Real and Financial Effects of Credit Shocks: Evidence from Medium-Sized Firms in Colombia

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Abstract

This paper estimates how temporary credit shocks affect medium-sized firms decisions using a firm-bank matched dataset from Colombia. To deal with the endogeneity between firm decisions and credit I use firm exposure to banks involved in a merger as an exogenous shock to credit supply. First, I show that firms that receive credit from banks involved in a merger experience a significant reduction in their outstanding level of credit after the merger. Interestingly, results suggest that acquirer and target banks reduce lending to firms by a similar amount. In a second stage, I show that credit negative shocks decreases investment by firms, with an elasticity close to one, which suggest that firms are credit constrained. Firm efficiency, as measured by earnings, is also affected by credit availability but not through revenue. I investigate how firms try to manage the financial constraints, finding that credit availability affects inventory decisions, and the provision of trade finance to firm's clients. I don't find a relation between credit and credit obtained from suppliers or through other accounts payable. Overall, the results suggest that credit availability determines significantly real and financial decisions of Colombian firms.

1 Introduction

Limited access to resources and financial frictions are widely accepted as important constraints for the performance of firms. Departing from a Modiagliani-Miller view of the world, a firm's financial structure and its decisions, notably investment spending, can become interrelated. Investment becomes sensitive to the availability of internal or external financing. Empirically it is not trivial to disentangle availability of either source

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of finance and investment. Understating financial frictions and its implications for firms is specially important in developing countries, where the development of the financial system is limited. For instance, Rajan and Zingales (1998) have shown that the performance of industries that rely intensively on the availability of external financing is strongly related to the development of financial system of countries. Hence, capital intensive firms have more difficulty to perform in such environments.

Despite the importance of financial frictions for firm's growth, microeconomic evidence on firms in developing countries is scarce. Data availability has constrained the research in this area: Most of the literature has focused on large corporations in developed countries or uses data that comes from studies of specific sectors (e.g. farming and manufacturing of small firms) or settings (e.g. rise and effectiveness of micro finance).[1] The goal of this paper is to provide evidence of the importance of financial constrains for medium sized firms in a developing country and how they affect the decisions of firms regarding investment and its financial management.

The empirical challenge for studying, for instance, the relation between firm's investment decisions and its funding is that the the two are interrelated. In economics jargon, investment and its financing are endogenous. A firm with a new investment project (positive net present value, NPV) can finance it with a mix of internal or external resources. The identification problem is that both internal and external funds depends on the NPV of the firm's project portfolio, which is not observable. The approach followed in the literature has been to identify exogenous shocks that affect the availability of internal or external financing that are not related to the NPV of the firm.

Papers approaching the problem from the side of internal finance build mostly on the

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[1]Notable exceptions are Paravisini (2008), Paravisini et al. (2011), and Banerjee and Duflo (2013). Among papers using data from developed countries, a non-exhaustive list would include Blanchard et al. (1994) Lamont (1997) Peek and Rosengren (1997, 2000), Rauh (2006) Gan (2007) and Amiti and Weinstein (2011). Estimates of the effect of credit constrains for farmers or microforms include papers by Rosenzweig and Wolpin (1993), McKenzie and Woodruff (2008) and De Mel et al. (2009b); de Mel et al. (2009a).

neoclassical framework proposed by Hayashi (1982) and Fazzari et al. (1988). Using a simple production function, Fazzari et al. (1988) suggest that NPV should be the only determinant of investment. If internal funds are less costly than external ones, the availability of liquidity should influence investment beyond the NPV. The empirical problem with this approach is that the NPV of the firm is not observable and that it is correlated with the cash-flow of firms. This measurement error would provide upward biased estimates of the importance of internal cash flows for investment. To improve on this, Blanchard et al. (1994) and Lamont (1997) proposes the use of exogenous variation of cash flow availability to finance new investments. Blanchard et al. (1994) study firms that received unexpected windfalls of cash after winning big lawsuits. The authors suggest that firms mostly used the resources for corporate acquisitions rather than to invest in new projects. The concern is that they only use 11 observations. Lamont (1997) examines investment by non-oil subsidiaries of oil companies when oil prices declined in 1986. Results show that non-oil subsidiary investment declined significantly after the oil shock, which the author suggest is not related to the NPV of these subsidiaries. Although a contribution, this paper has two shortcomings. First, a limited sample of 26 observations does not provide much statistical power, and arguably the sample used is not representative of other firms. Second, and most importantly, his empirics show that non-oil subsidiary investment declined, especially when those subsidiaries were being heavily subsidized by the parent companies. This suggest over investment by the subsidiaries, as opposed to under-investment. Presumably, reduction of internal finance was economically efficient in this cases. A more recent contribution is Rauh (2006) who uses mandatory contributions to defined benefit pensions plans as a exogenous variation that constraints the use of internal finance for new investment projects. Improving on the previous papers, Rauh (2006) uses over 1,500 firms (over 8 thousand observations). He exploits the structure of legal contribution requirements which have sharp non-linearities. The findings, which are representative of large corporations in the US, suggest a large sensitivity of firm's investment decisions to cash flows.

The alternative approach has been to identify exogenous shocks to the availability of

external finance. The challenge is to find constraints that affect, for instance, the ability of banks to lend but that are not correlated to the NPV of the firms. A non-exhaustive classification of the literature could separate papers in to two groups: 1) paper exploiting shocks to the "financial health" of banks, and 2) those exploiting policy interventions to credit supply.

Representative papers of this first group of papers are Peek and Rosengren (1997, 2000), Gan (2007), Khwaja and Mian (2008), Amiti and Weinstein (2011), and Paravisini et al. (2011). The idea of Peek and Rosengren (1997, 2000) and Gan (2007) is to exploit shocks to the Japanese capital markets or real estate market, respectively, as an exogenous limitation to the ability of Japanese banks lending in the US markets. The finding of these papers is that banks significantly cut lending to firms, affecting their investment. Similarly, Khwaja and Mian (2008) provide convincing evidence in Pakistan that deteriorations in bank health or increases in the cost of raising capital cause banks to contract lending. Amiti and Weinstein (2011), and Paravisini et al. (2011) investigate how the financial health of banks affected the performance of exporting firms in Japan and Peru, respectively. Arguably, exporting firms rely more intensively than other firms on external financing because of the delay between shipments and payments. Both papers find significant effects of credit on firm performance: a 1% increase in credit increases exports by 0.08% in Japan and 0.25% in Peru.

A second strand of the literature has identified policy interventions affecting the supply of credit to firms. Using data from Argentina, Paravisini (2008) analyzes a lending program introduced by the IADB designed to spur lending to small firms. The program allocated more funds to applicant firms that lent in poorer regions and that provide smaller average loans. Subsidized funding modified the cost of capital to firms. Banerjee and Duflo (2013) study a targeted lending program in India which required banks to allocate a significant fraction of its lending portfolio to some firms. The identification strategy used by the authors is to exploit modifications to the eligibility rule across firms and time. The authors find that availability of bank credit was not used to substitute other forms of credit, and that it was used to finance more production by firms. The acceleration of the sales and profit growth rates of of eligible firms suggest that firms

where severely credit constrained.

This paper proposes the use of bank mergers as shocks to the bank ability to supply credit. This shock, arguably, is not correlated to the NPV of the firm's projects and its investment decisions.[2] The importance and value of lending relations prevent firms from rapidly substituting their providers of credit when the supplier bank experiences a temporary shock. Hence, those firms that have significant exposure to merging banks may experience a temporary reduction in their outstanding level of credit. Using a firm-bank matched dataset of medium-sized firms from Colombia, I show that bank credit decreased for those firms that had a significant lending relation with banks involved in a merger. Interestingly, the reduction of credit was of the same order of magnitude for firms supplied by the target bank or acquirer bank. This clears the potential reverse causality concern that firm performance could have affected the ability of target banks to lend, motivating its acquisition by a larger bank. Unfortunately the data does not contain information that would have allowed us to investigate prices charged by banks. Using the instrumented credit provision, I investigate how credit affected firm decisions regarding investment and the management of its internal finance.

The results indicate that firms are highly responsive to credit availability. In estimates controlling for firm and time fixed effects, credit-investment elasticity ranges from 0.8 to 1.8. This large sensitivity of investment to credit suggest that firms are severely credit constrained. Regarding firm performance, I find that credit affects the firm's ability of becoming more profitable by increasing its earnings, but not through the firm's ability to sell more (credit-sales elasticity is statistically zero, while credit-EBITDA elasticity is close to 0.5). Analyzing the management of financial resources of the firm, I find that credit availability significantly increases the provision of credit for clients, and larger

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[2]Certainly, I'm not the first to use analyze the impact of bank mergers on the credit supply to firms. However, I'm not aware of other papers using mergers as an instrument in a first stage regression, and then analyzing in a second stage how credit affects investment or performance of firms. Recent papers exploring whether firms experience an increase in the interest rates charged, a reduction of credit supplied or whether the relation is dropped after a merger of banks include Sapienza (2002), Karceski et al. (2005), Bonaccorsi Di Patti and Gobbi (2007) and Degryse et al. (2010).

inventories. I don't find any change in the ability of the firm to modify the credit obtained from its suppliers or other accounts payable. Not surprisingly, I find that dividend payments are highly dependent on credit availability which suggest a strong substitution of internal and external finance.

Some of the findings in this paper contrast with those of Banerjee and Duflo (2013) that find that credit has a strong impact on firm sales. The difference probably comes from the fact that I exploit a temporary shock to banks, while they make use of a intervention that changed permanently the availability of credit. Both papers conclude that bank credit availability is substituted for other forms of external finance.

## 2 Institutional details and data

2.1 Credit Market in Colombia

The Colombian financial system had its most important phase of growth between 1991 and 1997, coinciding with the growth of the economy and the strong inflow of foreign capital. In 1995 for example domestic credit increased by 20% in real terms.[3]

As has been the case of lending booms in other countries, this rapid growth of credit was not properly supervised by the authorities, lacking appropriate monitoring the quality of the lending portfolio.[4] This resulted in the deterioration of financial indicators such as profitability, liquidity, and creditworthiness, which was aggravated by continued increases in interest rates as the central bank dealt with the early signs of the Asian crisis. Figure 1 shows the evolution of credit and investment in Colombia. During the late 1990's there was a collapse in investment which was accompanied by a sharp reduction of credit. Domestic credit to the private sector as a share of GDP decreased from 35% in 1997 to 22% in year 2000.

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[3]The following section draws extensively from Estrada (2005) and ANIF (2006).
[4]See for instance Estrada and Gutiérrez (2008).

Figure 1: Credit and Investment

(a) Credit   (b) Investment
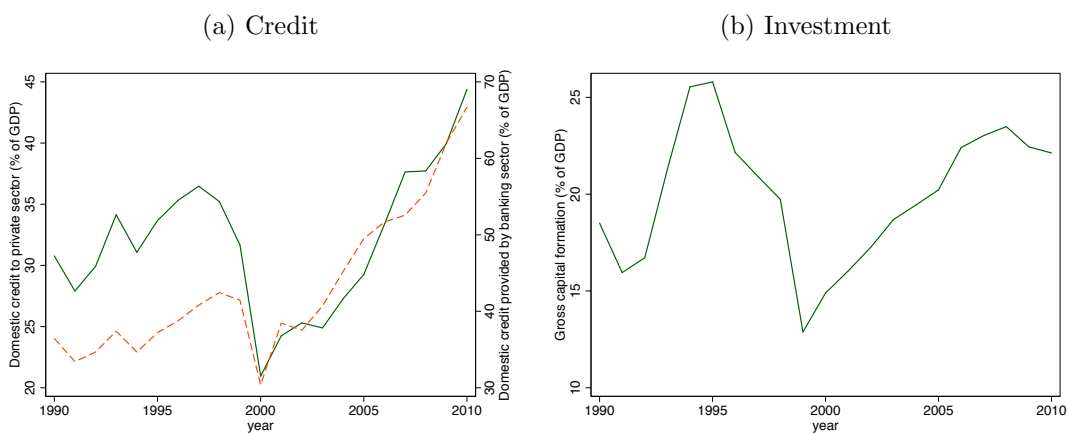
Source: World Development Indicators (WDI 2013). Panel 1a shows domestic credit to private as share of GDP (solid line) and domestic credit provided by banking sector as share of GDP (dash line). Panel 1b shows the gross capital formation as a share of GDP.

As a result, Colombia experienced an accelerated process of financial consolidation. In 1995 there were 485 entities authorized to make loans; by 1999 there were 89. Most small actors, under the legal form of Financial or Savings corporations (CFC and CAV, by their acronym in Spanish), were acquired by other entities or liquidated by the regulator. In many aspects this financial crisis was similar to the US Savings and Loans crisis of the early 1990s.

During the 2000s there was a second round of financial consolidation. Mergers and acquisitions amounted to 10 mergers of banks from 2005 to 2007. This paper focus on these bank mergers, neglecting the acquisitions of other lending institutions like leasings or factorings. Table 1 presents a summary of these mergers.[5] Corfinsura, which was not technically a deposit taking bank, is included in the list because many firms in the dataset report obtaining credit from this institution. The empirical strategy, explained in detail below, is to exploit the fact that mergers introduce a temporary disruption to

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[5]In 1999 there were two bank mergers that are excluded from Table 1 and from the analysis. These are the mergers of Banestado acquiring Uconal (August 1999) and Megabanco acquiring Coopdesarrollo in November of 1999. The focus of these banks was mortgage and micro finance business, not engaging in commercial lending. In fact, in the dataset there are no firms obtaining credit from Coopdesarrollo or Uconal.

organizations, affecting its ability to perform their core business.[6]

Table 1: Bank Mergers

	Target Bank		Acquirer bank		
Official Date	Code	Name	Code	Name	Dataset
(1)	(2)	(3)	(4)	(5)	(6)
3/1/05	5	Bancafe	50	Granbanco	2005q1
6/1/05	29	Tequendame	12	GNB Sudameris	2005q1
6/1/05	46	Banco Colmena	30	BCSC	2005q1
7/1/05	47	Banco Conavi	7	BanColombia	2005q2
7/1/05	18	Corfinsura	7	BanColombia	2005q2
5/1/06	45	Banco Granahorrar	13	BBVA	2006q1
5/1/06	34	Bansuperior	39	Davivienda	2006q1
6/1/06	22	Union Colombiano	23	Occidente	2006q1
11/1/06	44	Megabanco	1	Banco de Bogota	2006q3
9/1/07	50	Granbanco	39	Davivienda	2007q2

Source: Superintendencia Financiera de Colombia. Column (1) indicates the official date in which the target bank was absorbed by the acquirer bank. Columns (2) and (3) indicate the code and name of the target bank and (4) and (5) indicate the code and name of the acquirer bank. Column (6) shows the last quarter in which the dataset contains loans supplied by the target bank.

2.2   Data

The firm-bank matched dataset used in this paper is the result of merging data from two different sources: firm financial statements from the Superintendencia de Sociedades de Colombia (SSC) and bank lending to firms from the Superintendencia Financiera de Colombia (SFC).

The SSC is the bankruptcy agency of Colombia. To fulfill its overseeing duty it requires a sample of firms in Colombia to submit their financial statements at the end of each year. The universe of firms from which the sample is taken are those firms that have income or assets above US $9 million. Firms that are regulated by another government agency are excluded from this requirement. This excludes from the database utilities, oil companies, financial institutions, and firms that issued equity or debt (bonds

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[6]As an example of the importance of the disruption caused by bank mergers, Deloitte published a report with advise and suggestions for banks on how to avoid negative effects for bank clients and minimize customer attrition (see Deloitte (2010)).

or commercial paper) in the domestic capital market. The financial statements of sampled firms (balance sheet and cash flow) are publicly available for consultation.[7] The resulting sample is not representative of the all firms in Colombia, but it is intended to provide an accurate depiction of medium-sized firms.

The SFC requires banks to report monthly the outstanding credit supplied to every firm with the purpose of monitoring the exposure of banks across firms, sectors and geographical regions. Using the tax identification of firms in the SSC database, the SFC matched the credit supplied by each financial institution in Colombia.

The resulting dataset contains information on the total credit supplied by banks to firms with quarterly frequency, while the financial statements of firms is only available at the end of the year (fourth quarter).[8] The credit outstanding is an aggregation of all possible loans to the firm: credit lines, letters of credit, credit for investments, corporate credit cards, etc. The dataset does not contain information on the interest rate charged to the firm nor the number of employees of the firm.[9]

3   Empirical Strategy

The empirical challenge for studying the relation between firm decisions, notably investment but also productivity, pricing and employment, and its financing through internal or external funds, is that all of these decisions are endogenous. In short, the challenge is to disentangle supply and demand of investment opportunities and financial shocks.

Investment and credit are explained by the NPV of the firm's project portfolio. Better projects (higher NPV) induces higher firm investment and should increase the willing-

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[7]http://sirem.supersociedades.gov.co/Sirem2/

[8]A similar dataset is used by the Banco de la Republica (Colombia's Central Bank) to track credit flow across industries and geographical regions.

[9]The number of employees are reported to the SSC in one of the annexes to the financial statements. When the SFC merged the two datasets it did not include data from the annexes. Reportedly, there are many problems with the employment figures. According to an analyst of the SSC, the aggregate employment reported by firms adds to a number larger than the total population of the country.

ness of banks to lend (assuming that the screening process of the bank allows it to form a good guess of the NPV of the project). Increased credit supply should induce higher investment (replacing the use of firm internal funds), while higher investment, holding constant the NPV of the project, should reduce the willingness of the bank to finance the investment. Thus, a *naive* OLS estimation of the relation between investment and credit would provide a biased estimate. To solve this difficulty we need a exogenous shock (instrument) affecting the availability of financing that is not correlated to the firm's NPV, cash-flow, or investment.

This paper proposes bank mergers as an instrument that affects the ability of banks to supply credit. Mergers are disruptive events that affect negatively the internal dynamics of organizations and have impact on their performance.[10] As stressed by the "Lending Relations literature"[11], firms would find difficulties to immediately switch and demand credit from other banks. Thus, if mergers affect the performance of banks we should observe a reduction of outstanding credit allocated to firms. Arguably, bank mergers do not affect NPV of the projects or the cash flow of the firm meeting the exclusion restriction needed for an instrument.

The empirical strategy of this paper can be summarized by the following Instrumental

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[10]The academic literature on the value gains from bank mergers creates a troubling paradox. Empirical studies examining the stock market reaction to merger announcements find little evidence of wealth creation, with shareholders of the acquired firm gaining at the expense of shareholders of the acquiring firm. Houston et al. (2001) reviews the literature and provide an in depth analysis of the value creation from bank mergers. It provides an interesting quote: *"In spite of these opportunities to create value, implementing these actions is not problem-free. Conflicts over "who is in charge" can delay cost-cutting efforts, and reluctance to lay off staff can eliminate large cost-cutting opportunities. The integration process can also result in losses of bank customers and significant "restructuring costs" such as severance payments and lease buyouts. Customer run off and integration costs can be magnified when computer glitches slow down the integration process and cause disruption in customer service. Additionally, promised revenue enhancements might not materialize if customers rebel against fee increases or are not interested in the new services offered by an acquiring bank"* (see The American Banker, December 9, 1997, p. 25).

[11]See for instance Petersen and Rajan (1994), Petersen and Rajan (1995), Degryse and Ongena (2005) and De la Torre et al. (2010), among other papers.

Variables (IV) system of equations:

$$log(\text{credit})_{i,t} = \alpha \times (\text{Exposed to merger})_{i,t} + \eta_i + \mu_t + \epsilon_{i,t} \qquad (1)$$

$$log(\text{investment})_{i,t} = \beta \times log(\text{credit})_{i,t} + \gamma_i + \lambda_t + u_{i,t} \qquad (2)$$

where i indexes firm and t indexes time; $\text{credit}_{i,t}$ is the total credit that firms receive from the formal banking system in Colombia. Exposed to $\text{merger}_{i,t}$ is a variable that indicates whether the firm has significant lending relation with a bank involved in a merger. Below the definitions used to measure lending relations are explained. In equation (2) $\text{investment}_{i,t}$ is represents the purchases of properties, machinery and equipment done by the firm during year t.[12] Parameters η_i, μ_t, γ_i and λ_t denote firm and time fixed effects.

If mergers affect the ability of banks to perform, in equation (1) coefficient α is expected to be negative. Notice that since the proposed equation controls for firm and year fixed effects, I am effectively controlling for firms characteristics like industry capital intensity, and business cycle. Results shown below confirm our hypothesis that, when firms are exposed to a mergers, firms experience a significant reduction in their credit.

Equation (2) measures the impact of credit availability over firm investment. In this equation credit is instrumented by (1). Since it is a log-log regression, β provides a estimate of the credit-investment elasticity.

3.1 Exposed to bank mergers

The empirical strategy requires identifying firms that may be affected by bank mergers. For this I need to define 1) a measure of lending relations between firms and banks, and 2) what is to be significantly exposed to a credit reduction.

To proxy for the lending relation I calculate for every firm i the share of its credit

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[12]The focus in this paper is investment defined as purchase of properties, machinery, and equipment. This definition abstracts from financial investments, and does also not consider the sale of assets.

that comes from each bank j. Specifically, I calculate the three-quarter moving average of the credit share. This is denoted as $S^3_{j\to i}$.

A significant concentration of a firm's credit supply is needed to experience a significant reduction in its ability to secure financing if the supplier experiences a negative shock. Small exposures to a bank should not represent a limitation for the firm, since its relying on other providers for credit. But as importance of the lending relation (higher concentration) is increased, firms should have more difficulty in securing credit. Hence,the negative impact effect is expected to be non-linear. For this reason estimating equation (1) defining Exposed to merger$_{i,t}$ using $S^3_{j\to i}$ if bank j is involved in a merger and zero otherwise should provide a noisy estimate. To deal with the non-linearity I experimented defining exposure as a discrete variable using different thresholds. Formally,

$$\text{Exposed}^k_{i,t} \begin{cases} 1 & \text{if } \left(\sum_{j\in J} S^3_{j\to i}\right) \geq k \\ 0 & \text{otherwise} \end{cases} \tag{3}$$

where k is a threshold (i.e. 10%, 20%, etc.) and J is set of banks that merge at time t. Alternatively, I also define;

$$\text{Exposed to Target}^k_{i,t} = \begin{cases} 1 & \text{if } \left(\sum_{j\in T} S^3_{j\to i}\right) \geq k \\ 0 & \text{otherwise} \end{cases}$$

$$\text{and} \tag{4}$$

$$\text{Exposed to Acquirer}^k_{i,t} = \begin{cases} 1 & \text{if } \left(\sum_{j\in A} S^3_{j\to i}\right) \geq k \\ 0 & \text{otherwise} \end{cases}$$

where T and A is the set of target and acquirer banks at time t respectively.

Table 2 present a description of the number firms classified as exposed or not exposed using the definitions of equations (3) and (5) and setting the threshold k to 40% and

50%. For instance, using $k = 40\%$ in 2005, $5,066$ firms classify as not exposed and $1,234$ firms as exposed to bank mergers. Notice that summing the number of firms exposed to a target bank plus those exposed to an acquirer bank should not equate the number of exposed firms since its possible to have firms being part of the previous sets.

Table 2: Firms exposure to bank mergers

	Exposed $\geq 40\%$				Exposed $\geq 50\%$			
	Not exposed	Target	Acquirer	Exposed	Not exposed	Target	Acquirer	Exposed
1998	3,778	0	0	0	3,778	0	0	0
1999	3,721	0	0	0	3,721	0	0	0
2000	4,549	0	0	0	4,549	0	0	0
2001	3,514	0	0	0	3,514	0	0	0
2002	4,658	0	0	0	4,658	0	0	0
2003	4,234	0	0	0	4,234	0	0	0
2004	4,869	0	0	0	4,869	0	0	0
2005	5,066	309	939	1,234	6,073	227	721	948
2006	5,766	186	1,991	2,162	7,779	149	1,521	1,666
2007	7,915	154	81	235	8,038	112	69	181
2008	8,386	0	0	0	8,386	0	0	0
Total	56,456	649	3,011	3,631	59,599	488	2,311	2,795

Source: Shows for each year the number of firms classified as exposed or not exposed to a bank merger following the definitions of equations (3) and (5).

4   Results

This section presents the main estimates of the paper, starting with the results of estimating the first stage and then the real effect of credit shocks.

4.1   First stage: Validating the instrument

The empirical strategy of the paper relies on using the disruption originated in the bank merger as an exogenous shock to the credit supply of the firm. The results show that this hypothesis is supported by the data.

Table 3 shows estimates of equation (1). The estimates consider summarizing in one variable the exposure to a bank that merges (following equation (3)), independently of being the target or acquirer bank, or separating the exposure to the target or acquirer

bank following equation (5). Columns 1 and 2 present the estimates using the share of credit (not a discrete variable as proposed by (3) and (5)). As expected, the coefficient is small and statistically not different from zero. In column 3, where 'exposed' is defined if the firm receives 30% or more of its credit from a merging bank, I estimate that on average those firms experience a decrease of 8% in its outstanding level of credit. In column 4, where the effect coming from being exposed to a target or acquirer bank is separated, I confirm the magnitude of the shock. Interestingly the estimated coefficients of column 4 are of the same magnitude of those in column 2. Columns 4 to 8 repeat the exercise increasing the threshold k to 40% and 50%. The estimate of the decrease in credit increases monotonically.

Table 3: First Stage: Credit Reduction Bank Mergers

	Dep. variable: $log(\text{credit})_{i,t}$							
	Continuous		Credit $\geq$ 30%		Credit $\geq$ 40%		Credit $\geq$ 50%	
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposed	-0.0404		-0.0778***		-0.134***		-0.172***	
	(0.0424)		(0.0299)		(0.0331)		(0.0393)	
Exposed to target		0.0406		-0.0993*		-0.175**		-0.198**
		(0.0930)		(0.0547)		(0.0742)		(0.0899)
Exposed to acquirer		-0.0638		-0.0834**		-0.141***		-0.173***
		(0.0443)		(0.0326)		(0.0344)		(0.0401)
Obs.	60,087	60,087	60,087	60,087	60,087	60,087	60,087	60,087
R-squared	0.746	0.746	0.747	0.747	0.747	0.747	0.747	0.747
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Continuous		Credit $\geq$ 30%		Credit $\geq$ 40%		Credit $\geq$ 50%	

Notes: OLS estimation of equation (1). Standard errors in parentheses clustered at the 4-digit industry level. $***p < 0.001$, $**p < 0.05$, and $*p < 0.1$. Exposed indicates whether a firm has a lending relation with a bank involved in a event (as target or acquirer). Exposed to target and exposed to acquirer indicates whether the lending relation was with a target bank or an acquirer bank. Different definitions of the "exposition" variables are used; "continuous" defines the relation as the share of credit supplied by a bank involved in a merger in the three quarters before the event; "Credit $\geq$ X%" is a dummy that takes value 1 if the three-quarter average share of credit supplied by the bank before the event was greater or equal to 30%, 40% or 50%, respectively.

One concern in the estimation of (1) is that credit demanded by firms could depend on the availability of internal funds. For this reason, table 4 repeats the estimates of (1) controlling for the firm's cash flow in that period. The estimates confirm the findings; firms exposed to banks that merge experience a significant reduction in it's outstanding levels of credit.

Table 4: First Stage: Credit Reduction After Events (Controlling for Cash Flow)

	Dep. variable: $log(\text{credit})_{i,t}$							
	Continuous		Credit $\geq$ 30%		Credit $\geq$ 40%		Credit $\geq$ 50%	
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposed	-0.0387		-0.0762**		-0.133***		-0.170***	
	(0.0423)		(0.0297)		(0.0330)		(0.0392)	
Exposed		0.0395		-0.0987*		-0.175**		-0.199**
to target		(0.0933)		(0.0608)		(0.0743)		(0.0898)
Exposed		-0.0616		-0.0816**		-0.139***		-0.170***
to acquirer		(0.0442)		(0.0326)		(0.0343)		(0.0401)
Cash flow,	0.0185**	0.0185**	0.0184**	0.0184**	0.0183**	0.0183**	0.0183**	0.0183**
logs	(0.00808)	(0.00808)	(0.00808)	(0.00809)	(0.00809)	(0.00810)	(0.00809)	(0.00809)
Obs.	60,087	60,087	60,087	60,087	60,087	60,087	60,087	60,087
R-squared	0.747	0.747	0.747	0.747	0.747	0.747	0.747	0.747
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Continuous		Credit $\geq$ 30%		Credit $\geq$ 40%		Credit $\geq$ 50%	

Notes: OLS estimation of equation (1). Standard errors in parentheses clustered at the 4-digit industry level. $***p < 0.001$, $**p < 0.05$, and $*p < 0.1$. *Exposed* indicates whether a firm has a lending relation with a bank involved in a merger (as target or acquirer). *Exposed to target* and *exposed to acquirer* indicates whether the lending relation was with a target bank or an acquirer bank. Different definitions of the "exposition" variables are used; "continuous" defines the relation as the share of credit supplied by a bank involved in a merger in the three quarters before the event; "Credit $\geq$ X%" is a dummy that takes value 1 if the three-quarter average share of credit supplied by the bank before the event was greater or equal to 30%, 40% or 50%, respectively.

It is interesting to note that when being exposed to a target or to an acquirer bank that merges is distinguish, the coefficients are of the same order of magnitude. This provides an answer to two potential concerns. First, that the poor performance of the firms could have hurt the balance sheet of the bank (bad loan portfolio) forcing its owners to either increase capital or find an acquirer. The second concern is that a poorly perform-

ing bank could be providing inefficiently high levels of credit to bad firms. In such case, a new management from the acquirer bank would "efficiently" cut lending to firms from the target lending portfolio. The fact that the coefficient "exposed to acquirer" is of the same order of magnitude as the coefficient "exposed to target" suggest that the concerns mentioned do not hold in the data.

4.2   Second stage: Effect on firm decisions

The empirical strategy was first to isolate the observed level of credit from firms characteristics by using an instrument that affects the supply of credit. Nowthe real effect of credit shocks on firm decisions is explored.

Summarizing the results, I find that credit availability significantly affects investment levels, but that it does not have impact over the performance of the firm in terms of sales (operational income). The results suggest that credit availability has a positive effect on firm earnings (EBITDA). Regarding how the firm manages to finance the changes in credit availability, I find that credit availability does not alter the level of credit that the firm get from suppliers. Interestingly, I find that credit availability determines significantly the credit provided to the firm's clients.

4.2.1   Investment

Table 5 shows the results of estimating equation (2) using different definitions of the instruments in the first stage estimates, different thresholds for the exposition variables (k's), and by including or not the firm's cash flows of the period. The results suggest a significant effect of credit over firm investment levels.

When using $k = 40\%$ (columns 1 to 4 in Table 5), the estimates indicate a credit-investment elasticity in the range 1.4-1.9, meaning that a reduction of credit of 1% cuts investment more than one to one. This high elasticity suggest that firms are highly credit constrained. When using $k = 50\%$ (columns 5 to 8) the elasticity isclose to 1.

Table 5: Second Stage: Investment and Credit

| | Dep. variable: $log(\text{Investment})_{i,t}$ | | | | | | | |
| | Exposition $\geq 40\%$ | | | | Exposition $\geq 50\%$ | | | |
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Credit	1.891**	1.596**	1.630**	1.367**	1.017*	0.961*	0.815*	0.774*
	(0.749)	(0.646)	(0.728)	(0.630)	(0.578)	(0.554)	(0.491)	(0.470)
Cash Flows			0.371***	0.376***			0.386***	0.387***
			(0.0289)	(0.0276)			(0.0265)	(0.0263)
Observations	57,403	57,403	57,403	57,403	57,403	57,403	57,403	57,403
N. of firms	10,784	10,784	10,784	10,784	10,784	10,784	10,784	10,784
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Instrument	E	T+A	E	T+A	E	T+A	E	T+A

Notes: IV estimation of equation (2). Standard errors in parentheses clustered at the 4-digit industry level. $***p < 0.001$, $**p < 0.05$, and $*p < 0.1$. Credit and cash flow are in logs. Exposed indicates whether a firm has a lending relation with a bank involved in a event (as target or acquirer). Exposed to target and exposed to acquirer indicates whether the lending relation was with a target bank or an acquirer bank. In this table two different definitions of the "exposition" variables are used; "Credit $\geq$ X%" is a dummy that takes value 1 if the three-quarter average share of credit supplied by the bank before the event was greater or equal to 40% or 50%, respectively. "Instrument" indicates the variables used as instrument in the first stage equation; E denotes lending relation with a bank involved in a merger event, and "T+A" denotes the use of separate variables to control for lending relation with a target or acquirer bank.

4.2.2 Income and profits

Table 6 shows the results of estimating a modified version of the IV equation (2). I estimate,

$$log(\text{y})_{i,t} = \beta \times log(\text{credit})_{i,t} + \gamma_i + \lambda_t + u_{i,t} \tag{5}$$

where y is defined as either sales (operational revenue) or earnings (earnings before interest, taxes depreciation and amortization). The results shown in table 6 suggest that, at least in the short run, credit availability does not affect significantly the firm's ability to sell more, but it does affect its profits. In columns 1 to 4 the credit-revenue elasticity is estimated, which is found to be statistically zero. This result contrasts with the findings of Banerjee and Duflo (2013), that suggest that credit is important in India for

firm sales. In columns 5 to 8 estimates of the credit-profits elasticity are reported, which are significant at the 10% confidence level. My interpretation is that if credit does not affect the ability of firms to sell but does have an impact on profitability, presumably, the impact is through the increased costs of intermediate inputs. For instance, it may be possible that a shortage of credit may impede firms to purchase inputs paying cash, so they may end up paying higher prices to suppliers.

Table 6: Second Stage: Income and Earnings

	Dep. variable: $log(\text{Operational Income})_{i,t}$				Dep. variable: $log(\text{Ebitda})_{i,t}$			
	Exposition $\geq 40\%$		Exposition $\geq 50\%$		Exposition $\geq 40\%$		Exposition $\geq 50\%$	
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Credit, logs	0.158	0.153	0.144	0.148	0.511*	0.451*	0.491*	0.480*
	(0.177)	(0.161)	(0.162)	(0.159)	(0.310)	(0.273)	(0.290)	(0.291)
Observations	57,403	57,403	57,403	57,403	57,403	57,403	57,403	57,403
N. of firms	10,784	10,784	10,784	10,784	10,784	10,784	10,784	10,784
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Instrument	E	T+A	E	T+A	E	T+A	E	T+A

Notes: IV estimation of equation (5). Standard errors in parentheses clustered at the 4-digit industry level. $***p < 0.001$, $**p < 0.05$, and $*p < 0.1$. Exposed indicates whether a firm has a lending relation with a bank involved in a event (as target or acquirer). Exposed to target and exposed to acquirer indicates whether the lending relation was with a target bank or an acquirer bank. In this table two different definitions of the "exposition" variables are used; "Credit $\geq$ X%" is a dummy that takes value 1 if the three-quarter average share of credit supplied by the bank before the event was greater or equal to 40% or 50%, respectively. "Instrument" indicates the variables used as instrument in the first stage equation; E denotes lending relation with a bank involved in an merger event, and "T+A" denotes the use of separate variables to control for lending relation with a target or acquirer bank.

4.2.3   How firms deal with the credit shocks?

Experiencing changes to the availability of external finance may induce firms to modify some of their financial decisions. For instance, a reduction of credit may force firms to increase the credit received from it suppliers, to cut the credit line provided to its clients, or a combination of these two strategies.

Table 7 shows changes to financial decisions of firms depending on the availability of credit. In panel A exposed is defined as $k = 40\%$, and in panel B exposed is defined as $k = 50\%$. The estimates where done using two definitions of instruments for the first stage equation. On the asset side, the effect over working capital, credit to clients, and inventory is explored; while on the liabilities side what happens to other debts, credit to suppliers, accounts payable and dividends is studied.

The estimates suggest that there is a pass-through of credit available to the firm to its clients (Table 7 rows 2 and 9 in panels A and B). The estimates indicate that 1% increase of credit increases lending to clients by 0.3 to 0.4%. I find that credit availability to the firm does not change the amount that it gets from it suppliers (Table 7 rows 5 and 9 in panels A and B).

Credit availability also has a high impact on the dividends distributed by the firm. The estimates indicate that a 1% increase in credit rises the dividend payments in a range of 1.5 to 1.8 percent. This results suggest that the availability of external financing induces the firm to finance its needs for trade credit or investment, substituting the use of internal financing, which is returned to the owners of capital.

Table 7: Second Stage: Others

Panel A: Exposed $\geq 40\%$

		Instrument: E		Instrument: T + A	
		(1)		(2)	
	Dep. variable (logs)	Coefficient	S.E.	Coefficient	S.E.
(1)	Credit to clients	0.442***	(0.141)	0.383***	(0.120)
(2)	Inventory	0.480*	(0.296)	0.470*	(0.265)
(3)	Other debts	0.376	(0.496)	0.301	(0.448)
(4)	Credit from suppliers	0.437	(0.281)	0.392	(0.249)
(5)	Accounts payable	0.0160	(0.171)	0.0143	(0.153)
(6)	Dividends	1.801**	(0.789)	1.531**	(0.679)

Panel B: Exposed $\geq 50\%$

		Instrument: E		Instrument: T + A	
		(1)		(2)	
	Dep. variable (logs)	Coefficient	S.E.	Coefficient	S.E.
(1)	Credit to clients	0.360***	(0.114)	0.354***	(0.109)
(2)	Inventory	0.373*	(0.222)	0.386*	(0.234)
(3)	Other debts	0.648	(0.418)	0.608	(0.404)
(4)	Credit from suppliers	0.250	(0.237)	0.258	(0.229)
(5)	Accounts payable	0.00904	(0.148)	0.00604	(0.143)
(6)	Dividends	1.819***	(0.684)	1.772***	(0.656)

Notes: Coefficients reported correspond to the IV estimation of β in equation (5). All estimates use 57,403 observations (10,784 firms) and control for year and firm fixed effects. Standard errors in parentheses clustered at the 4-digit industry level. $***p < 0.001$, $**p < 0.05$, and $*p < 0.1$. Exposed indicates whether a firm has a lending relation with a bank involved in a event (as target or acquirer). Exposed to target and exposed to acquirer indicates whether the lending relation was with a target bank or an acquirer bank. In this table we use two different definitions of the "exposition" variables; "Credit $\geq$ X%" is a dummy that takes value 1 if the three-quarter average share of credit supplied by the bank before the event was greater or equal to 40% or 50%, respectively. "Instrument" indicates the variables used as instrument in the first stage equation; E denotes lending relation with a bank involved in a merger, and "T+A" denotes the use of separate variables to control for lending relation with a target or acquirer bank.

5 Conclusions

Credit availability affects significantly the real and financial decisions of firms. We find that firm investment is highly responsive to the supply of credit, but we don't find an impact on the sales of firms. We find, however, that it affects significantly the earnings of the firm. This suggest that fluctuations of credit affect the efficiency of the firms; for instance less credit may force to get credit from suppliers at a higher cost. Credit

also modifies the financial management of firms; credit availability to the firm increases lending to its customers and allows the firm to run a higher inventory.

The findings on changes to financial decisions of firms confirm that there exist significant financial frictions. More importantly, the estimated credit-investment elasticity above one suggest that firms are severely credit constrained, and that they have many investment projects that they would take if more external finance was available.

6 Appendix

6.1 Bancolombia, Conavi and Corfinsura

Bancolombia acquired Conavi, Bancolombia Corfinsura in July 2005. This merger increased the size of Bancolombia, which was already the biggest bank in term of assets. The merger complemented the different business lines of the banks. Bancolombia was focused in consumption loans, while Conavi was a medium sized bank focused in mortgage loans. Corfinsura had several different products, all aimed for small and medium businesses.

After the merger, Bancolombia reached 20% of total assets being located within the 15 largest banks of America. The bank also increased its participation in the commercial loans market, which reached 73% of its total loan portfolio.

6.2 Banco Caja Social and Colmena

The Banco Caja Social and Colmena announced their merger in late 2005. The two entities were part of the holding Fundacion Social and participated in the lending market through different legal arrangements. The new entity has its niche on small loans like those for micro and small-medium firms, contractors and the housing market in general. Before the merger both banks had different core businesses. Mortgage loans were 64% of Colmena's total loans, while Banco Caja Social had micro lending and consumer credit representing 74% of its portfolio.

6.3 Davivienda and Banco Superior

At the end of year 2004 Davivienda, the fifth largest bank in Colombia, announced the acquisition of BanSuperior. This merger, completed at the end of 2005 gave way to the fourth largest bank in the country with assets of over U.S. $ 3,000 million. Davivienda is the leading bank in mortgage lending, and Superior was focused on consumer lending which represented 91% of its portfolio. One of the motivations to merge with Banco superior was to acquire the franchise of Diners Club international.

6.4 BBVA-Granahorrar

BBVA, a spanish bank present in many countries of Latin America acquired a 98.8% of the share of Granahorrar in October 2005. Following its strategy in other countries, BBVA wanted to become the leading bank in Colombia in the mortgage market. Indeed, bank Granahorrar specialized in mortgage loans (60% of its assets), which allowed BBVA to complement its main products and services. With BBVA it expected to raise its participation in mortgage credit reaching 21% of the market. The new merged bank accounted for 7.6% of total banks assets in 2006, being the fourth largest bank in Colombia.

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