, given the tax bankruptcy cost specification. Moreover, we have shown the expected sign for cash flow predicted by the theoretical model; consequently the negative sign predicted by the Bond and Meghir (1994) theoretical model has been arrived at under the assumption that firms can raise finance at a given price. If this assumption is incorrect then cash flow may reflect an excess of sensitivity of investment to cash flow, a fact consistent with the economic literature.

5. 3. Granger causality test

We are also interested in studying the causality between firm investment and bank market power. We employ the Granger causality test with four lags for bank market power and concentration variables, and the firm investment rate. The results shown in Table 5 suggest that bank market power ($LERNER_{jt}$) predicts firm investment, but firm investment does not predict bank market power. To check the robustness of this result, we incorporate in our Granger test alternative measures of bank concentration, such as the HHI and C5 indices. The results are qualitatively similar to those obtained above in signs and significance, and thus we can conclude, employing several measures, that banking structure is a strong conditioner of firm investment, but we do not find empirical evidence that the relationship could be inverse, considering neither bank market power nor even bank concentration measures. Moreover, company control variables maintained for the complete regressions conserve the expected signs and significance for all the specifications.

The results reinforce those presented in the GMM estimation presented in the previous section. Consequently, this finding implies that bank market structure affects credit conditions such as credit availability or interest rates, although the reverse is not true and firms cannot condition bank market structures according to the level of firm investment. Therefore, our results show that bank market power is a strictly exogenous factor in the behaviour of company financing.

5. 4. Cash flow-investment sensitivity

In this section we examine whether the internal funds firms have available exert some kind on influence on firm investment, depending on bank market power. Table 6 presents the cash flow-investment sensitivity analysis by using Baltagi's 2SLS instrumental variables estimator. We also divide the sample into large and SME firms in order to consider the differences in cash flow sensitivity depending on firm size. We find that firms classified as SMEs exhibit a greater sensibility to cash flow (0.0471) than do larger businesses (0.0342). The results remain similar even when we exclude company control specification variables. Nevertheless, the principal point of interest is to check the sensitivity of internal funds to bank market power and firm investment. Therefore, we interact $(CF/K)_{it}$ and LERNER_{jt} in order to check the joint effect of internal funds and bank market power on firm investment (see Bonaccorsi Di Patti and Gobbi, 2007). We obtain a negative and statistically negative sign for the lagged variable in the Lerner index ($\text{LERNER}_{jt-1}*(CF/K)_{it}$), while on the other hand the sign becomes positive in the current period ($\text{LERNER}_{jt}*(CF/K)_{it}$). Therefore, we conclude that bank market power is cash flow sensitive, and that this effect becomes negative in the long-term. We also find differences depending on company size. The effect is statistically significant for SMEs but we do not find the same to be true for large companies.

The results are inverted if we interact $(I/K)_{it}$ and $(CF/K)_{it}$. We find that the sign for the lagged value of bank market power and cash flow ($\text{LERNER}_{jt-1}*(CF/K)_{it}$) becomes negative and significant, while the sign for the current period is positive and significant. Moreover, investment interaction remains positive and statistically significant for the lagged investment period ($(I/K)_{it}$*$(CF/K)_{it}$) and even when we considering the squared investment ($(I/K)^2_{it}$*$(CF/K)_{it}$).

5. 5. Robustness check: the effects of bank concentration

The specification of the baseline model presented in Table 4 suggests that bank market power exerts a negative effect on the company internment rate in the short-term, although this relationship is corrected in the long-term, to become increasing.

To check the robustness of our previous results, we estimate in Table 7 three alternative specifications replacing $LERNER_{jt}$ by measures of bank market concentration such as HHI_{jt}, $C3_{jt}$, and $C5_{jt}$ and dividing the sample into large firms and SMEs. The correspondence of the HHI and Lerner indices, and their relationship with firms' investment, depends on the evolution of market contestability and bank information production (see Carbó et al., 2009; Ongena et al., 2012; Panetta et al., 2009; Presbitero and Zazzaro, 2011). We obtain results similar to those reached using the Lerner index, which demonstrates the robustness of our results. The alternative measures support the existence of declining firm investment rates in the short-term, while the relations prove to be positive in the long-term.

6. Conclusions

Motivated by recent theoretical and empirical studies, this paper has tested the implications of bank market power on firm investment over time. One of the main findings of this paper is that the effects of bank market power exert a negative effect on firm investment in the short-term. However, we also find that firms are able to adapt in the long-term so that bank financing rates can be recovered and, consequently, firm investment can also increase. To the best of our knowledge, this is the first paper that analyses the repercussions of bank market power on long-term firm financing and investment.

We also perform the Granger causality test in order to determinate the predictability relationship between bank market power and the firm investment rate. Our results confirm that bank market power is a determinant of firm investment, but no causality is found in the opposite direction. The results are robust to different measures of concentration and market power.

We are also concerned with studying cash flow-investment sensitivity and the effects of bank market power on internal funds as one a key factor in determining the relationship between bank financing and firm investment. We find that cash flow is sensitive to bank market power for small and medium-sized enterprises.

Table 1:

Definition of variables

Variable	Definition
Company	
Firm investment $(I/K)_{it}$	This ratio is the endogenous variable and represents the rate of investment. It is defined as the difference between the tangible fixed assets at year end minus the depreciation (assumed to be 10%) of the tangible fixed assets at the beginning of the year over the amount of tangible fixed assets.
Asset growth (ΔA_{it})	This ratio constitutes an alternative proxy for investment growth in terms of total assets. This ratio is defined as the growth rate of firm's total assets.
Investment over assets $(I/A)_{it}$	This ratio is defined as the difference between firm investment, as defined above (I), and a firm's total assets (A). This ratio is also a proxy for the investment level of firms.
Cash flow over capital $(CF/K)_{it}$	This ratio is defined as cash flow relative to the proportion of capital. Cash flow is defined as net income plus depreciation plus changes in deferred taxes (Kaplan and Zingales, 1997, 2000; Fazzari et al., 2000).
Firm leverage $(B/K)_{it}$	This ratio measures company leverage over the proportion of capital. This variable represents the level of risk which the firm is able to run.
Financial expenses $(FE/TA)_{it}$	This ratio is proxied as the amount of financial expenditure incurred by the firm's total assets. Financial expenditure the expenditure associated with obtaining bank credit
Bank interest rate for I $(r^B/TA)_{it}$	This ratio measures the financial cost over a firm's total assets. The term r^B represents the interest rate paid by the firm to obtain bank financing.
Company output $(Y/K)_{it}$	This variable represents company output. This ratio is proxied as total sales plus the variation in stocks during the year over the amount of tangible fixed assets.
Bank variables	
Bank cost for loans $(C(L)/L)_{jt}$	This ratio represents the bank's average operating costs for loans. This ratio is measured as the operating cost over total loans.
$LERNER_{jt}$	The Lerner index measures the degree of competition in banking markets. This index is defined as the difference between the price and the bank's marginal cost, divided by the price, and measures the capacity of the bank to set a price above the marginal cost, being an inverse function of the elasticity of demand and the number of banks.
$LERNER\_D_{ji}$	This dummy variable takes the value of one if Lerner is above the median, and zero otherwise.
HHI_{jt}	The Herfindhal-Hirschman concentration index measures the degree of market concentration. This index is defined as the squared market shares of each of the banks operating in the Spanish market.
$C3_{jt}$	The concentration index C3 measures the degree of market concentration for the three largest banks operating in the Spanish market.
$C5_{jt}$	The concentration index C5 measures the degree of market concentration for the five largest banks operating in the Spanish market.
Price of labour $(w_1)_{jt}$	This ratio is defined as personnel costs over total assets. The variable is measured by a natural logarithm.
Price of capital $(w_2)_{jt}$	This ratio is defined as operating costs (except personnel costs) over fixed assets. The variable is measured by a natural logarithm.
Price of deposits $(w_3)_{jt}$	This ratio is defined as financial costs over deposits. The variable is measured by a natural logarithm.
$Crisis_t$	This dummy controls for the crisis period and takes the value of one from 2007 to 2009, and zero otherwise.
Mergers and acquisitions (MA_{jt})	This dummy controls for mergers and acquisitions processes, and takes the value of one if the financial institution has been involved in a process of M&A.

Table 2:
Summary statistics

Panel A: Summary statistics					
Variable	Observations	Mean	SD	Min.	Max.
Company variables					
$(I/K)_{it}$	427,912	0.2813	0.5278	-0.2363	1.9750
$(I/K)^2_{it}$	427,912	0.1701	0.3002	0.0008	0.9414
$(\Delta A_{it}/A_{it-1})$	435,816	0.1309	0.2564	-0.2169	0.8245
$(\Delta A_{it}/A_{it-1})^2$	435,816	0.0874	0.1713	0.0002	0.6857
$(I/A)_{it}$	427,901	0.0002	0.0004	-0.0002	0.0014
$(I/A)^2_{it}$	427,901	1.79e-07	5.07e-07	1.82e-12	2.13e-06
$(CF/K)_{it}$	483,066	0.8941	1.3287	-0.0972	5.2827
$(B/K)_{it}$	362,192	1.5671	2.2459	6.30e-06	8.7223
$(B/K)^2_{it}$	362,192	7.4995	19.0803	3.97e-11	76.0772
$(FE/TA)_{it}$	454,313	0.0195	0.0179	1.48e-06	0.0959
$(r^B/TA)_{it}$	451,584	0.0182	0.0164	1.49e-06	0.0843
$(Y/K)_{it}$	391,289	18.1589	21.0276	1.5789	67.1924
Bank variables					
$(C(L)/L)_{jt}$	571,738	0.0021	0.0042	4.48e-07	0.0364
LERNER_{jt}	286,305	0.2194	0.1494	0.0007	0.6833
HHI_{jt}	578,154	0.0129	0.0199	0.0000	0.0786
$C3_{jt}$	400,338	0.0048	0.0049	0.0000	0.0189
$C5_{jt}$	292,183	0.0034	0.0033	0.0000	0.0133
Price of labour ($\ln(w_{1jt})$)	575,320	-4.5695	0.3245	-6.7916	-1.3615
Price of capital ($\ln(w_{2jt})$)	568,459	-2.4709	1.5716	-10.4102	5.8064
Price of deposits ($\ln(w_{3jt})$)	577,021	-3.7199	0.4123	-8.6997	-0.8854
Dummies					
$Crisis_t$	578,188	0.2548	0.4358	0.0000	1.0000
MA_{jt}	578,188	0.3408	0.4739	0.0000	1.0000

Panel B: Means of investment variables, cash flow and leverage depending on the quartiles of LERNER_{jt}. Standard errors in parentheses.					
	Observations	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
$(I/K)_{it}$	427,912	0.3312	0.2669	0.2628	0.2879
		(0.5732)	(0.5113)	(0.5037)	(0.5152)
ΔA_{it}	435,816	0.1173	0.1135	0.1357	0.1576
		(0.2569)	(0.2487)	(0.2536)	(0.2573)
$(I/A)_{it}$	427,901	0.00018	0.00014	0.00014	0.00017
		(0.00038)	(0.00034)	(0.00033)	(0.00036)
$(CF/K)_{it}$	483,066	0.8597	0.7796	0.8739	0.8113
		(1.3029)	(1.2096)	(1.2884)	(1.2046)
$(B/K)_{it}$	413,996	1.5194	1.6874	1.6441	1.4453
		(2.2041)	(2.3395)	(2.3112)	(2.1369)

Table 3:
Parametric test for comparison of means and two-sample Kolmogorov-Smirnov test for equality of distribution functions by LERNER_D$_{jt}$.

	Parametric test for comparison of means		Kolmogorov-Smirnov
	Mean differences are reported. Diff = mean (0) – mean (1) under H_0: Diff = 0. T-statistics in parentheses. Standard errors are reported.		Diff: F(z) – G(z) under H_0: Diff = 0
Variable	**Coefficient (t-statistics)**	**Standard errors**	**Coefficient [p-value]**
Firm variables			
$(I/K)_{it}$	0.02303††† (14.1573)	0.0016	0.0176 [0.000]
$(\Delta A_{it}/A_{it-1})$	-0.03063*** (-39.1897)	0.0008	0.0650 [0.000]
$(I/A)_{it}$	0.00002††† (9.1882)	1.10e-06	0.0123 [0.000]
$(CF/K)_{it}$	-0.03119*** (-8.0834)	0.0039	0.0303 [0.000]
$(B/K)_{it}$	0.0586††† (7.7624)	0.0076	0.0169 [0.000]
$(FE/TA)_{it}$	0.0021††† (37.3497)	0.00005	0.0537 [0.000]
$(r^B/TA)_{it}$	0.0015††† (30.5923)	0.00005	0.0466 [0.000]
$(Y/K)_{it}$	-0.6093*** (-8.9855)	0.0678	0.0153 [0.000]
Bank variables			
$(C(L)/L)_{jt}$	0.0024††† (229.2520)	0.0000107	0.4664 [0.000]
HHI_{jt}	0.0207††† (456.0154)	0.0000453	0.6454 [0.000]
$C3_{jt}$	0.0035††† (216.1979)	0.000016	0.4487 [0.000]
$C5_{jt}$	0.0019††† (126.2729)	0.0000152	0.2352 [0.000]
Price of labour ($\ln(w_{1jt})$)	0.0267††† (30.8878)	0.0009	0.2035 [0.000]
Price of capital ($\ln(w_{2jt})$)	0.0213††† (5.0867)	0.0042	0.0851 [0.000]
Price of deposits ($\ln(w_{3jt})$)	0.4742††† (542.3220)	0.0009	0.5581 [0.000]
Dummy variables			
$Crisis_t$	0.2033††† (179.8123)	0.0012	0.2033 [0.000]
MA_{jt}	0.3249††† (273.1635)	0.0012	0.3249 [0.000]

Notes: *, **, *** statistically significant at the 10, 5 and 1% level, respectively, under Ho: Diff. < 0
†, ††, ††† statistically significant at the 10, 5 and 1% level, respectively, under Ho: Diff. > 0

Table 4: The impact of bank market power on firm investment, 1998-2009

Arellano and Bond (1991) dynamic panel data regression.
T-statistics in parentheses (White (1980) heteroskedasticity-robust standard errors).

	$(I/K)_{it}$			$(\Delta A_{it}/A_{it-1})$			$(I/A)_{it}$		
	Complete sample	Large firms	SMEs	Complete sample	Large firms	SMEs	Complete sample	Large firms	SME
Intercept	0.277***	0.277***	0.278***	0.0781***	0.0738***	0.0787***	0.000163***	0.000137***	0.000167***
	(71.13)	(15.97)	(66.80)	(37.19)	(12.35)	(34.90)	(63.75)	(18.06)	(60.96)
$(I/K)_{it-1}$	0.0144***	0.0143***	0.0140***						
	(10.50)	(3.40)	(9.55)						
$(\Delta A_{it}/A_{it-1})_{it-1}$				-0.00217	0.00376	-0.00329			
				(-1.08)	(0.61)	(-1.52)			
$(I/A)_{it-1}$							0.0243***	0.0246***	0.0238***
							(13.44)	(3.96)	(12.52)
$(FE/TA)_{it-1}$	-0.657***	-0.834***	-0.631***	-1.067***	-1.082***	-1.055***	-0.0000747	-0.000237*	-0.0000528
	(-5.59)	(-3.32)	(-4.83)	(-13.18)	(-5.14)	(-11.97)	(-1.37)	(-2.14)	(-0.85)
$(FE/TA)_{it-2}$	0.0923	-0.173	0.131	0.0534	-0.0232	0.0816	0.0000889	0.00000251	0.0000878
	(0.84)	(-0.70)	(1.07)	(0.69)	(-0.11)	(0.99)	(1.39)	(0.02)	(1.23)
$(r^B/TA)_{it-1}$	-0.643***	-0.0259	-0.728***	-3.317***	-2.616***	-3.418***	-0.000929***	-0.000291	-0.00102***
	(-4.43)	(-0.07)	(-4.58)	(-30.90)	(-8.61)	(-29.80)	(-11.49)	(-1.43)	(-11.45)
$(r^B/TA)_{it-2}$	-0.310*	0.401	-0.407**	1.229***	1.190***	1.211***	-0.000316***	0.0000819	-0.000355***
	(-2.32)	(1.17)	(-2.78)	(12.82)	(4.16)	(11.91)	(-3.75)	(0.38)	(-3.85)
$LERNER_{jt-1}$	-0.0585***	-0.0326*	-0.0587***	-0.0475***	-0.0374***	-0.0464***	-0.000080***	-0.0000267***	-0.0000838***
	(-13.00)	(-2.45)	(-12.25)	(-15.95)	(-4.03)	(-14.73)	(-28.91)	(-3.45)	(-28.48)
$LERNER_{jt-2}$	0.0702***	0.0320*	0.0745***	0.0586***	0.0684***	0.0589***	0.0000590***	0.0000192*	0.0000623***
	(16.16)	(2.35)	(16.18)	(20.99)	(7.31)	(19.91)	(21.08)	(2.35)	(20.95)
$(C(L)/L)_{jt-1}$	-3.779***	-2.200**	-3.902***	-2.947***	-2.312***	-2.983***	-0.00120***	-0.000647***	-0.00126***
	(-16.32)	(-3.23)	(-15.87)	(-20.85)	(-5.69)	(-19.82)	(-12.27)	(-3.38)	(-11.88)
$(C(L)/L)_{jt-2}$	-2.857***	-2.931***	-2.827***	-1.461***	-3.074***	-1.418***	-0.00233***	-0.000350	-0.00237***
	(-15.41)	(-4.40)	(-14.68)	(-12.01)	(-6.14)	(-11.26)	(-22.93)	(-1.39)	(-22.42)
$(CF/K)_{it-1}$	-0.0447***	-0.0439***	-0.0449***	0.0102***	0.0127***	0.00987***	-0.000019***	-0.0000195***	-0.0000190***
	(-26.26)	(-10.04)	(-24.71)	(12.35)	(5.24)	(11.42)	(-19.72)	(-6.94)	(-18.73)
$(I/K)^2_{it-1}$	1.523***	1.518***	1.523***						
	(476.63)	(153.20)	(452.49)						
$(\Delta A_{it}/A_{it-1})^2_{it}$				1.275***	1.269***	1.276***			
				(467.76)	(160.31)	(438.93)			
$(I/A)^2_{it}$							650.9***	635.5***	652.0***
							(426.58)	(117.24)	(410.17)
$(Y/K)_{it-1}$	-0.0105***	-0.0105***	-0.0105***	0.000267***	0.0000128	0.000291***	-0.000005***	-0.00000464***	-0.00000458***

	(-63.84)	(-22.76)	(-60.38)	(3.68)	(0.05)	(3.85)	(-45.72)	(-13.23)	(-44.00)
$(B/K)^2_{it-1}$	-1.63e-12	-1.53e-08***	-1.63e-12	4.27e-14	-8.47e-11	4.86e-14	-1.40e-16	1.74e-12***	-1.39e-16
	(-1.34)	(-18.39)	(-1.34)	(0.13)	(-0.39)	(0.15)	(-1.06)	(9.54)	(-1.06)
$Crisis_t$	-0.0151***	-0.00545	-0.0149***	-0.0222***	-0.0120**	-0.0223***	-0.000009***	-0.00000177	-0.00000898***
	(-6.72)	(-0.90)	(-6.17)	(-14.69)	(-2.82)	(-13.72)	(-8.75)	(-0.84)	(-8.14)
MA_{jt}	0.00474*	0.00232	0.00509*	0.00519**	0.00410	0.00539**	0.00000284	-0.00000210	0.00000327
	(2.02)	(0.32)	(2.07)	(3.07)	(0.85)	(3.01)	(1.80)	(-0.48)	(1.96)
Obs	204,303	22,397	181,906	206,637	22,708	183,929	204,303	22,397	181,906
Wald test (p-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sargan test (p-value)	0.0000	0.0188	0.0000	0.0000	0.0000	0.0000	0.0000	0.0060	0.0000
m1 (p-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
m2 (p-value)	0.0872	0.1603	0.1643	0.0000	0.4224	0.0043	0.7361	0.9356	0.6797

Notes: *, **, *** statistically significant at the 10, 5 and 1% level, respectively.

Table 5: Granger Causality Test

Instrumental variable regression with fixed effects.
Whole variables expressed in first differences.
T-statistics in parentheses.

	$(I/K)_{it}$	LERNER$_{jt}$	$(I/K)_{it}$	HHI_{jt}	$(I/K)_{it}$	$C5_{jt}$
Intercept	-0.141***	0.0230***	-0.0688**	0.000381***	-0.0500	0.00189***
	(-7.14)	(16.03)	(-2.80)	(24.14)	(-0.67)	(84.04)
$(I/K)_{it-1}$	-0.322***	0.00578	-0.304***	-0.000170	-0.315***	0.00000281
	(-15.88)	(0.78)	(-14.37)	(-1.82)	(-11.90)	(0.22)
$(I/K)_{it-2}$	-0.185***	0.00193	-0.163***	-0.000166*	-0.156***	0.00000137
	(-9.33)	(0.40)	(-7.87)	(-2.22)	(-5.89)	(0.11)
$(I/K)_{it-3}$	-0.083***	-0.000203	-0.0692***	-0.000140*	-0.0685**	-0.000000559
	(-5.17)	(-0.06)	(-4.13)	(-2.55)	(-3.19)	(-0.05)
$(I/K)_{it-4}$	-0.0147	-0.000846	-0.0123	-0.0000775*	-0.000441	-0.000000851
	(-1.54)	(-0.43)	(-1.24)	(-2.48)	(-0.03)	(-0.14)
LERNER$_{jt-1}$	0.108*	-0.0690***				
	(2.14)	(-3.99)				
LERNER$_{jt-2}$	0.612***	-0.0744***				
	(19.10)	(-6.11)				
LERNER$_{jt-3}$	0.700***	-1.014***				
	(16.37)	(-96.50)				
LERNER$_{jt-4}$	0.355***	-0.346***				
	(8.80)	(-37.69)				
HHI_{jt-1}			15.17***	-0.0212***		
			(5.99)	(-8.11)		
HHI_{jt-2}			9.764***	-0.204***		
			(5.31)	(-94.98)		
HHI_{jt-3}			8.715***	0.127***		
			(4.40)	(52.32)		
HHI_{jt-4}			0.350	0.199***		
			(0.27)	(97.96)		
$C5_{jt-1}$					84.19***	-0.163***
					(4.16)	(-12.70)
$C5_{jt-2}$					0.889	-0.191***
					(0.10)	(-42.63)
$C5_{jt-3}$					-81.96***	-0.723***
					(-8.38)	(-147.23)
$C5_{jt-4}$					-96.44***	-0.650***
					(-6.41)	(-76.42)
$(CF/K)_{it}$	-0.194***	0.0150***	-0.222***	-0.0000385	-0.216***	-0.00000664
	(-18.27)	(4.22)	(-20.12)	(-0.82)	(-14.93)	(-0.94)
$(Y/K)_{it}$	-0.084***	0.00480	-0.0884***	0.0000248	-0.079***	-0.000000975
	(-38.44)	(1.89)	(-38.30)	(1.28)	(-30.07)	(-0.73)
$(B/K)^2_{it}$	7.77e-10	5.74e-11	-5.21e-12**	-4.34e-16	-5.90e-12***	-1.74e-16
	(0.48)	(0.45)	(-3.16)	(-0.06)	(-3.95)	(-0.24)
$(r^B/TA)_{it-1}$	1.986	4.736***	5.463***	0.000828	1.828	0.00170*
	(1.75)	(12.02)	(4.68)	(0.16)	(1.15)	(2.19)
$(FE/TA)_{it-1}$	-0.562	-1.669***	1.140	-0.00211	0.253	0.00116**
	(-0.90)	(-8.23)	(1.76)	(-0.79)	(0.30)	(2.82)
Obs	51,418	51,366	57,089	57,089	27,403	27,403
F-test (p-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Notes: *, **, *** statistically significant at the 10, 5 and 1% level, respectively.

Table 6: Cash flow/investment sensitivity, depending on company size

Dependent variable: rate of investment $(I/K)_{it}$.
T-statistics in parentheses.
2SLS Baltagi instrumental variables estimator.

	Complete sample			Large firms			Small and medium-sized firms		
Intercept	0.0458***	0.0566***	0.0458***	0.0470***	0.0841***	0.0465***	0.0436***	0.0536***	0.0436***
	(46.77)	(65.28)	(46.82)	(16.85)	(8.89)	(16.46)	(41.22)	(52.62)	(41.26)
LERNER_{jt}	-0.0514***	-0.0278***	-0.0519***	-0.0488*	-0.00230	-0.0497*	-0.0478***	-0.0191***	-0.0479***
	(-6.36)	(-5.92)	(-6.43)	(-2.27)	(-0.11)	(-2.33)	(-5.41)	(-3.80)	(-5.42)
LERNER_{jt-1}	0.0458***	0.0381***	0.0461***	0.0486**	0.00775	0.0482**	0.0435***	0.0359***	0.0435***
	(6.85)	(10.45)	(6.90)	(2.66)	(0.58)	(2.65)	(6.00)	(9.47)	(6.00)
$(I/K)^2_{it}$	1.640***	1.500***	1.640***	1.680***	1.571***	1.679***	1.644***	1.513***	1.644***
	(407.38)	(382.13)	(407.35)	(137.50)	(61.57)	(137.19)	(373.09)	(333.58)	(372.97)
$(CF/K)_{it}$	-0.0663***	-0.104***	-0.0665***	-0.0484***	-0.115***	-0.0487***	-0.0662***	-0.103***	-0.0665***
	(-53.32)	(-113.95)	(-53.47)	(-12.46)	(-13.91)	(-12.42)	(-49.27)	(-101.56)	(-49.44)
$(CF/K)_{it-1}$	0.0474***	0.0765***	0.0473***	0.0342***	0.0592***	0.0348***	0.0471***	0.0752***	0.0471***
	(50.19)	(98.89)	(50.16)	(11.80)	(18.96)	(12.09)	(46.25)	(89.79)	(46.27)
$\text{LERNER}_{jt}*(CF/K)_{it}$	-0.000104***	0.000271***	0.000169**	-0.00431	0.000921	0.00201	-0.000101***	0.000281***	0.000145**
	(-7.34)	(4.07)	(3.07)	(-1.35)	(0.71)	(1.18)	(-6.81)	(4.17)	(2.70)
$\text{LERNER}_{jt-1}*(CF/K)_{it}$	0.0000941***	-0.000211***	-0.000148**	0.00407	-0.000229	-0.00209	0.0000910***	-0.000224***	-0.000125**
	(8.70)	(-3.75)	(-2.99)	(1.29)	(-0.17)	(-1.26)	(8.24)	(-3.98)	(-2.58)
$(I/K)_{it-1}*(CF/K)_{it}$		0.000118***	0.000104***		0.00120***	0.000467		0.000103***	0.0000846***
		(6.32)	(4.28)		(3.41)	(0.37)		(5.43)	(3.61)
$(I/K)^2_{it}*(CF/K)_{it}$		0.0000877***	0.0000710***		0.00121***	-0.00129		0.0000857***	0.0000617***
		(6.38)	(4.88)		(4.99)	(-1.62)		(6.09)	(4.38)
$(C(L)/L)_{jt}$	-2.194***	-3.504***	-2.187***	0.481	-5.576***	0.591	-2.223***	-3.671***	-2.222***
	(-14.09)	(-28.85)	(-14.04)	(0.81)	(-7.31)	(1.00)	(-13.61)	(-28.04)	(-13.60)
$(Y/K)_{it}$	-0.000651***		-0.000647***	-0.00088***		-0.000877***	-0.000636***		-0.000631***
	(-19.04)		(-18.90)	(-8.76)		(-8.71)	(-17.31)		(-17.18)
$(FE/TA)_{it}$	0.454***		0.458***	0.397		0.400	0.343*		0.352*
	(3.60)		(3.63)	(1.35)		(1.36)	(2.40)		(2.46)
$(B/K)^2_{it}$	1.62e-13*		-2.18e-13	-1.39e-08		-0.00000011*	1.59e-13		-1.24e-13
	(1.97)		(-1.47)	(-1.30)		(-2.56)	(1.92)		(-0.85)
$(r^B/TA)_{it}$	-0.790***		-0.793***	-0.741*		-0.721*	-0.668***		-0.677***
	(-5.97)		(-6.00)	(-2.34)		(-2.29)	(-4.48)		(-4.54)
Obs	232,926	348,315	232,926	27,381	36,003	27,381	205,545	312,312	205,545
F-test (p-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Notes: *, **, *** statistically significant at the 10, 5 and 1% level, respectively.

Table 7: Robustness check. Measures with concentration indices: HHI, C3, and C5.

Dependent variable: rate of investment $(I/K)_{it}$.
T-statistics in parentheses (White (1980) heteroskedasticity-robust standard errors).
Arellano and Bond (1991) dynamic panel data regression.

	Complete sample			Large firms			Small and medium-sized firms		
Intercept	-0.602***	-0.590***	-0.584***	-0.561***	-0.576***	-0.551***	-0.600***	-0.591***	-0.587***
	(-62.58)	(-40.37)	(-47.32)	(-18.31)	(-13.39)	(-15.31)	(-58.71)	(-37.88)	(-44.37)
$(I/K)_{it-1}$	1.621***	1.631***	1.619***	1.725***	1.786***	1.724***	1.602***	1.608***	1.601***
	(96.61)	(69.42)	(83.12)	(28.58)	(20.19)	(24.34)	(91.11)	(65.93)	(78.52)
$(FE/TA)_{it-1}$	1.115***	1.400**	0.891*	0.875	-0.0357	-0.297	1.164***	1.626**	1.084**
	(3.61)	(3.01)	(2.36)	(1.11)	(-0.03)	(-0.31)	(3.45)	(3.17)	(2.61)
$(FE/TA)_{it-2}$	-0.568	-0.701	-0.631	-1.198	-0.754	-1.634	-0.448	-0.671	-0.476
	(-1.85)	(-1.46)	(-1.63)	(-1.64)	(-0.60)	(-1.56)	(-1.33)	(-1.30)	(-1.14)
$(r^B/TA)_{it-1}$	0.462	0.161	0.500	0.567	0.154	0.939	0.322	0.0382	0.332
	(1.23)	(0.29)	(1.09)	(0.55)	(0.10)	(0.77)	(0.79)	(0.06)	(0.67)
$(r^B/TA)_{it-2}$	1.051**	1.171*	1.107*	0.850	1.728	1.946	1.001*	1.065	0.951
	(2.88)	(2.08)	(2.43)	(0.87)	(1.13)	(1.51)	(2.54)	(1.77)	(1.95)
HHI_{jt-1}	0.468			0.509			0.421		
	(1.95)			(0.74)			(1.66)		
HHI_{jt-2}	-0.367			-0.652			-0.393		
	(-1.73)			(-1.08)			(-1.74)		
$C5_{jt-1}$		-10.39**			-15.40			-9.271*	
		(-2.60)			(-1.22)			(-2.22)	
$C5_{jt-2}$		12.46*			21.06			12.06*	
		(2.53)			(1.39)			(2.33)	
$C3_{jt-1}$			-11.74**			-8.217			-11.11**
			(-3.09)			(-0.76)			(-2.76)
$C3_{jt-2}$			10.28*			6.154			10.22*
			(2.37)			(0.52)			(2.21)
$(C(L)/L)_{jt-1}$	-1.697**	-2.296**	-2.381**	-3.146	-3.874	-2.838	-1.641*	-2.300**	-2.417**
	(-2.63)	(-2.71)	(-2.90)	(-1.76)	(-1.50)	(-1.16)	(-2.38)	(-2.58)	(-2.78)
$(C(L)/L)_{jt-2}$	0.406	-6.279	-4.890	-7.601	-15.65	-15.48	0.0395	-5.313	-3.977
	(0.12)	(-1.63)	(-1.30)	(-0.78)	(-1.40)	(-1.43)	(0.01)	(-1.30)	(-1.00)
$(CF/K)_{it-1}$	0.154***	0.155***	0.156***	0.134***	0.132***	0.139***	0.156***	0.158***	0.158***
	(34.73)	(23.48)	(28.99)	(10.48)	(6.82)	(9.10)	(33.40)	(22.67)	(27.77)
$(I/K)^2_{it-1}$	-2.887***	-2.892***	-2.884***	-3.065***	-3.119***	-3.067***	-2.859***	-2.860***	-2.856***
	(-101.53)	(-72.32)	(-86.83)	(-30.23)	(-20.92)	(-25.62)	(-96.21)	(-69.05)	(-82.35)
$(Y/K)_{it-1}$	0.0405***	0.0408***	0.0404***	0.0416***	0.0427***	0.0414***	0.0403***	0.0405***	0.0402***
	(107.55)	(76.04)	(90.29)	(34.62)	(24.87)	(30.74)	(101.45)	(71.71)	(84.84)

$(B/K)^2_{it-1}$	1.90e-12	8.71e-12***	8.79e-12***	3.17e-11***	3.16e-12**	2.59e-12*	1.83e-12	8.67e-12***	8.75e-12***
	(0.76)	(4.85)	(4.97)	(10.04)	(2.85)	(2.46)	(0.74)	(4.84)	(4.98)
$Crisis_t$	-0.0234***	-0.0160*	-0.0112*	-0.0286*	-0.0572*	-0.0289	-0.0213***	-0.0147*	-0.0110
	(-6.28)	(-2.39)	(-2.08)	(-2.22)	(-2.45)	(-1.54)	(-5.45)	(-2.10)	(-1.96)
MA_{jt}	-0.00434	-0.0160	-0.0156	0.000251	-0.000336	0.00874	-0.00492	-0.0175	-0.0175*
	(-0.71)	(-1.86)	(-1.85)	(0.01)	(-0.01)	(0.30)	(-0.77)	(-1.95)	(-1.99)
Obs	218,607	107,289	151,542	24,859	11,214	16,491	193,748	96,075	135,051
Wald test (p-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sargan test (p-value)	0.0000	0.0000	0.0000	0.0000	0.0006	0.0000	0.0000	0.0000	0.0000
m1 (p-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
m2 (p-value)	0.1988	0.9721	0.1638	0.1910	0.4726	0.5111	0.2343	0.9138	0.2054

Notes: *, **, *** statistically significant at the 10, 5 and 1% level, respectively.

Appendix A: solving Euler's equation.

The firm's revenue function (3) is differentiated with respect to investment (*I*) and capital (*K*), in order to obtain the following first-order conditions:

$$\left(\frac{\partial \Pi}{\partial I}\right)_t = -b\alpha p_t \left(\frac{I}{K}\right)_t + bc\alpha p_t - p_t^I \qquad (13)$$

$$\left(\frac{\partial \Pi}{\partial K}\right)_t = \alpha p_t \left(\frac{Y}{K}\right)_t - \alpha p_t \left(\frac{\partial F}{\partial L}\frac{L}{K}\right)_t + b\alpha \left(\frac{I}{K}\right)_t^2 - bc\alpha p_t \left(\frac{I}{K}\right)_t \qquad (14)$$

where the price elasticity of demand is given by $= 1 - (1/\varepsilon) > 0$, with $\varepsilon > 1$ .The Euler equation characterizing the optimal investment path is given by

$$(1-\delta)\beta'_{t+1} E\left[\frac{\partial \Pi}{\partial I}\right]_{t+1} = -\left(\frac{\partial \Pi}{\partial I}\right)_t - \left(\frac{\partial \Pi}{\partial K}\right)_t - \nu_t \left(\frac{B}{K}\right)^2 \qquad (15)$$

We isolate the price of investment goods (P_t^I) which constitutes a nexus variable in our theoretical reasoning. To the best of our knowledge, this is the first paper that isolates the price of investment goods to study the factors affecting firm investment financing. The debt term $(B/K)^2$ represents the loans borrowed by the firm (*B*) to the stock of capital (*K*) and controls for non-separability between investment and borrowing decisions; it is eliminated under the Modigliani and Miller (1958) debt irrelevance theorem ($\nu_t = 0$).

Appendix B: Computing the Lerner index.

The computation of the marginal cost (C'_{jt}) of the Lerner index given in expression (11) is based on the specification of the following translog cost function:

$$\ln C_{jt} = \alpha_0 + \ln TA_{jt} + \tfrac{1}{2}\alpha_k (\ln TA_{jt})^2 + \sum_{h=1}^{3}\beta_h \ln w_{hjt} + \tfrac{1}{2}\sum_{h=1}^{3}\sum_{k=1}^{3}\beta_{hk}\ln w_{hjt}\ln w_{kjt}$$
$$+ \tfrac{1}{2}\sum_{h=1}^{3}\gamma_h \ln TA_j \ln w_{hjt} + \mu_1 Trend + \mu_2 \tfrac{1}{2} Trend^2 + \mu_3 Trend \ln TA_j \qquad (16)$$
$$+ \sum_{h=1}^{3}\lambda_h Trend \ln w_{hjt} + \ln u_j$$

where C_{jt} is a bank's total cost (financial and operating costs), TA_{jt} is total assets, and w_{jt} the cost of inputs (labour, capital, and the cost of deposits). We include the variable *Trend* to control for technological changes over time. A system of factor demand (share) equations is derived, according to Shephard's lemma, as:

$$\frac{\partial \ln c_j}{\partial \ln w_{hj}} = m_{hjt} \equiv \beta_h + \sum_{j=1}^{3} \beta_k \ln w_{kjt} + \tfrac{1}{2}\gamma_h \ln TA_{jt} + \lambda_h Trend \qquad (17)$$

where m_{hjt} is the cost share of factor *h* for bank *j* in period *t*.

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