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# Three Essays on Intangible Capital in Corporate Finance

Paul Beaumont

► **To cite this version:**

Paul Beaumont. Three Essays on Intangible Capital in Corporate Finance. Business administration. Université Paris sciences et lettres, 2019. English. NNT : 2019PSLED032 . tel-03222129

**HAL Id: tel-03222129**

**<https://theses.hal.science/tel-03222129v1>**

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**THÈSE DE DOCTORAT**

**DE L'UNIVERSITÉ PSL**

Préparée à l'Université Paris-Dauphine

**Three Essays on Intangible Capital in Corporate Finance**

Soutenue par

**Paul BEAUMONT**

Le 26 août 2019

Ecole doctorale n° ED 543

**Ecole doctorale de Dauphine**

Spécialité

**Gestion**

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# **Three Essays on Intangible Capital in Corporate Finance**

**Paul Beaumont**

The goal of this thesis is to explore the implications for corporate finance of the rising importance of intangible capital in shaping firm's growth and competitive edge. In the first chapter, we look at the role of liquidity constraints in the accumulation of customer capital. We show that both financing and product market frictions lead firms to under-invest in customer capital. In the second chapter, we study the implications of the under-diversification of the borrower base of banks. We find that it exposes lenders to considerable borrower idiosyncratic risk and leads credit variations to be more synchronized across banks. In the third chapter, we study how human capital shape firms' boundaries. Our results suggest that firms use M&As as a way to acquire specialized human capital when external hiring is too costly.

**Thesis Supervisor:** Gilles Chemla

*"Bower thinks that we can teach economics to undergraduates. I disagree. I have concluded reluctantly, after ruminating on it for a long me, that we can't. We can teach about economics, which is a good thing. The undergraduate program in English literature teaches about literature, not how to do it. No one complains, or should. The undergraduate program in art history teaches about painting, not how to do it. I claim the case of economics is similar. Majoring in economics can teach about economics, but not how to do it..."*

*[...] Let me sharpen the thought. I think economics, like philosophy, cannot be taught to nineteen-year olds. It is an old man's field. Nineteen-year olds are, most of them, romantics, capable of memorizing and emoting, but not capable of thinking coldly in the cost-and-benefit way. Look for example at how irrational they are a few years later when getting advice on post-graduate study. A nineteen-year old has intimations of immortality, comes directly from a socialized economy (called a family), and has no feel on his pulse for those tragedies of adult life that economists call scarcity and choice. You can teach a nineteen-year old all the math he can grasp, all the history he can read, all the Latin he can stand. But you cannot teach him a philosophical subject. For that he has to be, say twenty-five, or better, forty-five."*

**McCloskey, Deirdre.** 1992. "Other Things Equal: The Natural." *Eastern Economic Journal*, 18(2): 237-239.

## **Acknowledgements**

First, I would like to express my sincere gratitude to my advisor Gilles Chemla for his invaluable insights, his patience, and his communicative cheerfulness. Gilles introduced me to the corporate finance field when I was in my second year of master. I remember being baffled at the time by his encyclopedic knowledge of the finance literature and by how fast he understood (and even anticipated) my remarks. I still am today. Since then, Gilles has believed in me and given me continued support. Under his supervision, I learned how to define a research question, how to address it, and how to communicate my research effectively. On a personal level, Gilles has inspired me both by his passionate and hardworking attitude towards research and the attention he gives to his students and his family. I am proud to say that Gilles contributed a lot to define the kind of researcher I am today.

I would like to thank Edith Ginglinger for doing me the honour to chair my thesis committee. Edith followed my different projects and gave me precious advice throughout my thesis. I am glad I had the chance to benefit from her insights and from her extensive knowledge of the corporate finance literature.

I met Daniel Paravisini in 2018 at the ACPR and at the Bank of France. We discussed an early version of my first chapter which is largely inspired by his 2014 Review of Economic Studies paper. Daniel was very encouraging and gave me several ideas to improve the understanding of the economic mechanism and to sharpen the writing of paper. This version benefited a lot from his feedback. I would like to take this opportunity to thank him for that and for accepting to be part of my thesis committee.

As I became interestingly interested in studying the financial frictions limiting the growth of the firm, I was naturally led to discover and to get familiar with the work of Gordon Phillips. The idea that organizational choices of firms are actually well explained by value-maximizing behaviors exerted a strong influence on my research. My second chapter, in particular, draws to a large extent on his neoclassical vision of corporate diversification. It is therefore humbling for me to submit my research to someone whose writings have had such a visible impact on this dissertation. I am grateful to him for having accepted to join my thesis committee, and look forward to meeting him in person.

I would also like to give special thanks to Johan Hombert for his friendliness, his sharp insights and for the constant attention he has given to my work during these five years. The discussions I've had with him have always left me intellectually challenged and motivated to work more to improve my research.

The different projects presented in this dissertation would not have been the same without the contribution of my coauthors. My fellow Ph.D. students Camille Hebert, Anne-Sophie Lawniczak, Clémence Lenoir, Thibault Libert, and Victor Lyonnet and Huan Tang (some of them have become

assistant professors since then!) made these five years both an intellectually exciting and fun experience. My research owes a lot to the numerous talks I had with them. Many thanks to Christophe Hurlin, whose insights and advice proved decisive to write my third chapter. I am also grateful to Gilles Chemla, François Derrien, Johan Hombert, Adrien Matray and Evren Örs with whom I have collaborated on various projects which, I hope, will bear fruit soon. I look forward to continuing to work with all of them.

I have had the chance to find at Paris Dauphine both an intellectually dynamic and a supportive environment that helped me navigate through my Ph.D. journey. I would like in particular to express my gratitude to Carole Gresse, Edith Ginglinger, and Tamara Nefedova who have given me continued support during these five years. I am also thankful to Françoise Carbon, Serge Darolle, Jérôme Dugast, Evgenia Passari and Marius Zoican for their help and feedback on my projects.

I met Pierre Cahuc, Francis Kramarz and Isabelle Méjean five years ago during my master at ENSAE. I have regularly exchanged with them since then. I would like to thank them for their precious advice and for the hospitality they have offered me at CREST-Ecole Polytechnique. Edouard Challe, Grégory Corcos, Christian Gouriéroux, Jean-Baptiste Michau also helped me at various stages of my graduate years. I am grateful to them. Many thanks also to Fanda Traoré for her friendliness and her professionalism.

I would like to express my gratitude to Johan Hombert and Evren Örs for having invited me to visit the HEC Finance Department. The interactions I had with professors there really helped me improve my projects and widen my perspectives. I think this was a defining moment in my Ph.D., which further convinced me to pursue a career in academia. I would like to thank Jean-Noël Barrot, Jean-Edouard Colliard, François Derrien, Thierry Foucault, Denis Gromb, Augustin Landier, Mathias Efling, Christophe Pérignon, Guillaume Vuillemey for this very enriching experience.

I met a lot of other passionate, clever, hardworking students during these five years, and some of them became really good friends. I would like to thank Adrien Bilal, Maxime Bonelli, Mingyi Hua,

Pekka Honkanen, Antoine Bertheau, Fabien-André Dugardin, Caroline Genc, Camille Hebert, Mathilde Le Moigne, Clémence Lenoir, Victor Lyonnet, Bérengère Patault Noémie Pinardon-Touati, Chhavi Rastogi, Etienne Rochon, Huan Tang, and Junli Zhao for making this journey a very lively and stimulating one.

I joined the Economic Research Department of Insee (French National Statistics Office) in 2014 as an economist at the "Firms and Markets" division. I am deeply grateful to Didier Blanchet, Dominique Goux, Claire Lelarge, Corinne Prost and Sébastien Roux who helped me and advised me as I was taking my first steps in empirical research. I realize in retrospect the chance I had to begin my Ph.D. surrounded by talented economists willing to assist young researchers and to share their vast expertise. I am grateful to Arthur Bauer, Christophe Bellégo, Pauline Charnoz, Simon Georges-Kot, Fanny Godet, Marie-Baianne Khder, Malik Koubi, Quentin Laffeter, Raphaël Lardeux, Antoine Luciani, Christelle Minodier, Rémi Monin, Michaël Orand, Mathilde Poulhes, Brigitte Rigot, Ihssane Slimani-Houti and Milena Suarez-Castillo for having made this period at Insee so rich and enjoyable.

I am indebted to Bertrand Couillault, Laurent Clerc, Olivier de Bandt, Henri Fraisse and Cyril Pouvelle for having given me the opportunity to finish my Ph.D. at the Research Department of ACPR (French Prudential Supervision and Resolution Authority). I would like in particular to thank Henri Fraisse and Mathias Lé for their hospitality, for the time they took to answer my questions and for sharing their experience in research in empirical banking. I would also like to express my gratitude to Boubacar Camara, Edouard Chrétien, Victoria Delmas, Sébastien Diot, Camille Lambert-Girault, Sandrine Lecarpentier, Thibault Libert, George Overton, Justine Pedrono, Sylvain Peyron, Oana Toader, Clément Torres, Eric Vansteenberghé and Lucas Vernet for making these two years at ACPR such a productive and exciting period of my life. I hope that I will have the opportunity to work with people from ACPR and Bank of France in the future.

Last but not least, I would like to express my deepest gratitude to the members of my family.

This journey would not have been possible without the warm love, continued patience, and endless support of my parents, my sister, my parents-in-law and, of course, of Héloïse. More than anything, maybe, I am proud to finish writing this manuscript as the husband of my wife, and the father of my son.



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# Chapter 1

## Introduction

*"[...] The existing theories of the firm have been quite successful in providing an intellectual backbone for the principles of corporate finance we all know and teach.*

*The type of firm modeled by these theories, however, was the traditional business corporation, which emerged at the beginning of the twentieth century and has since prevailed. It is a very asset-intensive and highly vertically integrated firm, with a tight control over its employees-control that is concentrated at the top of the organizational pyramid. Its boundaries are clear cut and sufficiently stable that one can take them for granted while considering the impact of financing and governance choices. In such a world, once the concept of the firm is defined, most corporate finance can be developed without a continuous reference to the underlying theory of the firm.*

*Not any more. The nature of the firm is changing. Large conglomerates have been broken up, and their units have been spun off as stand-alone companies. Vertically integrated manufacturers have relinquished direct control of their suppliers and moved toward looser forms of collaboration. Human capital is emerging as the most crucial asset. As a result of these changes, the boundaries of the firms are in constant flux, and financing and governance choices can easily change them. The influence of theory of the firm is no longer limited to defining the object of analysis. The interaction between the nature of the firm and corporate finance issues has become so intimate that answering the fundamental questions in theory of the firm has become a precondition for any further advancement in corporate finance."*

**Zingales, Luigi.** 2000. "In Search of New Foundations." *Journal of Finance*, 55(4): 1623-1653.

## 1.1 Intangible capital in corporate finance

In May 2019, the ride-hailing platform Uber went public. The IPO was the biggest tech offering since Facebook in 2012, and the tenth biggest overall US listings by proceeds raised (Bond and Bullock, 2019). In stark contrast with traditional business corporations, Uber's cash-flows are not generated by selling products or services but by bringing customers and independent drivers together. As a result, Uber's market value does not come from its physical assets, but from the set of customers of the application and of drivers with whom it contracts. Does traditional corporate finance theory still apply for such a different type of firm? What does the decreasing importance of physical capital imply for firms' financing?

The emphasized quotation of Zingales (2000) shows that these questions are not new. In fact, Belo et al. (2018) estimate that most of the decrease in the contribution of physical capital to US firms' market value happened between 1975 and 2000. However, the increasing availability of data sets providing granular information on firms' marketing activities or workforce composition has allowed corporate finance researchers to offer new insights to this growing field of the literature. In this introduction, I start by reviewing recent research on the rising importance of intangible capital (as opposed to physical capital) in corporate finance. I then show how the three chapters of this thesis articulate with and contribute to our current understanding of the subject.

I focus on two specific components of intangible capital, namely customer and human capital. Customer capital is defined as the expected value of the discounted stream of cash-flows attached to the set of customers of the firm (Gourio and Rudanko, 2014). The notion of human capital, by contrast, encompasses all sources of economic value generated by the experience or the skills of the firm's workforce (Becker, 1962; Gibbons and Waldman, 2004; Autor and Dorn, 2009). Together, they are identified as two critical components of intangible capital and represent on average between 20% and 47% of total firm's market value (Belo et al., 2018).

Do the sets of customers and workers of a firm qualify as "capital"? When customer or employee

relationships are long-term in nature and the cost of a new relationship is paid up-front, the present value of firm profits from a relationship must make up for the initial costs of attracting the customer or the employee. This turns the existing base of customers and employees into valuable assets for firms. Merz and Yashiv (2007) and Gourio and Rudanko (2014) apply this logic respectively to hiring and pricing decisions using production-based asset pricing models with adjustment frictions. The results show that (i) adding investment in customer capital and human capital leads to a better fit of the data and (ii) that firms' value embodies the value of investment in intangible capital over and above the capital stock. Bronnenberg, Dubé and Gentzkow (2012) use consumer migration to highlight the role of the causal effect of past experiences on current purchases. Their results emphasize the role of habit formation in securing a customer base and suggests that firms can generate durable profits by investing in the development of their brand.

If intangible capital is indeed a form of capital, then most of the insights of the corporate finance literature on the real effects of financial constraints can be applied to investment in labor or in the customer base. This type of analysis allows generating new findings on firms' size, on the scope of their activities, or their exposure to idiosyncratic risk.

Chevalier and Scharfstein (1996) theoretically show that when customers find it costly to switch firms, suppliers choose prices by making a trade-off between present and future profits. While lower prices decrease current cash-flows, it attracts customers, which is associated with higher future expected profits. As liquidity-constrained firms value more current profits, they charge higher prices, resulting in lower investment in the customer base. In line with their model, the authors find evidence that financially constrained supermarkets raise their prices more during economic recessions. Gilchrist et al. (2017) show that this mechanism leads to the absence of deflationary pressures during the 2008 financial crisis.<sup>1</sup> Similarly, Caggese, Cuñat and Metzger (2018) find that when faced with an exogenous negative cash-flows shock, financially-constrained

---

<sup>1</sup>A limitation shared by these two studies, however, is that the identity of customers is not observable. Therefore, the authors can not determine whether the higher markups charged by liquidity-constrained firms lead to a lower accumulation of customer capital.

firms tend to value more immediate profits, which leads them to lay off workers with lower firing costs but with higher expected productivity growth. Besides short-term decreases in profitability, credit shocks also seem to affect firms' hiring decisions (Chodorow-Reich, 2013) and the ability to grow in product markets (Paravisini et al., 2014). Overall, these findings suggest that financial constraints can have long-term effects on firms' stock of intangible capital.

As with physical capital, a suboptimal level of intangible capital is likely to result in low production capacity. In particular, firms with low human capital should be less responsive to profitable growth opportunities as they are likely to face larger adjustment costs to complement their workforce. In line with this idea, Ayyagari and Maksimovic (2017) finds that higher initial levels of human capital are associated with faster growth and higher probability of survival of manufacturing firms. Comparing the trajectories of public and private firms, Maksimovic, Phillips and Yang (2019) find evidence supporting that entrepreneurial talent leads to a higher probability of IPO and higher responsiveness to growth opportunities. Regarding customer capital, Hoberg and Maksimovic (2018) show that investment is more sensitive to Tobin's Q when firms have already invested in the development and the distribution of their products.

Financial constraints may also lead firms to under-diversify their set of assets. For instance, a financially constrained flight company is likely to invest in a smaller aircraft fleet, making it more exposed to a breakdown of one of its planes. Similarly, financially constrained firms may be more sensitive to the departure of key workers or the fluctuations of demand addressed by a major customer. Kramarz, Martin and Mejean (2019) show that most French exporters have one or two main clients that dwarf the others, and that they are as of consequence strongly exposed to microeconomic demand shocks. Treating worker deaths as a shock on firms' human capital, Jäger and Heining (2019) estimate how exogenous worker exits affect a firm's demand for incumbent workers and new hires. They find evidence suggesting that longer-tenured workers and workers in specialized occupations are costly to replace. This under-diversification pattern is likely to be more

pronounced in the presence of financing constraints, magnifying firms' exposure to idiosyncratic risk.

Unlike physical assets, however, customer and human capital do not only depreciate because of technological reasons. Workers or customers may decide to terminate their relationship with a firm when they consider having a better alternative. This is a first significant difference between intangible capital and physical capital. Intangible capital is more fragile, in the sense that it is more likely to depend on the financial condition of the firm. Supporting this view, Baghai et al. (2018) and Barbosa, Bilan and Célérier (2019) find that skilled workers leave financially distressed firms for better-performing employers. Similarly, Brown and Matsa (2016) show that fewer skilled workers apply to jobs in financially distressed firms. Customers may in turn decide to stop trading with financially distressed firms following the departure of employees that are key for their employers' brand (Dou et al., 2018). Moreover, since financially constrained firms invest less in product quality and charge higher prices (Matsa, 2011; Phillips and Sertsios, 2013), customer capital is likely to quickly depreciate in the presence of adverse financial conditions.

Intangible assets are then often more firm-specific and more difficult to value and to liquidate than tangible assets. As a result, intangible capital has low collateral value, which increases the cost of debt financing. The rising importance of intangible capital over the last decades may have reduced the debt capacity of US firms, leading them to hoard more cash to finance growth opportunities. Falato et al. (2018) argue that this mechanism can explain the steady increase in average cash to assets ratio for U.S. industrial firms identified by Bates, Kahle and Stulz (2009). DellAriccia et al. (2018) find in turn that the increasing reliance on intangible capital can explain the decline in bank lending to the private sector. The authors find that banks reallocate the resulting lending capacity to other assets, notably mortgages.

In the following sections, I sum up briefly the three chapters of this thesis. The first chapter deals with the real effects of financing frictions on investment in customer capital. In the second

chapter, I show that the borrower bases of banks are very concentrated and that this results in a significant role of borrower idiosyncratic shocks in shaping bank and aggregate credit fluctuations. In the third and last chapter, I show how human capital is key to exploit growth opportunities, and that firms use M&As as a way to acquire specialized workers.

## **1.2 Building a customer base under liquidity constraints**

Why do some firms attract more customers than others? In the first chapter of this thesis (co-authored with Clémence Lenoir from Ecole Polytechnique-CREST), we explore the role of liquidity constraints in the formation of a network of customers.

Our identification relies on an exogenous liquidity shock generated by the enactment of a 2009 French law (the "policy"). The policy introduced a cap on the payment terms authorized in transactions contracted under the French trade code. Specifically, firms were required to pay their suppliers within 60 days, otherwise they would be exposed to important legal sanctions. This resulted in a large decrease in payment periods for firms operating in France.. Importantly, for financially constrained firms, this large variation in payment terms acted as a positive liquidity shock. We document how firms more exposed to the policy *ex ante* exhibit lower working capital needs and higher cash ratios after its enactment.

The restriction of trade credit contracts may also have affected the ability of suppliers to initiate and maintain trade relationships. To isolate the role of the liquidity shock, we focus on the effects of the policy on international transactions which were not affected by the 60-days cap. Therefore, our core object of study is the effect of lower domestic payment periods on the accumulation of international customer capital. We rely accordingly on an extensive data set recording the quasi-universe of product-level transactions between French exporters and their EU-based customers to keep track of international customer capital.

Our identification strategy is based on the observation that firms that were paid in 90 days before



the policy change were more likely to be affected than firms that were already paid in less than 60 days. The distance to the sixty-days threshold, however, is likely to be correlated with unobservable variables (suppliers' bargaining power, for instance). We address this issue by designing a "shift-share" variable based on the heterogeneity of sectoral payment terms. This "shift-share" variable serves as an instrument of the variation of payment periods. Our estimations therefore compare customer capital dynamics between firms present in sectors with high payment periods before the reform to firms in sectors with low payment periods.

Our baseline specification indicates that being paid three days earlier by domestic customers (a sample standard deviation) raises the export growth rate by 1.2 percentage points. Strikingly, the vast majority of the effect is explained by an expansion of the firms' customer base. We find the positive liquidity shock increased the entry into new destinations and limited the exit rate, which indicates that the effects on the accumulation of customer capital also had implications for firms' presence in export markets.

Looking at the economic mechanism, we find that firms do not appear to charge lower prices following the liquidity shock. Instead, the expansion of the customer base is more pronounced when product market frictions (search costs, switching costs) are high. These findings allows us to conclude that (i) liquidity-constrained firms under-invest in customer capital and (ii) product market frictions represent the main obstacle to the expansion of firms' customer bases.

### **1.3 Granular borrowers**

In the second chapter (with T. Libert from PSE and C. Hurlin from Université d'Orléans), we study the implications of the under-diversification of the borrower bases of banks. When borrowers face idiosyncratic and diversifiable credit line takedowns, banks can reallocate liquidity between liquidity-poor firms and firms with excess liquidity. When credit line portfolios are concentrated, however, banks have to hold liquid assets to hedge against negative idiosyncratic shocks affecting

very large borrowers.

We use a data set covering the quasi universe of firm-bank relationships in France between 1999-Q1 and 2016-Q4. In line with the presence of under-diversification of borrower bases, we document using a positive, strong relationship between the bank-level concentration of the portfolio of borrowers and the variance of total undrawn credit lines. The main empirical challenge that we face is to separately identify idiosyncratic credit variations originating from individual borrowers from bank-level shocks affecting the different pools of borrowers. We perform to that end a weighted linear regression of the credit growth rate at the firm-bank level on a full set of bank-time and firm-time fixed effects. The two sets of fixed effects respectively identify (up to a constant term) factors that simultaneously shift the evolution of credit in all the firm relationships of a bank and in all the bank relationships of a firm. We define idiosyncratic components as the deviation of the estimated fixed effects from a common trend. In the end, credit variations can be expressed as the sum of two terms, respectively reflecting the aggregation of firm and bank idiosyncratic shocks, and of a third term common to all lending relationships.

Relying on our decomposition of credit variations, we estimate further that in the absence of borrower idiosyncratic shocks, the variance of credit lines would fall on average by 18% to 31%. The role of borrower shocks on bank-level credit line variations is therefore sizeable and comparable in magnitude to the effect of macro shocks, for instance. Since large borrowers have credit commitments in multiple banks, moreover, borrower idiosyncratic shocks may also increase aggregate variance by making banks more correlated with each other. Consistently with idea, we find that most of the variance of the aggregate firm component comes from the linkages between banks. This result suggests that granular borrowers may represent a source of systemic risk for the banking system as they lead commitment takedowns to be less diversifiable and more coordinated between banks.

We then inspect the implications of the presence of very large borrowers (“granular borrowers”)

for the properties of aggregate credit. We devote our attention to a moment of key interest in the macro-finance literature, namely the comovement of credit borrowed by non-financial corporations with the business cycle. Our methodology allows to assess the respective contribution to the cyclicity of aggregate credit of idiosyncratic variations originating from the borrower and the lender side. Should the loan size distribution of firms and banks not be fat-tailed, these contributions would be negligible and the large majority of the correlation between credit and GDP would be explained by the macro component.

On the contrary, we find that firm idiosyncratic shocks explain between 60% and 80% of the comovement of aggregate credit with the business cycle. Bank idiosyncratic variations, by contrast, do not seem to significantly contribute to the correlation with GDP fluctuations. The skewness of the credit distribution confers moreover a disproportionate importance to large borrowers compared to the loan volume they represent, with more than two thirds of the contribution of firm idiosyncratic shocks originating from the top 100 borrowers. Our findings imply that the analysis of the cyclicity of aggregate credit is unlikely to give useful insights on the intensity or the nature of financing frictions applying to the bulk of non-financial firms.

## **1.4 Build or buy: Human capital and corporate diversification**

Why do some firms enter a new sector by acquiring an existing company ("buy"), while others do so using their existing resources ("build")? This question has major implications for understanding the role played by M&As in the reallocation of resources in the economy. In the third chapter (co-authored with Victor Lyonnet from Ohio State University and Camille Hébert from Université Paris Dauphine/Tilburg University), we look at how human capital shapes firms' diversification strategy.

We build to that end a model of diversification with endogenous choice of teams. In the model, the firm hires workers from different occupations that differ in their sector-specific skills. If the firm

decides to build, it can draw workers from its existing pool of workers (internal labor market) or from the external job market. Instead if the firm decides to buy, it can pick workers in the workforce of the acquired firm but has to pay the fixed costs of acquiring another firm. The model draws two predictions. First, in equilibrium, the firm chooses to build when its existing *internal human capital* is adapted to operate in the sector of entry. Instead, the firm buys when its workforce does not include the key worker occupations needed to operate in the sector of entry, and this despite restructuring costs. Second, the relationship between human capital and the decision to build or buy is stronger when it is difficult to hire key workers in the external job market.

The model moreover yields a firm-level measure of human capital that stems from the relation between the fraction of the wage bill that goes to a given type of workers and the contribution of these workers to the firm's output. The variable captures the extent to which the existing workforce is adapted to the sector of entry.

Another empirical challenge of our paper is to identify how firms diversify. We use the firms' detailed breakdown of sales across sectors to identify entries in new sectors. A firm enters a new sector if (i) at least one of its subsidiary starts selling in the new sector (ii) none of the other subsidiaries controlled by the same ultimate owner operates in the sector of entry. We identify buy entries by linking M&A deals retrieved from SDC Platinum and Bureau van Dijk Zephyr to the French administrative data. The entry is a "buy" if the subsidiary which starts selling in the new sector has been acquired by the firm. By contrast, a firm "builds" if the entry is made through an existing subsidiary.

We test whether firms' existing workforce composition explain their decision to build or buy. We compare firms that operate within the same sector of origin, diversify within the same sector of entry, the same year. This specification neutralizes potential unobservable time-varying synergies between the sector of entry and that of origin. We find that firms are more likely to buy when their human capital is not adapted to the sector of entry.

Our second key finding is that firms are more likely to buy when it is costly to hire key workers on the external job market, i.e., when key worker occupations are in short supply. We test this prediction using occupation-level data on local labor market (LLM) tightness. The data reports worker occupations in short supply in 350 commuting zones. Our measure of LLM tightness takes higher values if key occupations for the sector of entry are in short supply in the LLM. We find that firms are more likely to buy when labor markets are tight, and that the relationship between human capital and the choice to build or buy is driven by the highest tercile of labor market tightness. Finally, we find evidence supporting the idea that firms with less adapted human capital grow relatively more slowly in the sector of entry than firms with a highly adapted human capital. Taken together, these findings suggest that labor market frictions are crucial to understand the role of human capital in the decision to build or buy.

## 1.5 Bibliography

- Autor, David, and David Dorn.** 2009. "This Job is "Getting Old": Measuring Changes in Job Opportunities Using Occupational Age Structure." *American Economic Review*, 99(2): 45–51.
- Ayyagari, Meghana, and Vojislav Maksimovic.** 2017. "Fewer and Less Skilled? Human Capital, Competition, and Entrepreneurial Success in Manufacturing." Working Paper.
- Baghai, Ramin, Rui Silva, Viktor Thell, and Vikrant Vig.** 2018. "Talent in distressed firms: Investigating the labor costs of financial distress." Working Paper.
- Barbosa, Luciana, Andrada Bilan, and Claire Célérier.** 2019. "Credit Supply and Human Capital: Evidence from Bank Pension Liabilities."
- Bates, Thomas W, Kathleen M Kahle, and René M Stulz.** 2009. "Why Do US Firms Hold So Much More Cash Than They Used To?" *The Journal of Finance*, 64(5): 1985–2021.
- Becker, Gary S.** 1962. "Investment in Human Capital: A Theoretical Analysis." *Journal of Political Economy*, 70(5, Part 2): 9–49.
- Belo, Frederico, Vito D Gala, Juliana Salomao, and Maria Ana Vitorino.** 2018. "Decomposing Firm Value." Working Paper.
- Bond, Shannon, and Nicole Bullock.** 2019. "Uber shares close nearly 8% below IPO price." *Financial Times*.
- Bronnenberg, Bart J, Jean-Pierre H Dubé, and Matthew Gentzkow.** 2012. "The evolution of brand preferences: Evidence from consumer migration." *American Economic Review*, 102(6): 2472–2508.
- Brown, Jennifer, and David A Matsa.** 2016. "Boarding a sinking ship? An investigation of job applications to distressed firms." *The Journal of Finance*, 71(2): 507–550.
- Caggese, Andrea, Vicente Cuñat, and Daniel Metzger.** 2018. "Firing the Wrong Workers: Financing Constraints and Labor Misallocation." *Journal of Financial Economics*.
- Chevalier, Judith A, and David S Scharfstein.** 1996. "Capital-Market Imperfections and Countercyclical Markups: Theory and Evidence." *The American Economic Review*, 703–725.
- Chodorow-Reich, Gabriel.** 2013. "The Employment Effects of Credit Market Disruptions: Firm-Level Evidence from the 2008–9 Financial Crisis." *The Quarterly Journal of Economics*, 129(1): 1–59.
- DellAriccia, Giovanni, Dalida Kadyrzhanova, Ratnovski Lev, and Camelia Minoiu.** 2018. "Bank Lending in the Knowledge Economy." CEPR Discussion Papers.
- Dou, Winston, Yan Ji, David Reibstein, and Wei Wu.** 2018. "Customer capital, financial constraints, and stock returns." Working Paper.
- Falato, Antonio, Dalida Kadyrzhanova, Jae Sim, and Roberto Steri.** 2018. "Rising Intangible Capital, Shrinking Debt Capacity, and the US Corporate Savings Glut."
- Gibbons, Robert, and Michael Waldman.** 2004. "Task-specific Human Capital." *American Economic Review*, 94(2): 203–207.
- Gilchrist, Simon, Raphael Schoenle, Jae Sim, and Egon Zakrajšek.** 2017. "Inflation Dynamics during the Financial Crisis." *American Economic Review*, 107(3): 785–823.
- Gourio, Francois, and Leena Rudanko.** 2014. "Customer Capital." *Review of Economic Studies*, 81(3): 1102–1136.

- Hoberg, Gerard, and Vojislav Maksimovic.** 2018. “Product Life Cycles in Corporate Finance.” Working Paper.
- Jäger, Simon, and Jörg Heining.** 2019. “How Substitutable are Workers? Evidence from Worker Deaths.”
- Kramarz, Francis, Julien Martin, and Isabelle Mejean.** 2019. “Volatility in the Small and in the Large: The Lack of Diversification in International Trade.” CREST Working Paper.
- Maksimovic, Vojislav, Gordon M Phillips, and Liu Yang.** 2019. “Do Public Firms Respond to Industry Opportunities More Than Private Firms? The Impact of Initial Firm Quality.” NBER Working Paper.
- Matsa, David A.** 2011. “Running on empty? Financial leverage and product quality in the supermarket industry.” *American Economic Journal: Microeconomics*, 3(1): 137–73.
- Merz, Monika, and Eran Yashiv.** 2007. “Labor and the Market Value of the Firm.” *American Economic Review*, 97(4): 1419–1431.
- Paravisini, Daniel, Veronica Rappoport, Philipp Schnabl, and Daniel Wolfenzon.** 2014. “Dissecting the Effect of Credit Supply on Trade: Evidence from Matched Credit-Export Data.” *Review of Economic Studies*, 1–26.
- Phillips, Gordon, and Giorgio Sertsios.** 2013. “How do firm financial conditions affect product quality and pricing?” *Management Science*, 59(8): 1764–1782.





## **Chapter 2**

# **Building a Customer Base under Liquidity**

## **Constraints**

**with Clémence Lenoir (CREST-Ecole Polytechnique)**

### **Abstract**

This paper explores how financing frictions shape the formation of a customer base. Since a customer base cannot be pledged as collateral, current expenses involved in attracting customers are likely to be financed internally. Hence, liquidity-constrained firms will underinvest in the expansion of the customer base. We exploit a French reform capping payment terms in trade credit contracts at sixty days as an exogenous shock to access to liquidity. Relying on administrative data covering the universe of financial statements and intra-EU trade relationships of French exporters, we show that holding demand and supply constant, a decrease in payment periods from existing customers enables firms to invest more in the expansion of their customer base. Furthermore, we provide evidence that liquidity constraints prevent firms from reaching new customers through marketing but not from competing on price. As a result, the presence of liquidity constraints dampens the ability of firms to trade with distant customers and to sell differentiated products.

## 2.1 Introduction

Building a customer base is key for firms' long-term profitability, as loyal customers secure stable demand flows and generate durable advantages over competitors (e.g., Bronnenberg, Dubé and Gentzkow (2012)). The costs of acquiring new customers, however, can be substantial. In aggregate, US firms spend up to 8% of present value-added every year in marketing to create a demand for their products.<sup>1</sup> At the same time, the economic effects of marketing depreciate at a high rate, which implies that firms must constantly reinvest to attract new customers.<sup>2</sup> Since a customer base cannot be pledged as collateral, firms are likely to face financial constraints when trying to meet the liquidity needs required to attract new customers. How, then, do firms adapt their customer acquisition strategies to the presence of liquidity constraints, and how does that affect the formation of a customer base?

The answer to that question crucially hinges on the type of marketing firms undertake to attract new customers. If marketing is mostly about offering promotions, liquidity-constrained firms will be priced out of competitive markets. As a result, they should target customers in markets exhibiting a greater degree of spatial or product differentiation to avoid price competition.<sup>3</sup> In contrast, if marketing is mainly about informing customers about the existence and characteristics of products, liquidity constrained firms should favor standardized products and easily accessible customers to avoid information asymmetries. Determining which mechanism prevails is important, as these two views have dramatically different positive implications for the influence of liquidity frictions on the type of product and amount of information available to customers.<sup>4</sup>

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<sup>1</sup>See Gourio and Rudanko (2014) for the asset pricing implications of “customer capital” and Arkolakis (2010) for the magnitude and the economic role of marketing costs.

<sup>2</sup>Clark, Doraszelski and Draganska (2009) estimate a depreciation rate of 17% per year for the impact of advertising on brand awareness, which puts customer knowledge about the brand among the most rapidly depreciating types of capital (Fraumeni, 1997). This is a rather conservative estimate, as other studies use depreciation rates as high as 60% to compute the economic value associated with firms' customer base (Corrado, Hulten and Sichel, 2009).

<sup>3</sup>For instance, see Syverson (2004a); Steinwender (2018) for the role of geographical differentiation and Syverson (2004b); Hortaçsu and Syverson (2004); Hombert and Matray (2018) for the influence of product differentiation on competition intensity.

<sup>4</sup>The economic literature (e.g., Bagwell (2007)) traditionally distinguishes between the “persuasive” (i.e., altering

This paper exploits an exogenous liquidity shock to identify the role of financing frictions in the formation of a customer base. The first main contribution of this paper is to show that holding demand and supply constant, relaxing liquidity constraints allows firms to acquire new customers. This result provides the first direct, causal evidence in support of theories that highlight access to liquidity as a key determinant of the expansion of the customer base (e.g., Chevalier and Scharfstein (1996)). We then compare the effects of the shock across product and customer types. Our results indicate that liquidity frictions prevent firms from selling differentiated products and reaching out to distant customers. In contrast, we find no impact of the relaxation of liquidity constraints on prices. The second main contribution of this paper, therefore, is to show that liquidity constraints primarily distort firms' customer base by amplifying the role of informational frictions.

Our identification strategy exploits the 2009 enactment of a French law (the "reform") that limited payment terms in trade credit contracts to 60 days.<sup>5,6</sup> While future payment from customers (accounts receivable) represent an important short-term asset of firms, they are not equivalent to cash as they cannot be used costlessly to settle transactions.<sup>7</sup> A reduction in payment periods from customers, therefore, is akin to a reduction of the cost of access to liquidity (Barrot, 2016). Following the reform, firms received payments from customers three days faster on average, permanently shifting liquidity from accounts receivables to cash holdings.

A challenge for the empirical analysis is that the reform took place in the middle of the 2008-2009 financial crisis, during which trade suddenly collapsed (Eaton et al., 2016). A simple regression of sales on payment periods, therefore, is likely to yield a positive coefficient as both variables

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customers' tastes) and "informative" view of marketing (i.e., informing customers about the existence of the product). We choose instead to rely on the distinction between price competition and informational frictions as it yields sharper predictions on the influence of liquidity constraints on customer acquisition strategies.

<sup>5</sup>We refer to contractual payment limits as "payment terms", and to the time it actually takes for customers to pay as "payment periods".

<sup>6</sup>Specifically, the reform stated that as of January 1st, 2009, payment terms could no more exceed 60 days in commercial transactions contracted under the French trade code. The government made sure that the reform was enforced by introducing large sanctions for non-complying firms (up to €2 million) and by urging the French competition authority to conduct audits to detect bad payers.

<sup>7</sup>In our sample, account receivables constitute the most important short-term asset held by firms as they represent 20% of total assets on average, which is more than twice as much as cash holdings.

decreased simultaneously. We rely instead on a treatment intensity approach. The strategy is based on the idea that firms facing longer average payment periods from customers before the reform were likely to benefit more from the 60-day rule. Since confounding variables (e.g., bargaining power) could drive both pre-reform payment periods and investment in the customer base, the identification strategy makes use of the sectoral composition of the existing customer base. Specifically, our “shift-share” instrument for the variation in payment periods is based on the idea that a supplier mostly operating in sectors in which customers tend to pay in more than 60 days on average (high distance to the regulatory threshold) is highly exposed to the reform. In contrast, a supplier facing sectoral payment periods shorter than 60 days (zero distance to the threshold) should be barely affected by the cap on payment terms.<sup>8</sup> The identifying assumption underlying this strategy is that the average distance to the threshold affects firm sales growth only through its impact on the variation in payment periods.

We focus in the analysis on the formation of international supplier-customer relationships. There are three main reasons for this choice. First, the cap on payment terms was not binding for international transactions, as French exporters could choose to switch to the importer’s trade code to circumvent the legislation. Focusing on international transactions ensures that the variation in exports reflects the effects of the decrease of payment periods across existing customers and not the cap on payment terms with new customers. Second, firms are more likely to be “atomistic” in international markets given the large pool of international competitors they face. This mitigates the concern that the reduced form coefficient may capture the loss of customers by firms that are unaffected by the reform to firms that benefit from it (business stealing effect). Third, customs data are very rich, and contain in particular both the geographical location and the type of product involved in the transaction at a high level of disaggregation. This type of information is essential for our research question, as it enables us to control for the influence of demand factors in the evolution

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<sup>8</sup>This type of strategy is also called a “Bartik instrument” in reference to Bartik (1991). Adão, Kolesár and Morales (2019) and Borusyak, Hull and Jaravel (2018); Goldsmith-Pinkham, Sorkin and Swift (2018) respectively analyze the challenges to inference and identification in shift-share designs. We discuss these issues extensively in section 2.4.

of firms' customer base.

We assemble a comprehensive panel of wholesale and manufacturing firms based on administrative data covering the universe of French private and public companies from 2002 to 2012. Firm-level information on average payment periods across all customers (foreign and domestic) comes from balance sheet statements. We observe for each firm the split of sales by sector (which is necessary to build our shift-share instrument) using a quasi-exhaustive survey conducted by the French Statistical Institute. To track the international customer base of firms, we rely on a unique registry collected by French customs recording the quasi-universe of transactions between French exporters and their EU-based customers. The dataset contains information on quantity and unit prices at the exporter-importer-product level for more than 9,000 products and 600,000 distinct customers.

We start by showing that the reform generated a positive liquidity shock for firms. We find that a three-days reduction in payment periods (one sample standard deviation) permanently raises cash holdings scaled by total assets by 5.4% compared to the pre-reform mean, allowing firms to draw less on their credit lines. Moreover, we provide evidence that firms exhibit lower working capital needs after the shock. We find no effects of the reform on domestic sales, which suggests that customers do not ask for lower prices as compensation for the decrease in payment periods. Similarly, the reform does not lead French customers to import a larger fraction of their inputs.<sup>9</sup> Overall, our results suggest that the reform decreased working capital needs with domestic customers while leaving domestic sales unchanged.

We derive three main sets of results. In the first set of results, we show that the reform spurred export growth. Comparing firms exporting in the same country at the same time (country-year fixed effects), we find that being paid three days earlier by domestic customers raises export growth

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<sup>9</sup>The absence of effects of the reform on domestic sales may be explained by the presence in the 2009 law of sectoral derogations to the 60-day rule. Professional organizations representing both suppliers and customers of the same sector of activity had indeed the possibility to ask for a three-years derogation to the 60-day rule. It is therefore likely that *de facto*, the reform excluded sectors in which the cap on payment terms would have negatively affected the domestic activity of firms.

by 1.5 percentage points.<sup>10</sup> By comparison, the annual export growth rate in a country before the shock is 3.7%. The economic magnitude of the effect is sizeable; a one-standard-deviation shock brings the median exporter to the top 5% of the most dynamic firms. We obtain similar results when comparing exports of a given product category (country-product-year fixed effects). At the extensive margin, we find that the positive liquidity shock also leads to higher entry rates in new countries and lower exit rates from existing ones. Taken together, these findings show that comparable firms facing the same demand can grow at different rates in product markets depending on the intensity of liquidity constraints that they face.

We perform a series of tests to check that the increase in export growth is indeed caused by the reform. First, we show that the superior export performance of firms more exposed to the reform cannot be explained by a lower degree of vulnerability to the financial crisis.<sup>11</sup> Second, we run pre-reform covariate balance tests and find no evidence of pre-trends in export growth. Third, cross-sectional heterogeneity tests confirm that the increase in export growth was larger for firms more exposed to the reform such as firms importing a large share of their purchases (as they did not have to pay their foreign suppliers faster) or firms more likely to be liquidity-constrained (e.g, small, cash-poor or highly leveraged). Last, we check whether our results are driven by the choice to focus on the asset side of trade credit. Since firms are customers as well as suppliers, the net effect of the reform is a priori ambiguous. We examine in an alternative identification strategy the effects of the reform on the variation in the difference between payment periods from customers and payment periods to suppliers and the impact of that change on export growth. Our main conclusions remain unchanged.

In the second set of results, we show that the increase in export growth is caused by an investment in the consumer base and not by a change in supply-side factors such as production costs. Using

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<sup>10</sup>To limit the role of outliers, we measure export growth using the mid-point growth rate à la Davis, Haltiwanger and Schuh (1996).

<sup>11</sup>Specifically, we show that firms more exposed to the reform did not achieve higher employment growth or higher sales growth in the domestic market. Moreover, we find that the increase in export growth took place in 2010-2011, that is after the climax of the crisis.

the information on the identity of foreign customers, we find that the reform-induced increase in export growth is entirely driven by the acquisition of new international customers. In contrast, the reform's effects on sales to existing customers is a precisely estimated zero. This finding rules out most supply-side alternative mechanisms as they would predict an increase in the volume of sales to both existing and new customers.<sup>12</sup> Such heterogeneous effects, however, could arise if firms can price discriminate between new and existing customers, e.g. fully pass a decrease in production costs to new customers. Comparing the evolution of prices (as measured by unit values) for the same product across firms differentially exposed to the reform, we find no evidence of differentiated pricing strategies across customers. Lastly, we check that the acquisition of new customers is not due to an increase in firms' production capacity. We find the effects of the reform on exports to be concentrated among firms with high levels of inventoried products over sales, that is firms for which capacity constraints were unlikely to be binding.

We then provide evidence that firms did not change the nature of their products to form new trade relationships. First, we find that the increase in export growth to be entirely driven by sales of products that firms were already selling, which rules out product innovation as an explanation for the expansion of the customer base. Second, we check whether firms offer higher quality products to their new customers. Conditional on production costs, increasing quality should result in higher sales volumes (Khandelwal, 2010). Our tests allow rejecting this last hypothesis, as we find average sales per customer to be unaffected by the liquidity shock.

In the third and last set of results, we show that liquidity constraints primarily affect the formation of the customer base by exacerbating informational frictions. We begin by examining the actions firms take to attract new customers following the liquidity shock. We find no effect of the liquidity shock on prices even when focusing on homogeneous products, for which price strategies are likely to be more effective. Although the French accounting system does not identify

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<sup>12</sup>For instance, Bernard et al. (2019) model firm-to-firm trade in a standard monopolistic competition setting with CES demand. In the model, the price set by firms is set equal to a constant markup over their marginal cost, and a reduction of the marginal cost results in higher sales to all customers.

marketing expenditures separately, we find in contrast that a reduction of payment periods by three days caused firms to increase purchases of external services (which include advertising costs) by 1.3% and the share of intangibles (which include brand value and communication media) in total assets by 3.6%.<sup>13</sup> These findings suggest that liquidity frictions do not limit the ability of firms to compete on prices, but rather to reach new customers through advertising.

We then exploit the type of markets targeted by firms after the relaxation of liquidity constraints. First, focusing on multi-product firms, we compare exports dynamics within firms and across products (firm-country-year fixed effects) and provide evidence that the effects of the liquidity shock are stronger for products for which quality is more difficult to establish ex ante or more relationship-specific (Rauch, 1999; Martin, Mejean and Parenti, 2018). Second, we find the increase in exports to be concentrated among customers that were not already trading with a French exporter, for which informational frictions are likely to be larger (Morales, Sheu and Zahler, 2019). Third, comparing the effects of the reform on exports across countries using firm-year fixed effects, we show that the increase in export growth was more pronounced in countries where firms had a small local customer base (Bagwell, 2007). This last finding is in line with previous literature showing that a large existing customer base in a local market reduces informational frictions to trade with new customers (e.g, Chaney (2014))

**Related literature.** Our work contributes to a vast stream of research in corporate finance that explores the interaction between financing decisions and product market strategies. This paper is especially related to the literature that focuses on access to liquidity on product market outcomes

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<sup>13</sup>Purchases of external services are composed of "outsourcing expenses" (39%) and "other external expenses" (61%) which include advertising costs, travel costs, transportation costs and external R&D costs. Intangibles assets are composed of "concessions, patents and similar brands" (63% of total intangible assets) and "other intangible assets" (37%), which include firms' communication media (e.g., website). It is estimated that the total advertising costs of French manufacturing firms amounted to €18.2 billion in 2005 (Insee, 2007). This suggests that advertising costs represent approximately 11% of total purchases of external services. Assuming that the increase in purchases of external services is completely driven by a rise in advertising expenditures, the estimated coefficient would indicate that advertising expenditures increased by 12% following the shock.



such as price levels (Phillips, 1995; Chevalier, 1995*b*; Chemla and Faure-Grimaud, 2001; Khanna and Tice, 2005; Bau and Matray, 2019), the sensitivity of prices to demand shocks (Chevalier and Scharfstein, 1996; Campello, 2003; Gilchrist et al., 2017; Dou and Ji, 2018) or the ability of firms to build market share (Frésard, 2010; Boutin et al., 2013).<sup>14</sup> This paper contributes in three ways. First, we provide the first causal, direct evidence that liquidity frictions limit the ability of firms to finance the formation of new trade relationships. Second, our results emphasize the role of non-price strategies in the creation of a customer base and shed light on the role of informational frictions in the formation of business-to-business trade relationships. Third, this paper identifies trade credit supply as an important financial driver of product market outcomes. In this respect, this paper contributes to a series of studies looking at the adverse effects of long payment periods on firm growth (Murfin and Njoroge, 2015; Boissay and Gropp, 2013; Barrot, 2016; Barrot and Nanda, 2016) by providing evidence that large working capital needs with existing customers dampen the ability of firms to expand their customer base.

This paper is also connected to a developing stream of the literature that looks at the role of demand factors in shaping firms' size distribution (Hottman, Redding and Weinstein, 2016; Bernard, Moxnes and Saito, 2019), life-cycle growth (Foster, Haltiwanger and Syverson, 2016; Moreira, 2016; Fitzgerald, Haller and Yedid-Levi, 2016; Atkin, Khandelwal and Osman, 2017; Sedláček and Sterk, 2017; Eslava and Haltiwanger, 2019; Maksimovic, Phillips and Yang, 2019), or stock returns (Gourio and Rudanko, 2014; Dou et al., forthcoming). While these studies document a large role for demand factors, they remain largely silent on why some firms are able to attract more customers than others.<sup>15</sup> Existing research that investigates the determinants of the formation

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<sup>14</sup>More broadly, the literature in corporate finance has also investigated how financial factors shape industry structure (Brander and Lewis, 1986; Chevalier, 1995*a*; Kovenock and Phillips, 1997; Zingales, 1998; Bolton and Scharfstein, 1990; Cetorelli and Strahan, 2006), product quality (Maksimovic and Titman, 1991; Matsa, 2011; Phillips and Sertsios, 2013), or product innovation (Hellmann and Puri, 2000; Phillips and Sertsios, 2016; Hoberg and Maksimovic, 2019).

<sup>15</sup>An exception is Dou et al. (forthcoming) who study the asset pricing implications of the fragility of trade relationships in the presence of financial constraints. We complement this paper by focusing on the determinants of sales growth and by providing direct, causal evidence of a link between the presence of liquidity constraints and the expansion of the customer base.

of supplier-customer links has so far relied on randomized experiments connecting suppliers and customers in business meetings (Fafchamps and Quinn, 2016; Cai and Szeidl, 2017) or focused on factors that are largely exogenous to the firm such as tax reform (Gadenne, Nandi and Rathelot, 2019) or transportation systems (Duranton, Morrow and Turner, 2014; Donaldson, 2018; Bernard et al., 2019). Therefore, one important contribution of this paper is to shed light on a firm-level determinant of the investment in the customer base, namely the presence of liquidity constraints.

Lastly, our work relates to the literature that explores the role of financial frictions in shaping exports (Amiti and Weinstein, 2011; Minetti and Zhu, 2011; Caggese and Cuñat, 2013; Manova, 2013; Schmidt-Eisenlohr, 2013; Chaney, 2016; Eaton et al., 2016; Antràs and Foley, 2015; Demir, Michalski and Ors, 2017; Xu, 2019). Our main contribution to this literature is to provide a clean analysis of the margins through which liquidity constraints distort firm-level exports. Using export data on Peruvian firms, Paravisini et al. (2014) show that the 2008 bank credit crunch affected exports solely at the country intensive margin, and conclude that a reduction of bank credit supply is observationally equivalent to an increase in variable trade costs. We find that such equivalence does not hold for short-term financing, as the reduction of liquidity constraints also have effects at the country extensive margin. Moreover, we provide new evidence that liquidity frictions affect the customer extensive margin, but not the intensive one. Overall, our findings strongly support the idea that firms must incur market penetration costs à la Arkolakis (2010) to expand their customer base, and that relaxing liquidity constraints reduces the cost of financing the acquisition of new customers.

## 2.2 Institutional and theoretical background

### 2.2.1 The reform

Faced with a general increase in payment periods across European economies, in the early 2000s, the European Union called on member states to take action against what was considered a financial burden on SMEs. In response, the French government changed the trade code to set 30-day payment terms after product delivery as the default option. However, the 30-day limit was only a recommendation and rarely applied in practice.

Acknowledging the limitations of the 2001 law, in 2006, the French government enacted a reform capping contractual payment terms in the trucking sector at thirty days (see Barrot (2016) for further details). The cap on payment terms was then extended to any transaction involving French firms, regardless of the sector in which they operated. This extension was part of a broader package of reforms called the "Law on the Modernization of the Economy" (LME) approved by the French assembly in 2008.<sup>16</sup>

Effective January 1, 2009, the reforms prevented firms from agreeing on contractual payment terms exceeding sixty days after receipt of an invoice (or 45 days following the end of the month).<sup>17</sup> The government ensured that the reform was implemented by introducing considerable sanctions for non-complying firms and by urging the French competition authority to conduct regular audits.<sup>18</sup> Some sectors were exempted from the cap on payment terms, as lawmakers were concerned that

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<sup>16</sup>The Law on the Modernization of the Economy was not limited to payment periods. The law introduced a broad set of measures such as simplified administrative procedures for self-employers and the removal of regulatory hurdles to apply for public procurement contracts. More important, the law facilitated price discrimination between suppliers and customers. These measures, however, are not a concern for identification. Indeed, the payment period reform is the only one relying on a specific payment period threshold. Consequently, the exposure of firms to the payment period reform through their distance to this threshold is unlikely to be correlated with the other LME measures.

<sup>17</sup>Importantly, asking suppliers to delay their invoices is considered an abusive practice and is subject to meaningful sanctions.

<sup>18</sup>Firms' accounting auditors are required to report payment terms exceeding the legal limit. Penalty procedures can be initiated in the event of a violation and may result in a 75,000 euro fine. Non-complying firms are subject to civil sanctions amounting to up to 2 million euros. In 2015, for instance, a major telecom group had to settle a fine of 750,000 euros following several complaints from suppliers. See TelecomPaper.com (2015).

the reform might have been impractical or detrimental to economic activity. The complete list of derogations is displayed in Appendix 7. Importantly, the reform solely applied to transactions contracted under the French trade code. Hence, the cap on payment terms was not binding for international transactions because exporters could choose to contract under the trade code of the foreign customer or the CISG international trade code.<sup>19</sup>

To illustrate the reform and its implementation, Figure 2-1 displays the evolution of payment periods between 1999 and 2012 (the datasets and construction of the measures are described in section 2). The introduction of the reform is correlated with a sharp decrease in payment periods for firms operating mainly in the domestic market, from approximately 66 days in 2007 to 63 in 2009.

[Insert Figure 1 here]

A few comments are in order here. First, the sharp decline in payment periods one year before the implementation of the law reflects that it was generally anticipated (ODDP, 2009). Professional organizations were aware of the new law since they had participated in its design. Moreover, French firms are required by law to publish their general terms and conditions in the first quarter of each year. This document details the menu of unit prices and payment conditions for the coming year. To comply with the reform, as of January 1, 2009, firms had in principle to apply the new rules in 2008.

One may also be concerned that the decrease in payment periods was caused by the coincident 2008 financial crisis. Payment periods, however, approximately remained at their 2009 level in 2012, despite that financial conditions had largely returned to normal in the meantime. The persistence of the reduction in payment periods, therefore, suggests that the observed decline between 2007 and 2009 was not driven by the financial crisis.

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<sup>19</sup>CISG stands for Convention on Contracts for the International Sale of Goods, also known as the Vienna Convention. See Le Roch and Bricq (2013) for further details (in French)

## 2.2.2 Trade credit provision and liquidity constraints

Would a cap on payment terms mitigate firms' liquidity constraints? Traditional analysis of trade credit would give the opposite prediction. Given the large cost of trade credit, the corporate finance literature has rationalized the presence of interfirm lending as an optimal response to liquidity frictions affecting customers.<sup>20</sup> The different theories based on this idea predict that trade credit flows from large, creditworthy suppliers to small and financially constrained customers.<sup>21</sup> Consistent with this view, Garcia-Appendini and Montoriol-Garriga (2013) show that liquidity-rich suppliers increased their provision of trade credit to liquidity-poor customers during the 2008 financial crisis.<sup>22</sup>

[Insert Figure 2 here]

This traditional view has been challenged by empirical studies showing that firms with high bargaining power actually receive trade credit from smaller, potentially financially constrained suppliers (Klapper, Laeven and Rajan, 2012; Fabbri and Klapper, 2016).<sup>23</sup> Murfin and Njoroge (2015) shows that the provision of trade credit depletes small firms' internal funds, leading them to reduce capital expenditures. Examining the effects of the early implementation of the reform in the trucking sector in 2007, Barrot (2016) finds that long payment periods raise firms' exit rate (corporate defaults) and lower the number of new entrants in the industry.<sup>24</sup> Under this view,

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<sup>20</sup>Ng, Smith and Smith (1999) estimate the cost of trade credit to be as high as 44% in annualized terms.

<sup>21</sup>By assumption, in the absence of trade credit, customers would be unable to finance their purchases through bank credit. Suppliers may then fill the void left by banks because of the former's greater ability to screen customers (Smith, 1987; Biais and Gollier, 1997), or to prevent fund diversion (Burkart and Ellingsen, 2004; Cunat, 2007). Providing trade credit to customers is optimal from a supplier perspective because it allows for an increase in total sales.

<sup>22</sup>See also Restrepo, Sosa and Strahan (forthcoming) for evidence of increased reliance on accounts payable in the face of an adverse shock to short-term bank financing.

<sup>23</sup>Anecdotal evidence suggests that the financial gains at stake are massive for high bargaining power firms. In 2015, for instance, when Procter & Gamble unilaterally extended its payment terms to all its suppliers by 30 days, the cash balance of the company nearly doubled (Esty, Mayfield and Lane, 2016).

<sup>24</sup>Providing trade credit would not consume internal liquidity if receivables were readily convertible into cash. Empirical evidence suggests, however, that the use of working capital financing solutions such as factoring is generally limited to large firms. High costs or a lack of visibility are the main obstacles proposed to explain the low penetration of this type of short-term financing (Garcin and Charpin, 2013).

capping payment terms might be a way to limit the transfer of liquidity from small suppliers to high bargaining power firms through the provision of trade credit.

The analysis of payment periods suggests that the second view prevails in our case. Figure 2-2 plots the average payment periods from customers faced by firms in 2007 and 2009. Firms are sorted by sales percentiles in their main sector. The distribution of payment periods shows that small firms are disproportionately exposed to long payment periods, which is difficult to reconcile with the first view of trade credit.<sup>25</sup> Moreover, the figure shows that the reform has not led to a homogeneous reduction in payment periods but instead has mainly benefited the smallest companies. We formally test the effect of the reform on access to liquidity in section 2.5 by estimating how the cap on payment terms affected firms' cash holdings and credit line drawdowns.

Of course, the cap on payment terms might have additional effects beyond increasing the liquidity availability for suppliers, thus creating potential identification threats when using the reform as a shifter to assess the effect of liquidity constraints on the acquisition of customers. In particular, by restricting the contract space that suppliers can offer, the reform may have had a direct effect on the ability of treated firms to attract or retain customers (Breza and Liberman, 2017). We address this problem by focusing on *exports*. Indeed, as noted above, the reform only applied to trade credit contracts between domestic suppliers and customers but did not affect the generosity of trade credit terms suppliers could offer to their international clients.

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<sup>25</sup>There is, however, a “third” view of trade credit that is compatible with high bargaining power firms receiving trade credit that would predict a negative effect of the reform. Giannetti, Serrano-Velarde and Tarantino (2017) argue, for instance, that unlike price discounts, offering trade credit does not reduce the marginal cost of the customer. Granting large payment terms, therefore, might be a way for firms to limit the expansion of high bargaining power customers to preserve profitable trade relationships with low bargaining power firms. A last strand of papers posits that trade credit amounts to a short-term leasing of the product (Long, Malitz and Ravid, 1993; Kim and Shin, 2012). In the presence of uncertainty over the quality of the product, trade credit might be an optimal way to incentivize suppliers to satisfy the requirements of their customers. However, both theories predict that the reform should have negative effects on domestic sales, which is not the case in our setting. See section 2.5.3 for further details.

## 2.3 Data and summary statistics

### 2.3.1 Data

We use firm-level datasets from French customs (firm-to-firm exporting transactions), the French fiscal administration (tax returns) and the French National Institute of Statistics (Insee). The different sets of data are merged via a unique firm identifier (the “SIREN” identifier).

**Customs data.** We use a French customs dataset that records all transactions occurring between 2002 and 2012 involving a French exporter and an importing firm located in the European Union. For each transaction, the dataset records the identity of the exporting firm, the permanent identification number of the importing firm (VAT number) and its country of location, the date of the transaction (month and year), the product category (at the 8-digit level of the Combined Nomenclature classification), the value of the shipment and the quantity of products sold. On average, measured by value, 85% of French exports were realized by importing firms that were also present the year before, a sign of the good quality of the customer identifier. We remove transactions where the French exporter plays the role of an intermediary by selling a good that is actually imported from a third country. In some cases, the importing firm might request the goods to be delivered in another country than that in which it is currently located. In these cases, the destination country is recoded to correspond to the country of the buyer. In 2007, we observe a total of 67,000 exporters selling to 627,000 distinct importers. There are approximately 9,400 products sold across the 26 countries of the European Union.

In our baseline specification, the data are aggregated at the firm  $f$ , year  $t$  and country  $m$  level. For a given  $(f, m, t)$  triplet, however, we distinguish exports realized with a customer with whom firm  $f$  trades at both times  $t$  and  $t - 1$  (a *stable* customer), trades at time  $t$  but not at time  $t - 1$  (a *new* customer), or trades at time  $t - 1$  but not at time  $t$  (a *lost* customer). To measure export growth, we use the “mid-point” growth rate introduced by Davis, Haltiwanger and Schuh (1996) because it

is conveniently bounded. Hence, we define export growth as follows:

$$\begin{aligned}
\Delta Exports_{f,m,t} &= \frac{2 * (Exports_{f,m,t} - Exports_{f,m,t-1})}{(Exports_{f,m,t} + Exports_{f,m,t-1})} & (2.1) \\
&= \frac{2 * (Exports_{f,m,t}^S - Exports_{f,m,t-1}^S)}{(Exports_{f,m,t}^S + Exports_{f,m,t-1}^S)} + \frac{2 * (Exports_{f,m,t}^N - Exports_{f,m,t-1}^L)}{(Exports_{f,m,t}^S + Exports_{f,m,t-1}^L)} \\
&= \Delta Stable\ customers_{f,m,t} + \Delta Customer\ base_{f,m,t}
\end{aligned}$$

where the subscripts  $S$ ,  $N$  and  $L$  denote stable, new and lost customers, respectively.<sup>26</sup> This decomposition allows us to separate the contribution to export growth of the variation in sales to existing customers ( $\Delta Stable\ customers_{f,m,t}$ ) from the role of the evolution of the customer base ( $\Delta Customer\ base_{f,m,t}$ ).<sup>27</sup>

The extensive margin is analyzed through the lens of the variables  $Entry_{f,m,t}$  and  $Exit_{f,m,t}$ , which are equal to 1 when firm  $f$  enters (exits) country  $m$  at time  $t$ . By construction,  $Exit_{f,m,t}$  ( $Entry_{f,m,t}$ ) is only defined if firm  $f$  is exporting (is not exporting) to country  $m$  at time  $t - 1$ .

**Tax return data.** The second dataset comes from tax returns collected by the French fiscal administration. This dataset gives accounting information for the universe of French firms in the private sector (excluding the financial and agricultural sectors) between 2002 and 2012. In addition to balance sheet information, a 5-digit sector code (along the NACE, the EU economic activity nomenclature) is provided. We restrict the dataset to firms subject to the standard tax regime (firms with sales less than €789,000 are subject to a simplified tax regime, for which fewer variables are available). As we focus on the effects of the reform on international transactions, we also choose to only include firms in the manufacturing and wholesale sectors. This leaves us with approximately 480,000 firms selling in 363 sectors. To correct for reporting errors, we systematically replace

<sup>26</sup>Our results are entirely robust to using the standard growth rate, but we have to account for the presence of very large values of the variation in international sales. See Table A10 of the Online Appendix.

<sup>27</sup>We focus on export growth conditional on survival. Namely, we record  $\Delta Exports_{f,m,t}$  only when firm  $f$  exports in  $m$  at both times  $t$  and  $t - 1$ .



outliers of all variables by missing values.<sup>28</sup>

Transaction-level payment information is not reported in our dataset. Instead, we rely on balance sheet statements to compute a firm-level measure of the time taken to collect payment from customers:

$$Payment\ periods_{f,t} = \frac{Accounts\ receivable_{f,t}}{Sales_f}$$

*Accounts receivable<sub>f,t</sub>* gives the amount of sales that customers of firm *f* still have not paid at time *t*. The ratio is multiplied by 36.5 so that the unit of the variable is ten days. *Payment periods<sub>f,t</sub>* reflects the average payment period between firm *f* and its customers for a given fiscal year *t*. Symmetrically, we estimate the average time taken for a firm to pay its suppliers by computing the ratio of accounts payable to sales and expressing it in days of sales. We focus on payment periods from suppliers in most of the analysis and take the supplier side into account in robustness checks.<sup>29</sup>

Table A1 of the Appendix displays the sectors with the highest and lowest average value of payment periods from customers and to suppliers in 2007. Strikingly, long payment periods appear mostly in heavy industries. In contrast, short payment periods are observed nearly exclusively for food processing firms. This is consistent with the prediction of Long, Malitz and Ravid (1993) that product durability should be positively correlated with average payment terms.

Importantly, while this measure provides sensible information at the aggregate level, there might be important measurement errors at the firm level. The computation method indeed assumes that accounts receivable (or accounts payable) are evenly distributed over the fiscal exercise. The instrumentation method described in the next section explicitly addresses this issue.

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<sup>28</sup>We define an outlier as an observation that is above (resp. below) the median plus (resp. minus) three times the gap between the 5th and the 95th percentile. This treatment imposes less structure on the data than winsorizing outliers and is more flexible than trimming a given fraction of the distribution of the different variables.

<sup>29</sup>The source of identification in the baseline empirical strategy comes from heterogeneous exposure to the reform due to variation in the sectoral composition of firms' customer base. The split of sales by downstream sector is given by the EAE survey. The survey, however, does not contain the sectors of the suppliers, which makes the analysis using payment periods on the supplier side less precise.

**EAE survey.** To precisely identify the different sectors in which firms operate, we rely on an extensive yearly survey conducted by the Ministry of Industry (Enquête Annuelle des Entreprises, “EAE”). The survey is exhaustive for French firms with more than 20 employees or whose sales exceed €5 million and records the amounts of sales realized by each surveyed firm in each 5-digit sector.<sup>30</sup> The total turnover of the firms included in the sample represents more than 95% of the aggregate turnover. The survey includes 71,000 firms in 2007.

**DADS.** We use the French matched employer-employee administrative dataset (*Déclarations Annuelles des Données Sociales*, DADS) to study the evolution of the number of workers and the number of hours worked. Firms are required by law to report every year detailed information about their workers when filing payroll taxes.<sup>31</sup> The employer must report the type of contract, gross and net wages, the number of hours worked and an occupation code for each worker. The French nomenclature of occupations (*Nomenclatures des professions et catégories socio-professionnelles des emplois salariés des employeurs privés et publics*, PCS-ESE) consists of 414 different occupations, including, for instance, 14 occupations related to marketing (e.g., public relations and communication executives).

### 2.3.2 Summary statistics

The baseline sample is restricted to firms present in the intersection of the customs, EAE survey and tax return datasets. Detailed summary statistics and descriptions of the construction of the variables are given in 4.19. The dataset contains approximately 17,000 firms with non-missing values for the main variables of interest. In total, firms in the dataset account for approximately 80% of total exports to the European Union by manufacturers and wholesalers between 2003 and

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<sup>30</sup>The firm-level sector code available in the tax returns corresponds to the sector in which the firm realizes most of its activity.

<sup>31</sup>Note that reporting of the occupation code is required for firms that employed at least 20 employees in a given year and optional for firms below the threshold.

2012.

Firms belong mostly to the manufacturing sector (71 %) and are on average relatively mature (median age of 25 years). The average firm is a relatively large SME, with €14.1 million in total assets and generating €17.3 million in sales in 2.97 different sectors. Accounts receivable represent 20% of total assets, and cash holdings represent 8%. Approximately 40% of firms do not have long-term debt, and the average ratio of long-term debt to total assets is 4%.

The average firm in our dataset exports €9 million to the European Union, is present in 7.2 countries and has 5.0 customers per country (Table A3). Table A4 shows that the number of customers increases with the number of years spent in a country, with approximately 8.8 customers on average after five years compared to 3.6 in the year of entry. Similarly, we observe that the probability that a firm exits a country or terminates a trade relationship with a customer from this country decreases with the time spent in the market. Table A5 shows that 54% of the trade relationships give rise to more than one transaction. When they do, they last 25 months on average, with a transaction occurring every 5 months. A larger initial transaction between an exporter and an importer is associated with a higher likelihood of multiple transactions and with a higher transaction frequency.

## **2.4 Identification strategy**

The objective of the empirical analysis is to study how the decrease in payment periods induced by the reform affected the size and composition of the international customer base. A natural starting point, therefore, would be to run an OLS regression of exports on payment periods. Such a specification, however, would deliver biased estimates in our setting because the reform was enacted in the middle of the global 2008 financial crisis. Figure A1 in the Appendix shows that aggregate exports to the European Union decreased by 28% between 2007 and 2009. At the firm level, the average yearly growth rate of exports was equal to -13% during the same period. Since

the reduction in payment periods coincided with the collapse of exports, the within-firm correlation between the two variables is likely to be positive.

We need to compare firms differentially affected by the cap on payment terms to isolate the effects of the reform from the confounding impact of macroeconomic shocks. We exploit the 60-day rule as a source of variation in exposure to the reform. The idea of the treatment intensity approach is that firms paid 80 days before the reform should have benefited more from the reform than firms facing payment periods of only 65 days. Moreover, the reform should have left suppliers already paid in less than 60 days virtually unaffected by the rule. We formalize this idea by defining

$$Distance\ to\ 60\text{-day}\ rule_f = \max(0, Payment\ periods_f - 60)$$

The maximum operator captures the fact that only firms that faced payment periods longer than 60 days were exposed to the reform.

The ability of firms to acquire new customers and the payment periods that they face with their existing customers, however, may be jointly driven by unobservable characteristics. Firms with high bargaining power, for instance, should face short payment periods and are likely to have a superior ability to negotiate new trade contracts. Hence, the exposure to the reform as measured by distance to the 60-day threshold is likely to be endogenous. We address this concern by exploiting the sectoral composition of the customer base. While payment conditions vary across sectors, they tend to be relatively homogeneous within a given product market (Ng, Smith and Smith, 1999). First, most trade credit determinants emphasized in the literature are homogeneous at the sector level.<sup>32</sup> Second, as firms compete on the provision of trade credit (Singh, 2017; Demir and Javorcik, 2018), payment terms tend to be comparable within sectors. Therefore, a firm whose customers are

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<sup>32</sup>These determinants include the degree of product market competition (Brennan, Maksimovic and Zechner, 1988), the degree of uncertainty on the quality of the product (Long, Malitz and Ravid (1993) and Lee and Stowe (1993)) and the information advantage of suppliers over banks in observing product quality or enforcing high effort (Smith (1987), Biais and Gollier (1997), Burkart and Ellingsen (2004) or Cunat (2007)).

mostly present in sectors with long pre-reform average payment periods should be highly exposed to the reform.

Formally, we construct our shift-share variable instrument in the following way:

$$\overline{Distance\ to\ 60\text{-day\ rule}}_{f,07} = \sum_s \omega_{f,s,07} \cdot Distance\ to\ 60\text{-day\ rule}_{s,07}$$

where  $\omega_{fs07} = Sales_{fs07}/Sales_{f07}$  is the share of firm  $f$ 's sales in sector  $s$  in total 2007 sales (observed using the EAE survey) and

$$Distance\ to\ 60\text{-day\ rule}_{s,07} = \frac{1}{N_{s,07}} \sum_{g \in \Omega_{s,07}} Distance\ to\ 60\text{-day\ rule}_{g,07}$$

is the average distance to the threshold in sector  $s$  taken from the universe  $\Omega_{s,07}$  of firms making less than 10% of their sales abroad and operating primarily in sector  $s$ .<sup>33</sup> This variable captures the *ex ante* exposure to the reform based on the 2007 distance to the 60-day threshold in the sectors of firm  $f$ 's customers.

In addition to addressing the problem of unobserved firm-level heterogeneity, this instrumentation strategy has the advantage of limiting potential measurement error bias caused by the use of an imperfect proxy for payment periods (see subsection 2.3.1). In particular, by computing the average value of *Payment periods<sub>f</sub>* on the population of firms making less than 10% of their turnover abroad, we ensure that the exogenous variation induced by the reform is based on factors originating mostly from the domestic market.<sup>34</sup> This removes any potential mechanical link between the evolution of the rate of payment collection and export activity. The construction of the instrument, moreover, intentionally ignores the derogations introduced by the law (see section 2.2.1). Indeed, these exceptions might have been implemented because of some unobservable factors that could be related to

<sup>33</sup>The main sector of activity is observable for all French firms; the average distance is therefore computed using information on over 400 thousand companies. Sectors with fewer than 10 non-exporting firms are discarded.

<sup>34</sup>Computing the average on the population of non-exporting firms may be too restrictive because a significant proportion of companies report low export sales.

export performance. Introducing the derogation in the computation of  $\overline{Distance\ to\ 60\text{-day\ rule}}_{f,07}$  would in that case compromise the validity of the instrument.<sup>35</sup>

We obtain the final definition of the instrument by multiplying the 2007 distance by a dummy variable marking the implementation of the 60-day cap.

$$\overline{Distance\ to\ 60\text{-day\ rule}}_{f,t} = 1[t \geq 2007] \cdot \overline{Distance\ to\ 60\text{-day\ rule}}_{f,07}$$

the dummy being chosen to equal one beginning in 2007 to account for a potential anticipation of the reform. Our baseline equation is given by the 2SLS estimation of:

$$\begin{aligned} Y_{f,m,t} &= \alpha_f + \gamma_{m,t} + \beta_1 \cdot \Delta Payment\ periods_{f,t} + \beta_X \cdot X_{f,t} + \epsilon_{f,m,t} \\ \Delta Payment\ periods_{f,t} &= \delta_f + \eta_{m,t} + \theta_1 \cdot \overline{Distance\ to\ 60\text{-day\ rule}}_{f,t} + \theta_2 \cdot X_{f,t} + \nu_{f,m,t} \end{aligned} \quad (2.2)$$

where  $Y_{f,m,t}$  is an exporting variable,  $\alpha_f$  and  $\delta_f$  are firm fixed effects,  $\gamma_{m,t}$  and  $\eta_{m,t}$  are country-year fixed effects and  $X_{f,t}$  is the set of firm-level control variables. We expect the reform to induce a downward adjustment of payment periods ( $\theta_1 < 0$ ), thereby decreasing firms' cost of access to liquidity and enhancing their propensity to export ( $\beta_1 < 0$ ).

As discussed in Borusyak, Hull and Jaravel (2018), two conditions are required for the shift-share variable to be considered a valid exogenous factor. First, sectoral averages need to be uncorrelated with individual unobserved characteristics. This will not be the case if, for instance, some firms are large enough to influence sectoral payment conditions. However, this concern is mitigated by the fact that we take a simple average of payment periods within a sector and that we retain only sectors in which we observe at least ten firms (a sector contains on average 1003 firms).<sup>36</sup>

<sup>35</sup>Note that the first-stage estimation only identifies the change in payment periods that can be explained by the 60-day threshold. Therefore, the IV estimator captures the *local average treatment effect* (LATE) by relying only on the effects of the reform on the firms that were affected by and that applied the 60-day rule (*compliers*).

<sup>36</sup>Our results are broadly unaffected by changes in the definition of  $\overline{Distance\ to\ 60\text{-day\ rule}}_{f,07}$  such as using weighted averages in the computation of  $\overline{Distance\ to\ 60\text{-day\ rule}}_{s,07}$  or including exporters in the set  $\Omega_{s,07}$ .

The second condition states that the 2007 heterogeneity in the sectoral composition of the customer base should not capture other factors affecting export patterns. There are two main reasons why this condition may not be met, and we develop distinct strategies for each one.

First, firms that are more exposed to the reform may export to specific countries or export specific products that were more affected by the trade collapse. For instance, if exporters more affected by the reform were mainly present in countries where demand fell relatively more during the crisis, a naive estimation might erroneously yield a significant positive correlation between the variation in payment periods and export activity. In our baseline specification, we exploit the disaggregated nature of export data and introduce country-year fixed effects. Our estimations, therefore, are based on a comparison of export outcomes in a given country and in a given year across firms differently exposed to the reform. Similarly, using country-year-product fixed effects (i.e., comparing the exports to Germany of “shavers, hair clippers and hair removing appliances, with self-contained electric motor”), we address the concern that the exposure to the reform may be related to the mix of products sold by firm. In this alternative specification, we exploit the heterogeneity in the sectoral composition of the customer base across firms selling the same product in the same country to isolate the effect of the reform. Finally, we exploit the time dimension of the dataset to include firm fixed effects to remove the influence of time-invariant unobservable firm characteristics (e.g., management quality, distance to the closest port).

The second threat to identification is that the exposure to the law may capture differential trends in export dynamics unrelated to the enactment of the reform. We directly test for the presence of differential trends using covariate balance tests in subsection 2.6.1. Moreover, throughout the analysis, we control for several observable variables that could affect the ability of firms to acquire new international customers. Because of its "shift-share" design, the instrument may inappropriately capture sectoral variations that are unrelated to payment periods but that affect export activity. For instance, the instrumental variable (IV) may correlate with the dynamism of

the different downstream sectors in which the firm operates. We introduce in the specification the average growth rate of sectoral sales ( $\overline{Sales\ growth\ rate}_{f,t}$ ) weighted by the firm-level sectoral shares of sales. This variable, therefore, controls for the time-varying economic conditions that firm  $f$  experiences in the different sectors in which it operates. We also account for the role of size and productivity, two important determinants of exports, by including  $\log(Total\ Assets)_{f,t-1}$  and  $Labor\ productivity_{f,t-1}$  (defined as the ratio of value added to the number of employees) in the set of control variables. Finally, the presence in some specific downstream sectors may be related to firms' financing choices, which in turn could affect export activity. We control for  $Long-term\ debt/TA_{f,t-1}$  (defined as the ratio of debt of more than one year to total assets) to address this potential issue.

Following Adão, Kolesár and Morales (2019), we cluster standard errors on the main sector. Firms operating in the same main sector are likely to be similarly exposed to the reform, which may lead error terms to be correlated within sectors. In Table A9 of the Online Appendix, we show that our results are robust to alternative choices of clusters.

## 2.5 Effects of the reform on access to liquidity

### 2.5.1 Payment periods

Figures 2-3a and 2-3b provide a graphical representation of the relationship between the instrument and the variation in payment periods.<sup>37</sup> The  $x$ -axis in both graphics is constructed as follows:

$$\overline{Payment\ periods}_{f,07} = \sum_s \omega_{f,s,07} \cdot Payment\ periods_{s,07}$$

where  $Payment\ periods_{s,07}$  is the simple average of payment periods in sector  $s$ .  $\overline{Payment\ periods}_{f,07}$  is therefore akin to a slightly modified version of the instrument that does not account for the 60-day

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<sup>37</sup>In both figures, the sample is split into 100 percentiles along the  $x$ -axis; the ordinate axis displays the average value of the  $y$  variable in each percentile.



rule. In Figure 2-3a, the y-axis represents the evolution of firm-level payment periods between 2007 and 2009. Firms exposed to payment periods from customers shorter than 60 days in 2007 experienced only a small decrease in payment periods after the implementation of the reform. In contrast, there is a large and significant negative correlation between  $\overline{Payment\ periods}_{f,07}$  and  $\Delta Payment\ periods_{f,07-09}$  when average pre-reform payment periods exceed 60 days. This indicates that our estimation method correctly detects the effects of the 60-day rule on the variation in payment periods. Furthermore, Figure 2-3b shows that there is no obvious correlation between the instrument and the evolution of payment periods between 2003 and 2005, which suggests that the pattern shown in Figure 2-3a indeed reflects the effects of the implementation of the reform.

[Insert Figures 2-3a and 2-3b here]

We then formally estimate the effects of the reform on payment periods. We estimate to that end

$$\Delta Payment\ periods_{f,t} = \mu_f + \rho_t + \pi_1 \cdot \overline{Distance\ to\ 60\text{-}day\ rule}_{f,t} + \pi_X \cdot X_{f,t} + \xi_{f,t} \quad (2.3)$$

Note that this step is not formally equivalent to an estimation of the first stage of equation 2.2 since we abstract here from the set of exporting countries in which firm  $f$  operates (the regression here is performed at the firm level and not at the firm-country-year level).

[Insert Table 2.1 here]

Table 2.1 displays the results of the different specifications. The coefficient  $\pi_1$  is negative and significant at the 1% level in all columns. Specifications 1 to 3 indicate that each additional day of distance to the 60-day threshold is associated with a reduction of 0.091 to 0.115 days of customer payment periods per year.

## 2.5.2 Capital structure

We study in this subsection how firms adjust their capital structure following the change in payment periods. Specifically, we examine the evolution of financial characteristics induced by the decrease in customer payment periods related to short-term financing (working capital needs, cash and drawn credit lines) and long-term bank debt.<sup>38</sup> All variables are computed as a ratio to total assets. The specification includes controls and firm and year fixed effects.

[Insert Table 2.2 here]

The F-stats reported at the bottom of Table 2.2 are well above the recommended value of 10 (Stock and Yogo, 2005), which in line with Table 2.1, suggests that the instrument is not weak. Column 1 confirms that firms that experience a decrease in payment periods benefit from lower working capital needs. The economic magnitude is large, as the coefficient indicates that a three-day reduction in payment periods (one sample standard deviation) lowers working capital needs scaled by total assets by 3.8% relative to the pre-reform mean. Firms more exposed to the reform also exhibit higher cash ratios after the enactment of the law (column 2). Interestingly, the coefficient on the cash ratio is very close in absolute value to the credit line coefficient (column 3) but of the opposite sign. This suggests that the decrease in payment periods raises firms' cash holdings, which enables them to draw less on their credit lines. We find no effect of the reform on long-term debt (column 4), which is consistent with the idea that the decrease in payment periods reduces short-term liquidity needs but leaves long-term financing needs unaffected.<sup>39</sup> Overall, the results in Table 2.2 support the hypothesis that the reduction of payment periods from customers mitigated liquidity constraints.

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<sup>38</sup>The leverage measure is accordingly removed from the set of control variables in this subsection.

<sup>39</sup>In theory, the reform could have indirect effects on bank debt (e.g., Biais and Gollier (1997)), as firms could substitute between trade credit and bank debt, and banks could use trade credit as a source of information on the economic performance of the supplier and its customers. An econometric analysis of this channel, however, would probably require more detailed information on bank loans.

Figure 2-4 illustrates the dynamics of the effects of the reform on cash holdings. We compare cash holdings over time across firms below and above the median of the distance to the 60-day threshold in 2007 by interacting a dummy  $I(\text{Distance to 60-day rule} > \text{Median})_f$  with time and regressing the share of cash holdings in total assets on the interacted variable. The regression includes controls and firm and time fixed effects. The year 2007 is taken as the baseline. We find no evidence of pre-trends in cash holdings. Instead, cash holdings begin to increase for firms exposed to the reform in 2008, continue to grow in 2009, and remain stable thereafter. The pattern is consistent with the idea that the reform was partially anticipated and that the reduction in payment periods permanently increased cash holdings (see section 2.2.1).

### 2.5.3 Domestic sales

While payment periods decreased because of the reform, the restriction of the contract space induced by the cap on payment terms may have negatively affected firms' sales. Moreover, the previous results show that cash holdings increased because of the reform, which suggests that the decrease in sales, if there was one, did not offset the positive effects of the reduction in payment periods. A potential adverse effect of the reform on sales, therefore, is not a threat to our first stage but could still be problematic for the analysis of the impact of the reform on exports. Since the reform applied only to transactions contracted under the French code, French customers may have switched to foreign suppliers to continue benefiting from more advantageous payment terms. Under this hypothesis, a positive impact of the reform on exports may only reflect the presence of firms redirecting their activity to international markets in response to the cap on payment terms in the domestic market.

We explore this hypothesis in this subsection. This scenario implies that (i) an exogenous decrease in payment periods from French customers should result in lower domestic sales and (ii) an exogenous decrease in payment periods to French suppliers should result in higher import shares

(defined as the ratio of imports to total purchases). We test this joint hypothesis in Table 2.3.

[Insert Table 2.3 here]

The regressions of domestic sales on the variation in payment periods (first part of the hypothesis) yield a positive but not significant coefficient, which suggests that the reform did not have much impact on domestic sales (columns 1 and 2). The second part of the hypothesis states that when facing an exogenous decrease in payment periods to domestic suppliers, firms chose to rely relatively more on foreign firms to source their inputs. This would generate a negative relationship between the import share and the evolution of payment periods to suppliers.<sup>40</sup> We find no evidence of a statistically significant link between the two variables (columns 3 and 4). The F-stats are rather low, however, which suggests that the coefficients may be imprecisely estimated.

Taken together, these findings indicate that the reform did not have a clear, negative impact on sales in the domestic market. This may be explained by the fact that professional organizations representing both suppliers and customers in the same sector of activity were allowed to ask for a three-year derogation of the 60-day rule (see Appendix 7 for the list of sectors). Firms present in sectors in which the reform could have severely disrupted domestic trade relationships (e.g., sectors with highly seasonal activity such as the toy industry) are likely to have benefited from a derogation, which may have limited the adverse effects of the reform on domestic sales.

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<sup>40</sup>The evolution of payment periods to suppliers is instrumented by the sales-weighted average of the 2007 sectoral distance of payment periods to suppliers to the 60-day threshold. The weights are the same as for the baseline specification (share of sales realized by the firm in a given sector in 2007 total sales). This specification assumes that payment periods to suppliers are homogeneous across firms operating in the same sector.

## 2.6 Building a customer base under liquidity constraints

### 2.6.1 Export growth

Table 2.4 displays the results of the estimation of the effects of the reform on export growth (Panel A) and on exit and entry dummies (Panel B and C).<sup>41</sup> In each panel, the first column reports the estimates of the OLS regression of equation 2.2 without controls, and the next two columns display the results of the 2SLS specification without and with controls. All regressions include firm and country-year fixed effects.

[Insert Table 2.4 here]

The OLS regressions indicate a positive association between exports and the variation in payment periods for all three variables. There are two potential explanations for this. First, firms that experienced a greater decline in export demand in 2008-2009 may have asked their remaining customers to pay faster to meet their immediate liquidity needs. Second, since export transactions generate longer payment periods (Feenstra, Li and Yu, 2014), firms growing more internationally are likely to experience an increase in their average payment periods. In any case, this finding highlights the necessity of using a treatment intensity approach to isolate the effects of the reform on payment periods.

The sign of the coefficient is reversed when we compare export dynamics across firms differentially exposed to the reform using the 2SLS specification. The results in column 2 imply that larger reform-induced decreases in payment periods lead firms to grow more in countries in which they are already exporting (Panel A), to exit countries less often (Panel B), and to expand more rapidly in new countries (Panel C). Importantly, the estimated coefficient hardly changes when we introduce control variables, which suggests a limited role for omitted variables in our estimations. Expressing

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<sup>41</sup>Note that by construction, the size of the estimation sample changes with the dependent variable (see subsection 2.3.1).

the economic magnitudes in terms of sample standard deviation, we find that a three-day decrease in payment periods increases the growth rate of exports by 1.5 pp (compared to a pre-reform mean of 3.7%), lowers the propensity to exit a country by 1.2 pp (14.3%) and raises the probability of entry by 0.1 pp (3.9%). In other words, a one-standard-deviation shock brings the median exporter into the top 5% of the most dynamic exporters.

[Insert Figure 2-5 here]

Figure 2-5 breaks down the effects of the variation in payment periods on export growth over time.<sup>42</sup> This exercise serves three main purposes. First, it is important to remove any concern that our results may be driven by pre-existing trends in export growth. Second, the positive impact of the variation in payment periods on export growth could be explained by better export performance among firms more exposed to the reform during the crisis. For instance, firms more exposed to the reform may offer products for which demand decreased less during the trade collapse. Examining the relative performance of firms during the financial crisis enables us to test this hypothesis. Third, analyzing the dynamics of the effects after the reform is informative because it allows us to understand how firms react to a permanent shock to cash holdings. As in Figure 2-4, we compare the evolution of exports over time across firms below and above the median of the distance to the 60-day threshold in 2007 by regressing exports on the dummy  $I(\text{Distance to 60-day rule} > \text{Median})_f$  interacted with time. The regression includes controls and country-year and firm fixed effects.

[Insert Table 2.5 here]

The figure highlights two important findings. First, firms more exposed to the reform did not experience higher export growth before the reform, which rules out the hypothesis of the presence of differential pre-trends. Second, the effects of the reform on exports become clearly positive in 2010-2011 and disappear in 2012. This result indicates in particular that firms more exposed to the

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<sup>42</sup>In the remainder of the analysis, we focus on the effects of the reform on export growth (intensive margin).

reform did not export more in 2008-2009, which clearly shows that our results cannot be explained by better performance during the financial crisis among firms more distant to the 60-day threshold. The presence of a gap between the effects of the reform on cash holdings (Figure 2-4) and export growth (Figure 2-5) can either reflect the fact that efforts to raise international sales took time to materialize or that firms did not immediately invest in the expansion of their international customer bases. The breakdown over time of the effects of the reform on proxies of marketing in section 2.7.2 provides evidence in support of the second hypothesis and suggests that companies waited until the end of the crisis to invest in the acquisition of new international customers.

## 2.6.2 Expansion of the customer base

In this subsection, we examine the origins of the increase in export growth induced by the reform. Our research hypothesis is that the relaxation of liquidity constraints enables firms to invest more in the expansion of the customer base. The liquidity shock, however, could also have lowered firms' production costs, allowing them to become more competitive and to achieve higher export growth. Under this hypothesis, however, the variation in payment periods should affect both sales to existing and new customers (Bernard et al., 2019). A pure investment in the expansion of the customer base, in contrast, should only have effects on sales to new customers.

Using equation 3.6 in columns 1 to 3 of Table 2.5, we decompose export growth into a component capturing the variation in exports to existing customers ( $\Delta Stable\ customers_{f,m,t}$ ) and another component reflecting the evolution of the customer base ( $\Delta Customer\ base_{f,m,t}$ ). Strikingly, sales to existing customers do not increase following the enactment of the reform. Instead, the increase in export growth appears to be entirely driven by the expansion of the set of customers. We further dissect the impact of the reform on the evolution of exports by highlighting the contribution of the creation and termination of trade relationships to the evolution of exports. The results in columns 4 and 5 indicate that approximately two-thirds of the effects on  $\Delta Customer\ base_{f,m,t}$  are

explained by an increase in the acquisition of new customers and that one-third is due to a higher rate of retention of existing customers (the *Lost customers* $s_{f,m,t}$  coefficient, however, is not statistically significant).

[Insert Table 2.6 here]

The decomposition of the effects between existing and new customers shows that the increase in export growth cannot be explained by a decrease in production costs. The expansion of the customer base, however, could still be explained by mechanisms other than firms investing in the formation of demand for their products. First, firms could have simply started selling more products, which may have attracted new customers. In the first three columns of Table 2.6, we test whether firms realize higher international sales by selling more units of their existing products or by expanding their set of products. The estimations indicate that firms do not alter their product mix following the reform but rather sell more of their current products to new customers.<sup>43</sup>

Second, the reform may have allowed firms to expand their production capacity. This would have enabled firms to serve more customers without necessarily lowering infra-marginal production costs, which would be in line with the absence of effects on existing customers. We test this alternative explanation in the last two columns of Table 2.6 by sorting firms by the ratio of inventoried production over sales. Under the capacity constraints hypothesis, the effects should be concentrated among firms with low amounts of inventoried production because they do not have additional units to sell to potential new customers. Instead, we find the effects of the reform to be only significant for firms with high production reserves.

Third, firms could have started selling higher quality products to new customers. This would have led average sales per customer to rise, as an increase in quality while holding production costs fixed should result in higher trade volumes (Khandelwal, 2010). In columns 1 and 2 of Table 2.7, we

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<sup>43</sup>In this table, we define a product as an 8-digit code from the harmonized Combined Nomenclature.



show that neither average sales per customer nor average sales per new customer increase following the reform, which allows us to rule this third and final alternative mechanism.

[Insert Table 2.7 here]

The absence of an effect on average sales, moreover, suggests that firms do not target specific customers when expanding their customer base.<sup>44</sup> The regressions of the share of one-time customers on payment periods in columns 3 and 4 support this hypothesis, as we find that firms do not initiate more short-term trade relationships following the shock. Taken together, these results suggest that new customers are observationally identical to existing customers. The expansion of the customer base, therefore, is associated with a marked reduction in sales concentration across customers (column 5).<sup>45</sup> Using the Herfindahl index of sales across customers in a given country  $m$ , we estimate that a one-standard-deviation liquidity shock reduces sales concentration by 2.3% from the pre-reform mean.

### 2.6.3 Robustness checks

The identifying assumption underlying our instrumentation strategy is that the exposure to the reform  $\overline{Distance\ to\ 60\text{-}day\ rule}_{f,t}$  affects exports only through its impact on the variation in payment periods. However, it is possible that the exposure to the policy may be related to the composition of the products sold by firms. In that case, our estimations may not capture the heterogeneous treatment of the reform but rather the presence of differentiated demand dynamics across products. To test this hypothesis, we disaggregate our data one step further at the firm-country-product-year level. This allows us to introduce country-product-year fixed effects and account for differentiated demand shocks across products and potential composition effects. Table 2.8 presents the estimation

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<sup>44</sup>If firms can identify potential customers and customer acquisition entails fixed costs, firms should target larger customers first. In that case, a relaxation of liquidity constraints would allow firms to expand their customer base by adding relatively smaller customers. This would result in lower average sales per customer after the reform.

<sup>45</sup>The acquisition of small customers compared to existing customers, in contrast, is not expected to have a significant impact on the concentration of the customer base.

of the reduced-form equation based on the equation displayed in section 2.6.1. In the reduced-form specification, the variation in payment periods is not instrumented but directly replaced by  $\overline{Distance\ to\ 60\text{-}day\ rule}_{f,t}$ , the ex ante exposure to the reform.<sup>46</sup> The results show that our main conclusion is unchanged, as firms more exposed to the reform still achieve higher export growth by investing more in the acquisition of new customers.<sup>47</sup>

[Insert Table 2.8 here]

We proceed to several exercises to assess the sensitivity of our results to alternative specifications. For brevity, we relegate the details of the robustness checks to sections XI and XII of the Online Appendix and summarize the main tests here. First, we change the specification by considering OLS estimations or by including the derogations in the definition of the instrument. Second, the effects of the variation in payment periods on exports is reassessed using different levels of aggregation (firm, firm-year). Third, we test several alternative methods of constructing the instrument. Fourth, we re-estimate the impact of the reform on the different components of export growth using the standard growth rate instead of the mid-point growth rate. Fifth, we compute the standard errors using alternative definitions of clusters. Taken together, the tests strongly support the presence of an economically significant effect of the reform on export growth.

One might then object that since firms are customers as well as suppliers, the net effect of the reform may be null or ambiguous. We address this issue by designing an alternative specification that considers the effects of the variation in payment periods in *net* terms. As both payment periods from customers and to suppliers decreased all the more following the reform when the pre-reform distance to the 60-day threshold was larger, the reform mechanically reduced net payment periods. Specifically, we find that pre-reform imbalances between payment periods to suppliers and from

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<sup>46</sup>Using the reduced-form specification reduces the estimation noise coming from the 2SLS two-step procedures. Since both the treatment and the IV variables are defined at the firm-year level, the first stage is imprecisely estimated in the presence of country-product-year fixed effects.

<sup>47</sup>Note that in the reduced-form specification, the  $\overline{Distance\ to\ 60\text{-}day\ rule}_{f,t}$  coefficient is positive, as an increase in the ex ante exposure to the reform is associated with higher export growth.

customers are predictive of the sign and the magnitude of the subsequent change in net payment periods and use this insight to instrument the variation in net payment periods. We find our main results to be qualitatively unchanged by this exercise.

#### **2.6.4 Exposure to the reform**

In this subsection, we check that the effects of the reform on exports are stronger for firms that were likely to benefit from a reduction in payment periods. We begin by examining the role of financial constraints (see section XIV of the Appendix for a more detailed discussion). Following the literature on the subject (e.g., Fazzari et al. (1988), Hadlock and Pierce (2010) or Almeida, Campello and Weisbach (2004)), we proxy for the intensity of financial constraints by the size of the firm (measured by the volume of total sales) and the ratios of cash holdings over assets and of long-term debt over assets. We also draw on Bates, Kahle and Stulz (2009) and include the volatility of sales in the analysis, as firms with more volatile sales are more likely to be liquidity constrained. The three first variables are averaged for the period preceding the implementation of the reform (2003-2007). The volatility of sales is computed over the same period and normalized by the average amount of sales.

[Insert Table 2.9 here]

Table 2.9 presents the estimations of the effects of the reform on export growth for different sub-samples of firms. Each of the sub-samples is obtained by ranking firms according to the four indicators of financial constraints described above. Columns 1 to 8 show that the coefficients are significant at the 5% level only for small firms and firms with low levels of cash and high levels of debt and that exhibit high idiosyncratic risk. Combined with the results in Table 2.2, this finding strongly supports the idea that the decrease in payment periods spurs export growth by easing access to short-term financing for liquidity-constrained firms.

[Insert Table 2.10 here]

Firms' presence in domestic and international markets, in turn, may have shaped their exposure to the reform. First, firms that imported a large fraction of their inputs should have benefited more from the reform. Indeed, they should have been paid more rapidly by their French customers while still being able to pay international suppliers in more than 60 days. We test this idea by sorting exporters according to their 2007 import shares (columns 1 and 2). Accordingly, we find that the elasticity is significantly different from zero only for exporters that imported a large share of their inputs before the reform. Second, as firms with low market power are more likely to be harmed by disadvantageous payment terms (Klapper, Laeven and Rajan (2012)), they should benefit more from a regulation restricting long payment terms. To test this hypothesis, we split the sample based on the 2007 market share in France in a firm's main sector of activity. In line with our hypothesis, we find that firms with a low domestic market share (low market power) are strongly impacted by the decrease in payment periods, while dominant firms appear largely unaffected (columns 3 and 4).

## **2.7 Liquidity constraints and informational frictions**

### **2.7.1 Do firms attract new customers by lowering prices?**

How did firms attract new customers? An interpretation of our results along the lines of Chevalier and Scharfstein (1996) would be that the relaxation of liquidity constraints allowed firms to charge lower prices to invest in the acquisition of new customers.<sup>48</sup> We take this hypothesis to the data by examining how product prices reacted to the variation in payment periods. The mechanism

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<sup>48</sup>Chevalier and Scharfstein (1996) explores the pricing decisions of liquidity-constrained firms in the presence of informational frictions. Suppliers choose prices by making a trade-off between present and future profits. While lower prices decrease current cash flows, they attract customers, which ultimately results in higher future expected profits. As liquidity-constrained firms value current profits more than expected profits, they charge higher prices and, therefore, invest less in the expansion of their customer base.

in question predicts that we should observe a positive relationship between the variation in payment periods and the evolution of prices. To test this prediction, exports are aggregated at the level of a product  $p$  (defined as an 8-digit item of the Combined Nomenclature)<sup>49</sup>, a firm  $f$ , a country  $m$  and a time  $t$ . Our proxy for price  $Price_{f,m,p,t}$  is given by the ratio of the volume to the quantity of product sold ("unit value"). We specify our regression as

$$\Delta Price_{f,m,p,t} = \kappa_f + \chi_{m,p} + \psi_t + \zeta_1 \cdot \overline{Distance\ to\ 60\text{-}day\ rule}_{f,t} + \zeta_X \cdot X_{f,t} + u_{f,m,p,t} \quad (2.4)$$

where  $\kappa_f$  and  $\psi_t$  denote firm and year fixed effects and  $\chi_{m,p}$  is a country-product dummy<sup>50</sup>. The regression is estimated using the reduced-form specification.  $\Delta Price_{f,m,p,t}$  is measured in growth rates.<sup>51</sup>

[Insert Table 2.11 here]

Table 2.11 presents the results of the estimations. We find no evidence of a statistical link between the variation in payment periods and prices (column 1), suggesting that firms do not rely on price strategies to acquire new customers. The absence of an average effect on prices, however, may actually be concealing heterogeneous patterns among customers. In particular, it is possible that firms raise prices with their new customers but simultaneously lower prices with their existing customer base. We therefore separately examine at the evolution of prices for existing and new customers:

$$\Delta Price_{f,m,p,t}^N = \frac{Price_{f,m,p,t}^N - Price_{f,m,p,t-1}}{Price_{f,m,p,t-1}} \quad \text{and} \quad \Delta Price_{f,m,p,t}^S = \frac{Price_{f,m,p,t}^S - Price_{f,m,p,t-1}}{Price_{f,m,p,t-1}}$$

<sup>49</sup>We harmonize the product nomenclature over time following the procedures of Pierce and Schott (2012) and Bergounhon, Lenoir and Mejean (2018).

<sup>50</sup>Introducing country-product fixed effects  $\chi_{m,p}$  allows us to control for "pricing-to-market" patterns; on this subject, see, for instance, Drozd and Nosal (2012).

<sup>51</sup>We remove the influence of outliers by dropping the bottom 5 % and top 5% of unit value growth rates. Our results are entirely robust to alternative standard measures of the evolution of prices.

with  $S$  denoting stable customers and  $N$  denoting new customers as in subsection 2.3.1. Columns 2 and 3 show the results of the regression of prices charged to existing and new customers on the variation in payment periods. We find the coefficient of the variation in payment periods to be non-significant for both variables, which rules out the hypothesis of the presence of differentiated price dynamics across customers.

[Insert Table 2.12 here]

A high degree of product differentiation may limit the ability of firms to attract new customers through low prices. It is possible, therefore, that prices of homogeneous products reacted more to the variation in payment periods. We separately examine price dynamics for homogeneous and differentiated products following the Rauch (1999) classification and check whether prices react more to the liquidity shock for homogeneous products.<sup>52</sup> We do not find any significant effect of the reform on the prices of either type of product, indicating that firms do not rely on differentiated pricing strategies across products (columns 4 and 5).

## 2.7.2 Evidence of investment in marketing

The previous results show that firms did not expand their customer base following the liquidity shock by lowering prices. In this subsection, we turn to another type of customer acquisition strategy, namely, marketing. Since the French accounting system does not allow us to directly observe marketing expenditures, we successively use the number of workers in marketing, purchases of external services and intangible capital as proxies for firms' investment in their customer base.

[Insert Table 2.13 here]

In Table 2.12, we use the firm-level specification presented in section 2.5 to assess the reaction of the number of workers and hours worked to the decrease in payment periods. Specifically, we

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<sup>52</sup>Moreover, unit values better proxy for prices of homogeneous products; as for differentiated products, a change in unit values can reflect a change in quality or in price.

examine the number of workers and hours worked for firms' entire workforce, (columns 1 and 4), marketing division (columns 2 and 5), and other divisions (columns 3 and 6). We find that the reform shock did not affect the number of workers or the hours worked in marketing or in other activities. This finding suggests that following the reform, firms did not invest in marketing by recruiting workers but rather outsourced their marketing activities.<sup>53</sup> This absence of effect on total employment contrasts with the findings of Barrot and Nanda (2016), who show that a US federal reform that accelerated payments to small business contractors of the US government had positive employment effects. The fact that our reform was implemented in the middle of the financial crisis likely encouraged firms to turn to external service providers for their marketing activities rather than hiring sales workers.

[Insert Figures 2-6a and 2-6b here]

In Table 2.13, we proxy for investment in marketing by the purchase of external services and the share of intangible assets in total assets. In our data, purchases of external services total consist of outsourcing expenses (39%), advertising costs (11%), travel and transportation costs as well as external R&D costs (50%).<sup>54</sup> We find that a decrease in payment periods by 3 days raises the ratio of purchases of external services over total assets by 1.3% from its pre-reform mean (column 2), which would imply a 12% increase in advertising if the variations in purchases of external services were entirely driven by advertising. Intangible assets are composed of investment in "concessions, patents, and similar brands" (63%) and "other intangible assets" (37%), which include firms' communication media such as websites. Importantly, we do not include goodwill in intangible assets, as it could directly reflect future expected benefits associated with firms' customer base. Similarly, we find that a decrease in payment periods by 3 days raises the ratio of investment

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<sup>53</sup>Incidentally, this result provides additional evidence that the effects of the reform on exports cannot be explained by the coincident presence of the financial crisis. An alternative explanation for the positive effects of the reform on export growth is that firms exposed to the reform were relatively spared by the 2008-2009 crisis. This hypothesis, however, would predict a positive association between the decrease in payment periods and employment.

<sup>54</sup>The decomposition of the different items composing total purchases of external services is only available in 2007.

in intangible assets over total assets by 3.6% from its pre-reform mean (column 4). Taken together, our results strongly suggest that the relaxation of liquidity constraints lowered the costs of financing the acquisition of new customers through marketing.

The results in subsections 2.5.2 and 2.6.1 show that firms did not immediately begin growing more abroad after the enactment of the reform. A potential explanation for the presence of such a gap is that firms did not invest in the expansion of the customer base during the 2008-2009 financial crisis and instead waited for the economic situation to improve. Figures 2-6a and 2-6b confirm this hypothesis. The graphs show that firms more exposed to the reform (i.e., a distance to the 60-day threshold greater than the sample median) only started investing relatively more in intangible capital (resp., made more use of external services) in 2010 (resp., 2011). These results underline the importance of matching financing opportunities with growth opportunities in firms' expansion strategies.

### **2.7.3 The role of informational frictions**

The fact that firms use marketing and not price-based strategies suggests that the main barrier that liquidity-constrained firms face in acquiring new customers is informational in nature. This implies that liquidity-constrained firms should favor trade relationships for which information asymmetries are likely to be low (see subsection XIV of the Appendix for a more detailed discussion). In this subsection, we compare the effects of the relaxation of liquidity constraints across products, customers and markets to understand the interactions of informational and financial frictions in the formation of the customer base.<sup>55</sup>

[Insert Table 2.14 here]

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<sup>55</sup>For convenience, we return below to the setting of Table 2.8 and define a product as a 4-digit product code of the harmonized Combined Nomenclature. However, our results are robust to changing the product classification or the unit of aggregation.



The informational frictions that firms face in acquiring new customers can be classified into two types. Frictions can limit the ability of suppliers to find and match with customers (e.g., search costs) or reduce the propensity of customers to switch suppliers (e.g., relationship specificity).

We begin by comparing the effects of the reform across products. We rely on the classification of products established by Rauch (1999) to build the first proxy of informational frictions. Products are labeled "homogeneous" if they are traded on an organized exchange (e.g., cereals) or reference priced (e.g., construction materials) and "differentiated" otherwise. We regard this measure as a proxy for search costs. Rauch shows that when products are differentiated, geographical proximity and cultural ties have a stronger impact on bilateral country-level trade volumes because they help mitigate the presence of information asymmetries over the quality or the characteristics of the products.

A limitation of this measure is that it focuses only on one source of trade frictions, namely, how product markets are organized. To address this limitation, we turn to the "relationship stickiness" index recently introduced by Martin, Mejean and Parenti (2018). The index is based on the average length of firm-to-firm relationships in various product markets. Intuitively, long average trade relationships in a product market signal the presence of high switching costs. We regard this measure as a proxy for relationship specificity. A more precise description of the construction of the variable is available in section XIII of the Appendix.

We rank products according to each proxy and estimate, for instance, for the Rauch index:

$$\Delta Exports_{f,m,p,t} = \hat{\alpha}_{f,m,t} + \hat{\gamma}_p + \hat{\beta}_X \cdot X_{f,t} + \hat{\beta}_2 \cdot 1(Differentiated)_p \times \overline{Distance\ to\ 60\text{-}day\ rule}_{f,t} + \hat{\epsilon}_{f,m,t}$$

This specification differs from equation 2.2 in two important ways. First, we use the reduced form to flexibly assess how the impact of the reform varies across products.<sup>56</sup> The difference in

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<sup>56</sup>Interacting the endogenous regressor with product variables in the 2SLS specification would require additional instruments in the first stage.

the sensitivity of exports of differentiated products to the liquidity shock is captured by the  $\hat{\beta}_2$  coefficient. Second, we use firm-country-year fixed effects instead of firm fixed effects. This specification is more demanding because the coefficients are identified by the comparison of export dynamics across products, *within firms and countries*.<sup>57</sup>

In column 1, we see that ten additional days of distance to the 60-day threshold generates, on average, a 1.7 pp increase in export growth at the country-product level. Columns 2 and 3 suggest that this increase was concentrated in differentiated products. The estimation with firm-country-year fixed effects in column 3 indicates that an increase in the distance by 10 days raises the within-firm and -country gap in export growth by 2.2 pp between homogeneous and differentiated products. We find similar results for relationship stickiness (columns 5 and 6).

[Insert Table 2.15 here]

We then compare the effects of the reform across customers. Chaney (2014) shows that trading with a firm in a foreign country (being "connected") subsequently reduces the costs of finding trade partners in the same network. Importers that have already traded with French firms, therefore, should be easier to reach.<sup>58</sup> Every year, we identify new buyers that have never interacted with a French exporter before ("non-connected" firms)<sup>59</sup> and compute the growth rate of exports to connected and non-connected buyers. Table 2.15 shows that exports to non-connected firms increase more following the enactment of the reform, confirming that informational frictions are the main obstacle firms face in expanding their customer base.

[Insert Table 2.16 here]

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<sup>57</sup>To visualize the source of identification, assume that exports of differentiated products are indeed more sensitive to the presence of liquidity constraints. We should observe no difference in export dynamics across products for firms with zero exposure to the reform. As the exposure to the reform increases, however, we should observe a larger gap in export growth between homogeneous and differentiated products. The coefficient  $\hat{\beta}_2$  should capture this widening within-firm and within-country differential between differentiated and homogeneous products as the exposure to the reform increases.

<sup>58</sup>For instance, connected importers may have adapted their production process to French standards (lower specificity of inputs) or be more aware of the existence of French suppliers (lower search costs).

<sup>59</sup>The year 2003 is accordingly removed from the analysis.

In the same vein, the model of Chaney (2014) suggests that having a large network of customers in a local market reduces the cost of acquiring new customers in that market. We therefore compare the effects of the reform across countries. The idea of the test is that the liquidity shock should have affected export growth relatively less in markets in which firms were already exporting extensively before the reform, as the costs of acquiring new customers in those markets are likely to be low. To test this hypothesis, we measure the pre-reform presence of a firm in a given country by its quartile in the distribution of exports in the country in 2007 and compare the effects of the reform across countries and within firms using firm-year fixed effects.

Column 1 of Table 2.16 presents the reduced-form estimation with firm fixed effects. The distance coefficient is equal to 0.005, meaning that on average, ten additional days of distance to the 60-day threshold caused a 0.5 percentage point increase in export growth after the reform. In column 2, we introduce interacted terms but retain firm fixed effects. The estimates show that the average coefficient in column 1 conceals a heterogeneous impact of the reform across countries. While the coefficient is equal to 0.036 in countries with low presence (first quartile of exports in 2007), it is not statistically significant in countries in which firms were already actively exporting. This gap is even more pronounced once we introduce firm-year fixed effects (column 3), as we find that an increase in the distance by 10 days generates a within-firm gap in export growth of 5.7 pp. This finding strongly suggests that the expansion of the customer base was more pronounced in countries in which firms had a small local customer network before the reform. Overall, our results indicate that the presence of liquidity constraints dampens the ability of firms to trade with distant customers and to sell differentiated products.

## **2.8 Conclusion**

What are the effects of liquidity constraints on firms' customer acquisition strategy? If firms primarily attract new customers using promotions, liquidity-constrained firms will be priced out of

competitive markets and should instead attempt to avoid competition by targeting “niche” markets (e.g., differentiated products, remote geographical areas). In contrast, if the main obstacle that firms face in acquiring new customers is informational in nature (e.g., marketing), liquidity-constrained firms should favor standardized products and easily accessible customers to avoid information asymmetries. The presence of liquidity frictions, therefore, can have dramatically different positive implications for the type of product and the amount of information available to customers depending on which mechanism prevails.

The objective of this paper is to empirically explore the role of liquidity frictions in the formation of a customer base. We exploit a 2009 reform capping payment terms at sixty days in transactions between French firms as an exogenous shock to access to liquidity. The identification strategy uses the pre-reform sectoral composition of firms’ customer base to isolate a source of exogenous variation in exposure to the cap on payment terms. Our results show that firms more exposed to the reform experienced large increases in cash holdings, which led them to draw less on their credit lines.

The first contribution of this paper is to provide the first direct evidence in support of theories emphasizing the role of liquidity constraints in firms’ investment in the customer base. Relying on administrative data covering the universe of intra-EU trade relationships of French exporters, we find that the liquidity shock spurred export growth at both the intensive and extensive margin. Importantly, using information on the identity of foreign importers, we show that the increase in export growth induced by the shock is entirely driven by the acquisition of new international customers.

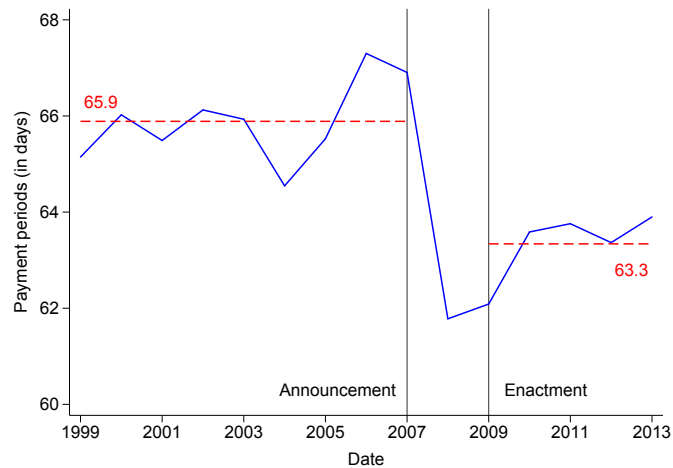
The second contribution of this paper is to show that liquidity constraints primarily distort firms’ customer base by amplifying the role of informational frictions. When examining the effects of the reform on firms’ customer acquisition strategy, we find the reduction in payment periods to be associated with sizable increases in proxies for marketing expenditures. In contrast, we find no

evidence that the relaxation of liquidity constraints allowed firms to charge lower prices. Comparing the effects of the liquidity shock across product and customer types, our results indicate that liquidity frictions prevent firms from reaching out to distant customers and from selling products for which quality is more difficult to establish ex ante or more relationship-specific.

Our results have two main implications. First, liquidity-constrained firms are likely to have an under-diversified customer base and, therefore, to be more impacted by idiosyncratic variations in their customers' demand. Moreover, since liquidity-constrained firms sell more homogeneous products, they should be more exposed to the risk of losing their customers to another supplier. In other words, liquidity constraints should affect firms' cash-flow risk by altering the composition of the customer base. Second, our findings imply that financing constraints distort the supplier-buyer network by exacerbating the role of informational frictions. Hence, financing constraints may lower total production not only by creating a misallocation of resources across firms but also by constraining the set of suppliers with which they can trade. An exploration of these hypotheses would contribute to a better understanding of the real effects of liquidity frictions.

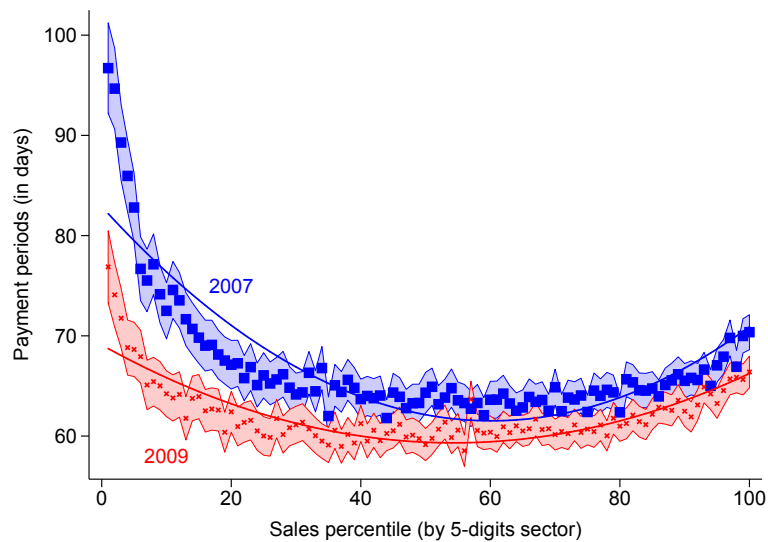
## Figures and tables

**Figure 2-1 – Payment periods before and after the reform**



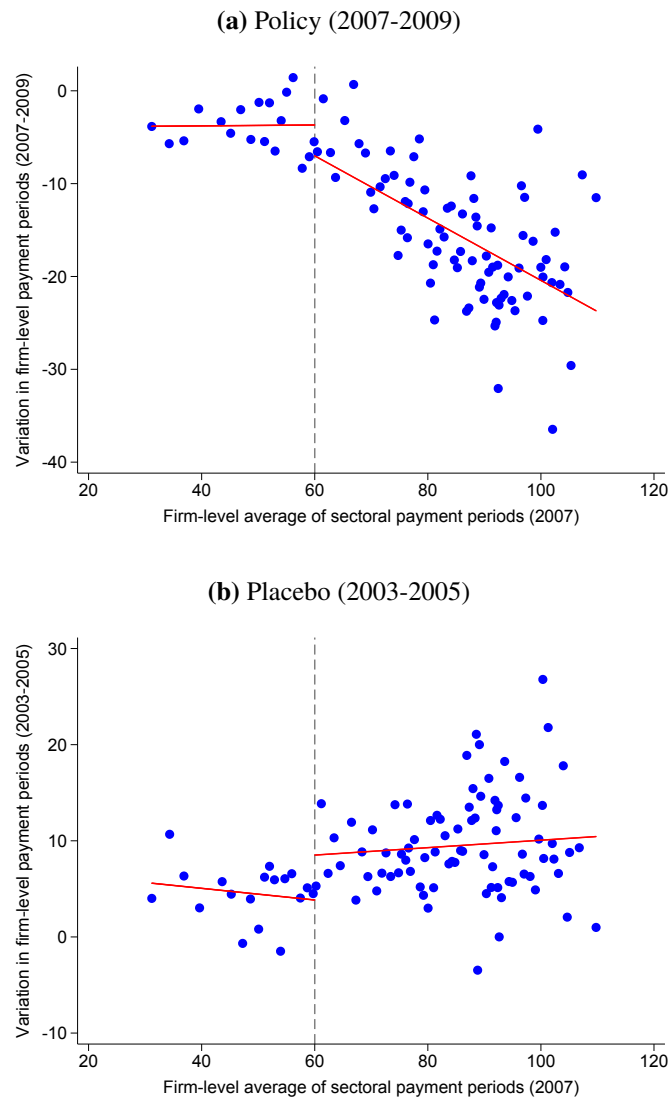
*Note:* This graph displays the evolution of average payment periods between 1999 and 2013 for the universe of non-financial French firms (agricultural and public firms are excluded from the sample). Payment periods are computed at the firm level as the ratio of accounts receivable over sales multiplied by 365.

**Figure 2-2 – Payment periods by firm size**



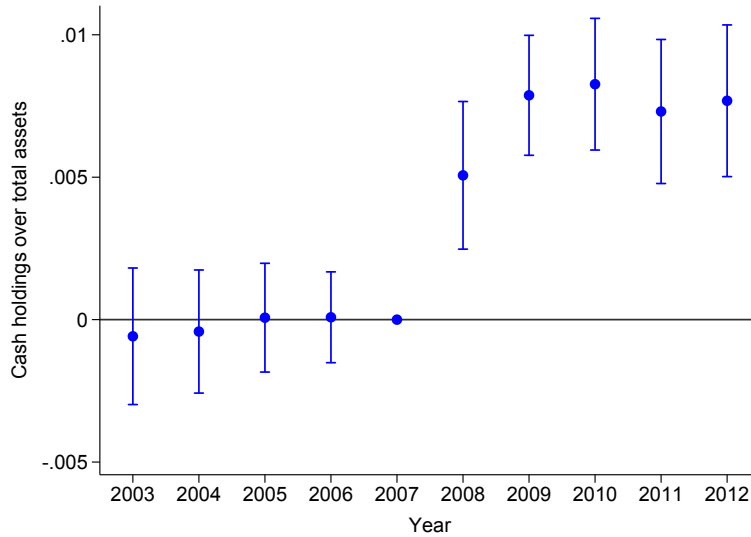
*Note:* This graph displays average payment periods by firm size in 2007 and 2009 for the universe of non-financial French firms (agricultural and public firms are excluded from the sample). The  $x$ -axis gives the percentile of sales computed by sector. A sector is defined as a 5-digit code of the NACE (EU classification of sectors). Payment periods are computed at the firm level as the ratio of accounts receivable over sales multiplied by 365. The  $y$ -axis gives the simple average of payment periods by sales percentile. The 95% confidence intervals around average payment periods are given by the shaded areas.

**Figure 2-3 – Effects of the reform on payment periods**



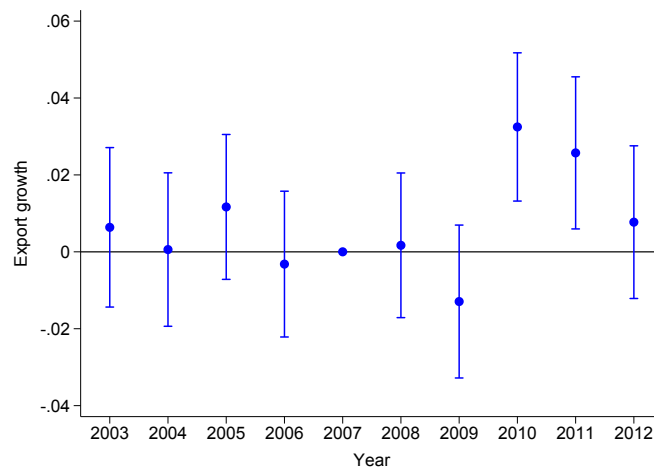


**Figure 2-4 – Dynamics of the effects of the reform on cash holdings**



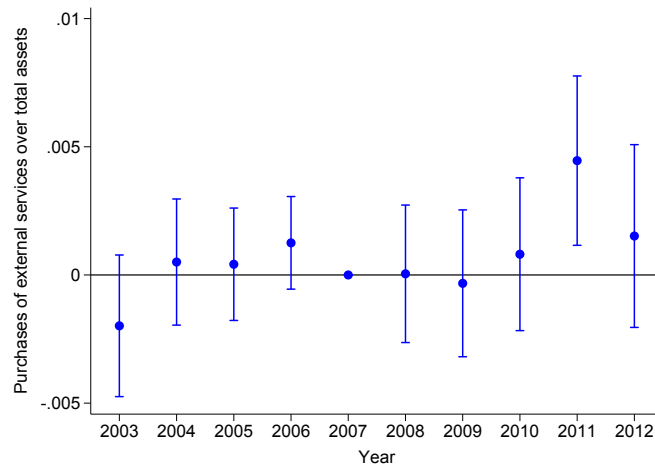
*Note:* This graph displays the coefficients of the regression of the share of cash holdings in total assets on a dummy  $I(\text{Distance to 60-day rule} > \text{Median})_f$  interacted with time. The dummy is equal to one when the variable  $\text{Distance to 60-day rule}_f$  is higher than the sample median. The distance measures the distance to the 60-day threshold in the sectors in which firm  $f$  is operating in 2007 and is defined in two steps. First, we take the 2007 sector-level average of firm-level payment periods in excess of 60 days (payment periods from customers are computed at the firm level as the ratio of accounts receivable over sales multiplied by 365). Second, we take the firm-level average of the sectoral distance to the 60-day rule weighted by the share of sales realized by the firm in each sector in 2007. The specification includes the following control variables:  $\text{Labor productivity}_{f,t-1}$  (value-added over the number of employees),  $\log(\text{Total Assets})_{f,t-1}$  (total assets in logarithm), and  $\text{Sales growth rate}_{f,t}$  (sales-weighted average of sectoral growth rates). The regression includes firm and year fixed effects. Standard errors are clustered at the firm level. The figure displays the 95% confidence intervals.

**Figure 2-5 – Dynamics of the effects of the reform on export growth**

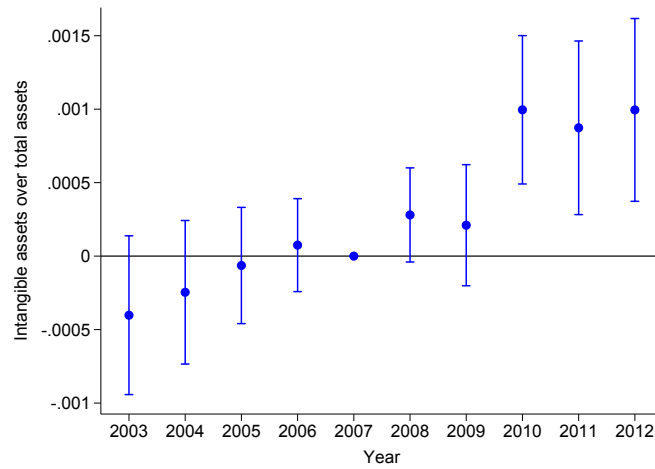


**Figure 2-6 – Dynamics of the effects on marketing**

**(a) Purchases of external services over total assets**



**(b) Intangible assets over total assets**



**Table 2.1 – Effects of the reform on payment periods**

	$\Delta\text{Payment periods}_{f,t}$		
	(1)	(2)	(3)
$\overline{\text{Distance to 60-day rule}}_{f,t}$	-0.112*** (0.006)	-0.091*** (0.005)	-0.115*** (0.013)
Observations	101,509	101,509	101,509
Firm FE	No	No	Yes
Year FE	Yes	Yes	Yes
Controls	No	Yes	Yes

*Note:* The dependent variable is the variation in payment periods. Payment periods from customers are computed at the firm level as the ratio of accounts receivable over sales. The variable is multiplied by 36.5 so that its unit is ten days. The main independent variable is  $\overline{\text{Distance to 60-day rule}}_{f,t}$ . The variable measures the distance to the 60-day threshold in the sectors in which firm  $f$  is operating in 2007 and is defined in three steps. First, we take the 2007 sector-level average of firm-level payment periods in excess of 60 days (sectoral distance to the 60-day rule). Second, we take the firm-level average of the sectoral distance to the 60-day rule weighted by the share of sales realized by the firm in each sector in 2007. Third, we multiply the variable by a dummy equal to 1 after 2007. Control variables include  $\text{Labor productivity}_{f,t-1}$  (value-added over the number of employees),  $\log(\text{Total Assets})_{f,t-1}$  (total assets in logarithm),  $\text{Long-term debt}/\text{TA}_{f,t-1}$  (ratio of long-term debt to total assets),  $\text{Sales growth rate}_{f,t}$  (sales-weighted average of sectoral growth rates). Regressions include firm and year fixed effects. Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.

**Table 2.2 – Payment periods and capital structure**

Dependent variables (scaled by $Total\ assets_{f,t}$ ):	$Working\ capital_{f,t}$	$Cash_{f,t}$	$Credit\ line_{f,t}$	$Long-term\ credit_{f,t}$
	(1)	(2)	(3)	(4)
$\Delta Payment\ periods_{f,t}$	0.022*** (0.006)	-0.014*** (0.004)	0.014*** (0.003)	-0.005 (0.004)
Observations	96,709	96,709	96,709	96,709
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
F-stat	66.7	66.7	66.7	66.7

*Note:* The dependent variables are ((1) the working capital needs of firm  $f$  at time  $t$  (defined as the sum of inventories, accounts receivable net of accounts payable as well as other operating receivable), (2) cash holdings, (3) drawn credit lines and (4) long-term debt. All the dependent variables are expressed as a ratio of total assets. The instrumented variable is  $\Delta Payment\ periods_{f,t}$ . Payment periods from customers are computed at the firm level as the ratio of accounts receivable over sales. The variable is multiplied by 36.5 so that its unit is ten days. The instrument for the variation in payment periods is  $Distance\ to\ 60-day\ rule_{f,t}$ . The variable measures the distance to the 60-day threshold in the sectors in which firm  $f$  is operating in 2007 and is defined in three steps. First, we take the 2007 sector-level average of firm-level payment periods in excess of 60 days (sectoral distance to the 60-day rule). Second, we take the firm-level average of the sectoral distance to the 60-day rule weighted by the share of sales realized by the firm in each sector in 2007. Third, we multiply the variable by a dummy equal to 1 after 2007. Control variables include  $Labor\ productivity_{f,t-1}$  (value-added over the number of employees),  $\log(Total\ Assets)_{f,t-1}$  (total assets in logarithm), and  $Sales\ growth\ rate_{f,t}$  (sales-weighted average of sectoral growth rates). Regressions include firm and year fixed effects. Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.

**Table 2.3 – Effects of the reform on domestic sales and sourcing strategies**

	$\Delta Domestic\ turnover_{f,t}$		$Import\ share_{f,t}$	
	(1)	(2)	(3)	(4)
$\Delta Payment\ periods_{f,t}$	0.020 (0.014)	0.007 (0.013)		
$\Delta Payment\ periods\ (suppliers)_{f,t}$			-0.004 (0.027)	-0.005 (0.014)
Observations	101,472	101,472	101,352	101,352
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes
F-stat	75.9	64.2	3.5	10.6

*Note:* The dependent variable is the variation in sales in the domestic market in the two first columns and the import share (ratio of imports to total purchases) in the last two columns. The instrumented variable in the first two columns is  $\Delta Payment\ periods_{f,t}$ . Payment periods from customers are computed at the firm level as the ratio of accounts receivable over sales. The variable is multiplied by 36.5 so that its unit is ten days. The instrument for the variation in payment periods is  $\overline{Distance\ to\ 60\text{-day}\ rule}_{f,t}$ . The variable measures the distance to the 60-day threshold in the sectors in which firm  $f$  is operating in 2007 and is defined in three steps. First, we take the 2007 sector-level average of firm-level payment periods in excess of 60 days (sectoral distance to the 60-day rule). Second, we take the firm-level average of the sectoral distance to the 60-day rule weighted by the share of sales realized by the firm in each sector in 2007. Third, we multiply the variable by a dummy equal to 1 after 2007. The instrumented variable in the last two columns is  $\Delta Payment\ periods\ (suppliers)_{f,t}$ . Payment periods to suppliers are defined at the firm level as the ratio of accounts payable over sales. The variable is multiplied by 36.5 so that its unit is ten days. The instrument for the variation in payment periods to suppliers is  $\overline{Distance\ to\ 60\text{-day}\ rule\ (suppliers)}_{f,t}$ . The construction of the variable is identical to that of  $\overline{Distance\ to\ 60\text{-day}\ rule}_{f,t}$  with payment periods to suppliers instead of payment periods from customers. Control variables include  $Labor\ productivity_{f,t-1}$  (value-added over the number of employees),  $\log(Total\ Assets)_{f,t-1}$  (total assets in logarithm),  $Long\text{-term}\ debt/TA_{f,t-1}$  (ratio of long-term debt to total assets),  $Sales\ growth\ rate_{f,t}$  (sales-weighted average of sectoral growth rates). Regressions include firm and year fixed effects. Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.

**Table 2.4 – Payment periods and exports**

	OLS (1)	2SLS (2)	2SLS (3)
<i>Panel A: <math>\Delta Exports_{f,m,t}</math></i>			
$\Delta Payment\ periods_{f,t}$	0.012*** (0.001)	-0.057* (0.032)	-0.053** (0.025)
Observations	807,650	807,650	807,650
F-stat	-	32.0	37.7
<i>Panel B: <math>Exit_{f,m,t}</math></i>			
$\Delta Payment\ periods_{f,t}$	-0.001*** (0.000)	0.033** (0.015)	0.034*** (0.012)
Observations	939,299	939,299	939,299
F-stat	-	36.1	39.7
<i>Panel C: <math>Entry_{f,m,t}</math></i>			
$\Delta Payment\ periods_{f,t}$	0.001*** (0.000)	-0.004* (0.002)	-0.005** (0.002)
Observations	2,817,999	2,817,999	2,817,999
F-stat	-	80.7	80.4
Firm FE	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes
Controls	No	No	Yes

*Note:* The table has three panels. In panel A, the dependent variable is the variation in exports in country  $m$  for firms that remain in the country between times  $t$  and  $t - 1$  (intensive margin). In panel B, the dependent variable is a dummy indicating whether firm  $f$  exits country  $m$  at time  $t$ . In panel C, the panel is a dummy indicating whether firm  $f$  enters country  $m$  at time  $t$ . The first regression of each panel is estimated with OLS and the last two ones with 2SLS. The instrumented variable is  $\Delta Payment\ periods_{f,t}$ . Payment periods from customers are computed at the firm level as the ratio of accounts receivable over sales. The variable is multiplied by 36.5 so that its unit is ten days. The instrument for the variation in payment periods is *Distance to 60-day rule* $_{f,t}$ . The variable measures the distance to the 60-day threshold in the sectors in which firm  $f$  is operating in 2007 and is defined in three steps. First, we take the 2007 sector-level average of firm-level payment periods in excess of 60 days (sectoral distance to the 60-day rule). Second, we take the firm-level average of the sectoral distance to the 60-day rule weighted by the share of sales realized by the firm in each sector in 2007. Third, we multiply the variable by a dummy equal to 1 after 2007. Control variables include *Labor productivity* $_{f,t-1}$  (value-added over the number of employees), *log(Total Assets)* $_{f,t-1}$  (total assets in logarithm), *Long-term debt/TA* $_{f,t-1}$  (ratio of long-term debt to total assets), *Sales growth rate* $_{f,t}$  (sales-weighted average of sectoral growth rates). Regressions include firm and country-year fixed effects. Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.

**Table 2.5 – Effects of payment periods on the formation of a customer base.**

	$\Delta Exports_{f,m,t}$	$\Delta Stable\ customers_{f,m,t}$	$\Delta Customer\ base_{f,m,t}$	$New\ customers_{f,m,t}$	$Lost\ customers_{f,m,t-1}$
	(1)	(2)	(3)	(4)	(5)
$\Delta Payment\ periods_{f,t}$	-0.053** (0.025)	-0.008 (0.017)	-0.045*** (0.017)	-0.032*** (0.012)	0.013 (0.011)
Observations	807,650	807,650	807,650	807,650	807,650
Firm FE	Yes	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
F-stat	37.7	37.7	37.7	37.7	37.7

*Note:* The dependent variables are (1) the variation in exports in country  $m$  between times  $t$  and  $t - 1$ , (2) the variation in exports to customers in country  $m$  with whom firm  $f$  has a trade relationship at  $t - 1$  and  $t$ , (3) the variation in exports to customers in country  $m$  with whom firm  $f$  has a trade relationship only at  $t - 1$  or at  $t$ , and (4) the amount of exports to customers acquired at  $t$  and (5) lost at  $t - 1$ . All variables are standardized by the average of total exports in country  $m$  of firm  $f$  between times  $t - 1$  and  $t$ . All the dependent variables are defined only for firms that remain in country  $m$  between  $t - 1$  and  $t$ . The instrumented variable is  $\Delta Payment\ periods_{f,t}$ . Payment periods from customers are computed at the firm level as the ratio of accounts receivable over sales. The variable is multiplied by 36.5 so that its unit is ten days. The instrument for the variation in payment periods is  $\overline{Distance\ to\ 60\text{-day\ rule}_{f,t}}$ . The variable measures the distance to the 60-day threshold in the sectors in which firm  $f$  is operating in 2007 and is defined in three steps. First, we take the 2007 sector-level average of firm-level payment periods in excess of 60 days (sectoral distance to the 60-day rule). Second, we take the firm-level average of the sectoral distance to the 60-day rule weighted by the share of sales realized by the firm in each sector in 2007. Third, we multiply the variable by a dummy equal to 1 after 2007. Control variables include  $Labor\ productivity_{f,t-1}$  (value-added over the number of employees),  $\log(Total\ Assets)_{f,t-1}$  (total assets in logarithm),  $Long\text{-term}\ debt/TA_{f,t-1}$  (ratio of long-term debt to total assets),  $\overline{Sales\ growth\ rate}_{f,t}$  (sales-weighted average of sectoral growth rates). Regressions include firm and country-year fixed effects. Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.



**Table 2.6 – Alternative mechanisms: product mix and capacity constraints**

	$\Delta Exports_{f,m,t}$	$\Delta Stable\ products_{f,m,t}$	$\Delta Product\ base_{f,m,t}$	$\Delta Exports_{f,m,t}$ Inventoried production/Sales	
	(1)	(2)	(3)	$\leq P50$ (4)	$> P50$ (5)
$\Delta Payment\ periods_{f,t}$	-0.053** (0.025)	-0.051** (0.021)	-0.002 (0.011)	-0.033 (0.030)	-0.092** (0.042)
Observations	807,650	807,650	807,650	395,414	395,319
Firm FE	Yes	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
F-stat	37.7	37.7	37.7	29.3	16.1

*Note:* The dependent variables are (1) the variation in exports in country  $m$  between times  $t$  and  $t - 1$ , (2) the variation in exports of products in country  $m$  that firm  $f$  exported in  $m$  both at time  $t - 1$  and  $t$  and (3) the variation in exports of products in country  $m$  that firm  $f$  exported in  $m$  only at time  $t$  or  $t - 1$ , (4) and (5) the variation in exports in country  $m$  between times  $t$  and  $t - 1$ . All the dependent variables are defined only for firms that remain in country  $m$  between  $t - 1$  and  $t$ . Products are defined as a 8-digit code of the Combined Nomenclature. In columns (4) and (5), observations are sorted by the average value of the ratio of inventoried production over sales between 2003 and 2007 (inventoried production is defined as the difference between stocked production and the variation in merchandise stocks). Rankings are made within country-year (P50 stands for the median). The instrumented variable is  $\Delta Payment\ periods_{f,t}$ . Payment periods from customers are computed at the firm level as the ratio of accounts receivable over sales. The variable is multiplied by 36.5 so that its unit is ten days. The instrument for the variation in payment periods is  $Distance\ to\ 60\text{-day}\ rule_{f,t}$ . The variable measures the distance to the 60-day threshold in the sectors in which firm  $f$  is operating in 2007 and is defined in three steps. First, we take the 2007 sector-level average of firm-level payment periods in excess of 60 days (sectoral distance to the 60-day rule). Second, we take the firm-level average of the sectoral distance to the 60-day rule weighted by the share of sales realized by the firm in each sector in 2007. Third, we multiply the variable by a dummy equal to 1 after 2007. Control variables include  $Labor\ productivity_{f,t-1}$  (value-added over the number of employees),  $\log(Total\ Assets)_{f,t-1}$  (total assets in logarithm),  $Long\text{-term}\ debt/TA_{f,t-1}$  (ratio of long-term debt to total assets),  $Sales\ growth\ rate_{f,t}$  (sales-weighted average of sectoral sales growth rates). Regressions include firm and country-product-year fixed effects. Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.

**Table 2.7 – Sales per customer, trade duration, and concentration of the customer base**

Customers:	$\log(\text{Exports/customer})_{f,m,t}$		% of one-time customers $_{f,m,t}$		$\log(\text{Herfindahl})_{f,m,t}$
	All	New	All	New	All
	(1)	(2)	(3)	(4)	(5)
$\Delta\text{Payment periods}_{f,t}$	-0.012 (0.052)	-0.046 (0.061)	-0.001 (0.005)	0.003 (0.014)	0.078*** (0.020)
Observations	807,650	412,269	733,138	376,777	807,650
Firm FE	Yes	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
F-stat	37.7	33.1	37.5	32.4	37.7

*Note:* The dependent variables are (1) the logarithm of average sales per customer, (2) the logarithm of average sales per new customer, (3) the fraction of total sales realized with one-time customers, (4) the ratio of sales realized with one-time customers to total sales realized with new customers and (5) the logarithm of the Herfindahl index of firms sales across customers within a country (a high Herfindahl index reflects a concentrated customer base). All the dependent variables are defined only for firms that stay in country  $m$  between  $t - 1$  and  $t$ . The instrumented variable is  $\Delta\text{Payment periods}_{f,t}$ . Payment periods from customers are computed at the firm level as the ratio of accounts receivable over sales. The variable is multiplied by 36.5 so that its unit is ten days. The instrument for the variation in payment periods is  $\text{Distance to 60-day rule}_{f,t}$ . The variable measures the distance to the 60-day threshold in the sectors in which firm  $f$  is operating in 2007 and is defined in three steps. First, we take the 2007 sector-level average of firm-level payment periods in excess of 60 days (sectoral distance to the 60-day rule). Second, we take the firm-level average of the sectoral distance to the 60-day rule weighted by the share of sales realized by the firm in each sector in 2007. Third, we multiply the variable by a dummy equal to 1 after 2007. Control variables include  $\text{Labor productivity}_{f,t-1}$  (value-added over the number of employees),  $\log(\text{Total Assets})_{f,t-1}$  (total assets in logarithm),  $\text{Long-term debt}/\text{TA}_{f,t-1}$  (ratio of long-term debt to total assets),  $\text{Sales growth rate}_{f,t}$  (sales-weighted average of sectoral growth rates). Regressions include firm and country-year fixed effects. Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%

**Table 2.8 – Effects of payment periods on product-level exports**

	$\Delta Exports_{f,m,p,t}$	$\Delta Stable\ customers_{f,m,p,t}$	$\Delta Customer\ base_{f,m,p,t}$	$New\ customers_{f,m,p,t}$	$Lost\ customers_{f,m,p,t-1}$
	(1)	(2)	(3)	(4)	(5)
$\overline{Distance\ to\ 60\text{-}day\ rule}_{f,t}$	0.012** (0.006)	-0.001 (0.001)	0.012** (0.005)	0.007** (0.003)	-0.005* (0.003)
Observations	4,938,990	4,938,990	4,938,990	4,938,990	4,938,990
Firm FE	Yes	Yes	Yes	Yes	Yes
Country-Product-Year FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes

*Note:* The table gives the results of the estimation of the reduced-form specification of the regression of export outcomes on the variation in payment periods. The dependent variables are in the order of the columns (1) the variation in exports in country  $m$  between times  $t$  and  $t - 1$ , (2) the variation in exports to customers in country  $m$  with whom firm  $f$  has a trade relationship at  $t - 1$  and  $t$ , (3) the variation in exports to customers in country  $m$  with whom firm  $f$  has a trade relationship only at  $t - 1$  or at  $t$ , (4) the amount of exports to customers acquired at  $t$  and (5) lost at  $t - 1$ . All variables are standardized by the average of total exports in country  $m$  of firm  $f$  between times  $t$  and  $t - 1$ . All the dependent variables are defined only for firms that stay in country  $m$  between  $t - 1$  and  $t$ . The main independent variable is  $\overline{Distance\ to\ 60\text{-}day\ rule}_{f,t}$ . The variable measures the distance to the 60-day threshold in the sectors in which firm  $f$  is operating in 2007 and is defined in three steps. First, we take the 2007 sector-level average of firm-level payment periods in excess of 60 days (payment periods from customers are computed at the firm level as the ratio of accounts receivable over sales multiplied by 365). Second, we take the firm-level average of the sectoral distance to the 60-day rule weighted by the share of sales realized by the firm in each sector in 2007. Third, we multiply the variable by a dummy equal to 1 after 2007. Control variables include  $\overline{Labor\ productivity}_{f,t-1}$  (value-added over the number of employees),  $\log(\overline{Total\ Assets})_{f,t-1}$  (total assets in logarithm),  $\overline{Long\text{-}term\ debt/TA}_{f,t-1}$  (ratio of long-term debt to total assets),  $\overline{Sales\ growth\ rate}_{f,t}$  (sales-weighted average of sectoral sales growth rates). Regressions include firm and country-product-year fixed effects. A product is defined as a 4-digit code of the harmonized Combined Nomenclature product classification. Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.

**Table 2.9 – Heterogeneity I - Intensity of liquidity constraints**

	$\Delta Exports_{f,m,t}$							
	Cash/Assets		Debt/Assets		Total sales		Volatility of sales	
	$\leq P50$ (1)	$> P50$ (2)	$\leq P50$ (3)	$> P50$ (4)	$\leq P50$ (5)	$> P50$ (6)	$\leq P50$ (7)	$> P50$ (8)
$\Delta Payment\ periods_{f,t}$	-0.145** (0.061)	-0.000 (0.023)	-0.018 (0.042)	-0.081*** (0.029)	-0.084** (0.038)	-0.029 (0.031)	-0.048 (0.037)	-0.066** (0.033)
Observations	389,441	389,586	386,869	386,902	395,170	395,444	387,315	387,405
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-stat	13.1	39.3	11.6	34.9	16.8	22.5	20.0	21.9

*Note:* The dependent variable is the variation in exports in country  $m$  for firms that stay in the country between  $t - 1$  and  $t$ . The instrumented variable is  $\Delta Payment\ periods_{f,t}$ . Payment periods from customers are computed at the firm level as the ratio of accounts receivable over sales. The variable is multiplied by 36.5 so that its unit is ten days. The instrument for the variation in payment periods is  $Distance\ to\ 60\text{-}day\ rule_{f,t}$ . The variable measures the distance to the 60-day threshold in the sectors in which firm  $f$  is operating in 2007 and is defined in three steps. First, we take the 2007 sector-level average of firm-level payment periods in excess of 60 days (sectoral distance to the 60-day rule). Second, we take the firm-level average of the sectoral distance to the 60-day rule weighted by the share of sales realized by the firm in each sector in 2007. Third, we multiply the variable by a dummy equal to 1 after 2007. Control variables include  $Labor\ productivity_{f,t-1}$  (value-added over the number of employees),  $\log(Total\ Assets)_{f,t-1}$  (total assets in logarithm),  $Long\text{-}term\ debt/TA_{f,t-1}$  (ratio of long-term debt to total assets),  $Sales\ growth\ rate_{f,t}$  (sales-weighted average of sectoral sales growth rates). In the first three groups, observations are sorted by the average values between 2003 and 2007 of total sales, ratio of cash to assets and long-term debt over assets. In the last group, observations are sorted by volatility of sales computed as the standard deviation of sales normalized by the average value of sales between 2003 and 2007. Rankings are within country  $\times$  year (P50 is the median). Regressions include firm and country-year fixed effects. Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.

**Table 2.10 – Heterogeneity II - Exposure to the reform**

	$\Delta Exports_{f,m,t}$			
	Import share (2007)		Market share (2007)	
	$\leq P50$ (1)	$> P50$ (2)	$\leq P50$ (3)	$> P50$ (4)
$\Delta Payment\ periods_{f,t}$	-0.039 (0.033)	-0.084* (0.047)	-0.086** (0.042)	-0.015 (0.033)
Observations	395,714	395,636	397,539	397,684
Firm FE	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
F-stat	23.6	15.8	18.5	20.3

*Note:* The dependent variable is the variation in exports in country  $m$  for firms that stay in the country between  $t - 1$  and  $t$ . The instrumented variable is  $\Delta Payment\ periods_{f,t}$ . Payment periods from customers are computed at the firm level as the ratio of accounts receivable over sales. The variable is multiplied by 36.5 so that its unit is ten days. The instrument for the variation in payment periods is *Distance to 60-day rule* $_{f,t}$ . The variable measures the distance to the 60-day threshold in the sectors in which firm  $f$  is operating in 2007 and is defined in three steps. First, we take the 2007 sector-level average of firm-level payment periods in excess of 60 days (sectoral distance to the 60-day rule). Second, we take the firm-level average of the sectoral distance to the 60-day rule weighted by the share of sales realized by the firm in each sector in 2007. Third, we multiply the variable by a dummy equal to 1 after 2007. Control variables include *Labor productivity* $_{f,t-1}$  (value-added over the number of employees), *log(Total Assets)* $_{f,t-1}$  (total assets in logarithm), *Long-term debt/TA* $_{f,t-1}$  (ratio of long-term debt to total assets), *Sales growth rate* $_{f,t}$  (sales-weighted average of sectoral growth rates). *Import share* $_{f,07}$  is defined as the share of imports in the total amount of inputs purchased by the firm. The domestic market share is defined as the ratio of domestic sales realized by the firm in its principal sector of activity to total domestic sales realized in the sector. Rankings are within destination  $\times$  year (P50 is the median). Regressions include firm and country-year fixed effects. Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.

**Table 2.11 – Payment periods and product prices**

	$\Delta Price_{f,m,p,t}$				
	All	Existing	New	Homogeneous	Differentiated
	(1)	(2)	(3)	(4)	(5)
<i>Distance to 60-day rule</i> <sub><i>f,t</i></sub>	0.001 (0.000)	-0.003 (0.003)	0.150 (0.132)	-0.002 (0.002)	0.001 (0.003)
Observations	3,385,036	2,961,584	1,463,473	436,052	2,865,887
Firm FE	Yes	Yes	Yes	Yes	Yes
Country-Product FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes

*Note:* Columns (1) to (5) display the results of the reduced-form specification of the regression of the growth rate of prices on the variation in payment periods. Prices are computed as the ratio of volume to quantity (unit value) at the firm ( $f$ ), country ( $m$ ), product ( $p$ ), and time ( $t$ ) level. A product is defined as a 8-digit code of the harmonized Combined Nomenclature (CN) product classification. The dependent variable in columns (1) to (5) is the evolution of prices computed as growth rates (trimmed at the 5% level). In columns (2) and (3), we compare product prices charged to existing and new customers to the average price charged for the same product in the same country at year  $t - 1$ . In columns (4) and (5), we look separately at the evolution of prices charged for (4) homogeneous products (sold on organized exchanges or reference priced) and for (5) differentiated products. The main independent variable is *Distance to 60-day rule*<sub>*f,t*</sub>. The variable measures the distance to the 60-day threshold in the sectors in which firm  $f$  is operating in 2007 and is defined in three steps. First, we take the 2007 sector-level average of firm-level payment periods in excess of 60 days (payment periods from customers are computed at the firm level as the ratio of accounts receivable over sales multiplied by 365). Second, we take the firm-level average of the sectoral distance to the 60-day rule weighted by the share of sales realized by the firm in each sector in 2007. Third, we multiply the variable by a dummy equal to 1 after 2007. Control variables include *Labor productivity*<sub>*f,t-1*</sub> (value-added over the number of employees), *log(Total Assets)*<sub>*f,t-1*</sub> (total assets in logarithm), *Long-term debt/TA*<sub>*f,t-1*</sub> (ratio of long-term debt to total assets), *Sales growth rate*<sub>*f,t*</sub> (sales-weighted average of sectoral growth rates). Regressions include firm, year and country-product fixed effects. Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.

**Table 2.12 – Effects of the reform on marketing and non-marketing workers**

	$\Delta\text{Number of workers}_{f,t}$			$\Delta\text{Hours}_{f,t}$		
	All (1)	Marketing (2)	Not mark. (3)	All (4)	Marketing (5)	Not mark. (6)
$\Delta\text{Payment periods}_{f,t}$	−0.004 (0.009)	−0.001 (0.003)	−0.003 (0.009)	−0.008 (0.009)	−0.001 (0.004)	−0.006 (0.009)
Observations	87,520	87,520	87,520	87,520	87,520	87,520
# Firms	14,488	14,488	14,488	14,488	14,488	14,488
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
F-stat	43.1	43.1	43.1	43.1	43.1	43.1

*Note:* The dependent variable is the variation in the number and hours worked of total workers, marketing workers, and non-marketing workers. Information on the workforce of the firm comes from the DADS matched employer-employee dataset. Marketing workers are identified using a 4-digit occupation code (PCS code). The instrumented variable is  $\Delta\text{Payment periods}_{f,t}$ . Payment periods from customers are computed at the firm level as the ratio of accounts receivable over sales. The variable is multiplied by 36.5 so that its unit is ten days. The instrument for the variation in payment periods is  $\text{Distance to 60-day rule}_{f,t}$ . The variable measures the distance to the 60-day threshold in the sectors in which firm  $f$  is operating in 2007 and is defined in three steps. First, we take the 2007 sector-level average of firm-level payment periods in excess of 60 days (sectoral distance to the 60-day rule). Second, we take the firm-level average of the sectoral distance to the 60-day rule weighted by the share of sales realized by the firm in each sector in 2007. Third, we multiply the variable by a dummy equal to 1 after 2007. Control variables include  $\text{Labor productivity}_{f,t-1}$  (value-added over the number of employees),  $\log(\text{Total Assets})_{f,t-1}$  (total assets in logarithm),  $\text{Long-term debt}/\text{TA}_{f,t-1}$  (ratio of long-term debt to total assets),  $\text{Sales growth rate}_{f,t}$  (sales-weighted average of sectoral growth rates). Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.

**Table 2.13 – Effects of the reform on marketing expenditures**

	<i>Purchases of external services<sub>f,t</sub>/TA<sub>f,t</sub></i>		<i>Intangible assets<sub>f,t</sub>/TA<sub>f,t</sub></i>	
	(1)	(2)	(3)	(4)
$\Delta\text{Payment periods}_{f,t}$	-0.010** (0.004)	-0.009** (0.005)	-0.002** (0.001)	-0.002** (0.001)
Observations	98,029	98,029	98,818	98,818
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes
F-stat	80.0	66.3	85.1	71.0

*Note:* The dependent variable is (1-2) the amount of purchases of external services divided by total assets (3-4) the ratio of intangible assets to total assets. The instrumented variable is  $\Delta\text{Payment periods}_{f,t}$ . Payment periods from customers are computed at the firm level as the ratio of accounts receivable over sales. The variable is multiplied by 36.5 so that its unit is ten days. The instrument for the variation in payment periods is *Distance to 60-day rule<sub>f,t</sub>*. The variable measures the distance to the 60-day threshold in the sectors in which firm  $f$  is operating in 2007 and is defined in three steps. First, we take the 2007 sector-level average of firm-level payment periods in excess of 60 days (sectoral distance to the 60-day rule). Second, we take the firm-level average of the sectoral distance to the 60-day rule weighted by the share of sales realized by the firm in each sector in 2007. Third, we multiply the variable by a dummy equal to 1 after 2007. Purchases of external services are composed of "outsourcing expenses" (39%) and "other external expenses" (61%) which include advertising costs, travel costs, transportation costs and external R&D costs. Intangible assets are composed of "concessions, patents and similar brands" (63% of total intangible assets) and "other intangible assets" (37%) which include firms' communication media (e.g., website). Control variables include *Labor productivity<sub>f,t-1</sub>* (value-added over the number of employees), *log(Total Assets)<sub>f,t-1</sub>* (total assets in logarithm), *Long-term debt/TA<sub>f,t-1</sub>* (ratio of long-term debt to total assets), *Sales growth rate<sub>f,t</sub>* (sales-weighted average of sectoral growth rates). Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.



**Table 2.14 – Heterogeneity III - Informational frictions**

	$\Delta Exports_{f,m,t}$				
	(1)	(2)	(3)	(4)	(5)
$\overline{Distance\ to\ 60\text{-day\ rule}}_{f,t}$	0.016*** (0.005)	0.001 (0.003)		0.004 (0.005)	
$1(Differentiated)_p \times \overline{Distance\ to\ 60\text{-day\ rule}}_{f,t}$		0.017*** (0.001)	0.022*** (0.001)		
$Q2\ Stickiness_p \times \overline{Distance\ to\ 60\text{-day\ rule}}_{f,t}$				0.011*** (0.002)	0.008*** (0.002)
$Q3\ Stickiness_p \times \overline{Distance\ to\ 60\text{-day\ rule}}_{f,t}$				0.016*** (0.002)	0.010*** (0.002)
$Q4\ Stickiness_p \times \overline{Distance\ to\ 60\text{-day\ rule}}_{f,t}$				0.015*** (0.003)	0.005*** (0.002)
Observations	4,941,544	3,935,473	3,447,070	4,910,440	4,390,992
Firm FE	Yes	Yes	No	Yes	No
Firm-Country-Year FE	No	No	Yes	No	Yes
Country-Year FE	Yes	Yes	No	Yes	No
Product FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes

*Note:* This table displays the results of the estimation of the reduced-form specification of the regression of export outcomes on the variation in payment periods. The dependent variable is the variation in exports in country  $m$  of product  $p$  between  $t - 1$  and  $t$ . The main independent variable is  $\overline{Distance\ to\ 60\text{-day\ rule}}_{f,t}$ . The variable measures the distance to the 60-day threshold in the sectors in which firm  $f$  is operating in 2007 and is defined in three steps. First, we take the 2007 sector-level average of firm-level payment periods in excess of 60 days (payment periods from customers are computed at the firm level as the ratio of accounts receivable over sales multiplied by 365). Second, we take the firm-level average of the sectoral distance to the 60-day rule weighted by the share of sales realized by the firm in each sector in 2007. Third, we multiply the variable by a dummy equal to 1 after 2007. A product is defined as a 4-digit code of the harmonized Combined Nomenclature (CN) product classification. In columns 2 and 3, we attribute to each 8-digit product a number (0: homogeneous, 1: reference priced, 2: differentiated) in line with its position in the Rauch (1999) classification. For each firm-country-product-year observation, the Rauch code is computed as the average of the Rauch code weighted by exports. Observations are ranked as "Homogeneous" (resp. "Differentiated") if the average Rauch code is below (resp. above) the median. In columns 4 and 5, observations are ranked in quartiles according to the value of the "relationship stickiness" index associated with product  $p$  (Martin, Mejean and Parenti, 2018). A higher value of the index signals longer durations of trade relationships for a given product and reflects higher informational frictions. Columns 1, 2 and 4 include firm, country-year and product fixed effects. Columns 3 and 5 include firm-year, country-year and product fixed effects. Control variables include  $Labor\ productivity_{f,t-1}$  (value-added over the number of employees),  $\log(Total\ Assets)_{f,t-1}$  (total assets in logarithm),  $Long\text{-term}\ debt/TA_{f,t-1}$  (ratio of long-term debt to total assets),  $Sales\ growth\ rate_{f,t}$  (sales-weighted average of sectoral growth rates). Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.

**Table 2.15 – Connected and non-connected customers**

	$\Delta Exports$ ( <i>non-connected customers</i> ) $_{f,m,t}$		$\Delta Exports$ ( <i>connected customers</i> ) $_{f,m,t}$	
	(1)	(2)	(3)	(4)
$\Delta Payment\ periods_{f,t}$	-0.141** (0.056)	-0.134*** (0.051)	-0.036 (0.027)	-0.041* (0.024)
Observations	268,639	268,639	728,844	728,844
Firm FE	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes
F-stat	37.3	41.0	38.6	40.2

*Note:* The dependent variable in the first two columns (last two columns) is the growth rate of exports at time  $t$  in country  $m$  realized with non-connected (resp. connected) customers. A customer is said to be "connected" if it has already traded with a French exporter before time  $t$ , and "non-connected" otherwise. The year 2003 is accordingly removed from the sample. The instrumented variable is  $\Delta Payment\ periods_{f,t}$ . Payment periods from customers are computed at the firm level as the ratio of accounts receivable over sales. The variable is multiplied by 36.5 so that its unit is ten days. The instrument for the variation in payment periods is  $Distance\ to\ 60\text{-day}\ rule_{f,t}$ . The variable measures the distance to the 60-day threshold in the sectors in which firm  $f$  is operating in 2007 and is defined in three steps. First, we take the 2007 sector-level average of firm-level payment periods in excess of 60 days (sectoral distance to the 60-day rule). Second, we take the firm-level average of the sectoral distance to the 60-day rule weighted by the share of sales realized by the firm in each sector in 2007. Third, we multiply the variable by a dummy equal to 1 after 2007. Control variables include  $Labor\ productivity_{f,t-1}$  (value-added over the number of employees),  $\log(Total\ Assets)_{f,t-1}$  (total assets in logarithm),  $Long\text{-term}\ debt/TA_{f,t-1}$  (ratio of long-term debt to total assets),  $Sales\ growth\ rate_{f,t}$  (sales-weighted average of sectoral growth rates). Regressions include firm and country-year fixed effects. Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.

**Table 2.16 – Heterogeneity IV - ex ante market penetration**

	$\Delta Exports_{f,m,t}$		
	(1)	(2)	(3)
$\overline{Distance\ to\ 60\text{-day\ rule}}_{f,t}$	0.005** (0.002)	0.036*** (0.002)	
$Q2\ Market\ share_{f,m,07} \times \overline{Distance\ to\ 60\text{-day\ rule}}$		-0.017*** (0.001)	-0.020*** (0.001)
$Q3\ Market\ share_{f,m,07} \times \overline{Distance\ to\ 60\text{-day\ rule}}$		-0.035*** (0.001)	-0.045*** (0.002)
$Q4\ Market\ share_{f,m,07} \times \overline{Distance\ to\ 60\text{-day\ rule}}$		-0.041*** (0.002)	-0.057*** (0.001)
Observations	807,650	664,036	646,848
Firm FE	Yes	Yes	No
Firm-Year FE	No	No	Yes
Country-Year FE	Yes	Yes	Yes
Quartile FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes

*Note:* The table gives the results of the estimation of the reduced-form specification of the regression of export outcomes on the variation in payment periods. The dependent variable is the variation in exports in country  $m$  for firms that remain in the country between times  $t$  and  $t - 1$ . The main independent variable is  $\overline{Distance\ to\ 60\text{-day\ rule}}_{f,t}$ . The variable measures the distance to the 60-day threshold in the sectors in which firm  $f$  is operating in 2007 and is defined in three steps. First, we take the 2007 sector-level average of firm-level payment periods in excess of 60 days (payment periods from customers are computed at the firm level as the ratio of accounts receivable over sales multiplied by 365). Second, we take the firm-level average of the sectoral distance to the 60-day rule weighted by the share of sales realized by the firm in each sector in 2007. Third, we multiply the variable by a dummy equal to 1 after 2007. The market share in 2007 is measured as the quartile of 2007 exports of firm  $f$  in country  $m$ .  $Q1\ Market\ share_{f,m,07} = 1$  means for instance that firm  $f$  was in the first quartile of exports in country  $m$  in 2007, i.e it has a low market-share. The first and second columns include firm, country-year and quartile fixed effects. The third column include firm-year, country-year and quartile fixed effects. Control variables include  $Labor\ productivity_{f,t-1}$  (value-added over the number of employees),  $\log(Total\ Assets)_{f,t-1}$  (total assets in logarithm),  $Long\text{-term}\ debt/TA_{f,t-1}$  (ratio of long-term debt to total assets),  $\overline{Sales\ growth\ rate}_{f,t}$  (sales-weighted average of sectoral growth rates). Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.

## Additional tables and figures for Online Appendix

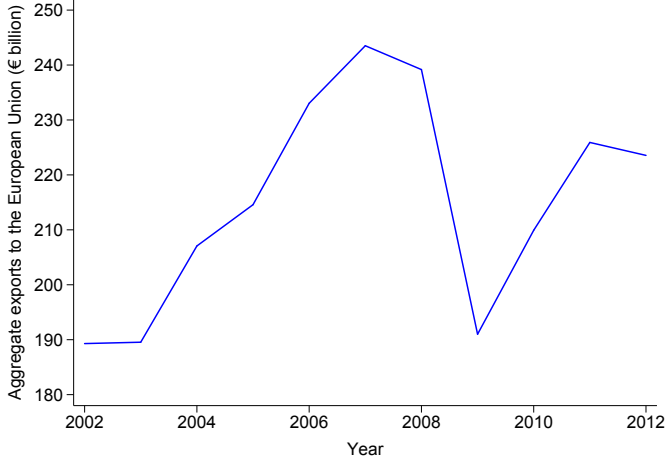
### IX Descriptive statistics

**Table A1 – Customer and supplier payment periods: top and bottom 5 sectors (2007)**

Payment periods from customers		Payment periods to suppliers	
Manufacture of non-metallic mineral products	145.1	Manufacture of ceramic sanitary	99.7
Manufacture of industrial gases	120.1	Manufacture of batteries	98.1
Manufacture of locomotives	119.7	Manufacture of fibre cement	82.8
Manufacture of steam generators	118.1	Manufacture of other mineral products	80.6
Manufacture of cement	112.6	Wholesale of beverages	80.2
Processing and preserving of potatoes	8.2	Bakery confectionery	30.5
Confectionery shop	6.7	Bakery products	30.4
Delicatessen	6.4	Processing of potatoes	28.7
Bakery	6.1	Cooked meats production and trade	28.1
Industrial bakery	5.0	Manufacture of medical equipment	32.3

*Note:* This table displays the sectors in the manufacturing and wholesale sector with the highest and lowest values of average payment periods from customers and average payment periods to suppliers. A sector is defined as a 5-digit code of the NACE classification. Payment periods from customers are computed as the average ratio of accounts receivable over sales multiplied by 365. Payment periods to suppliers are computed as the average ratio of accounts payable over purchases multiplied by 365.

**Figure A1 – Aggregate exports to the European Union**



**Table A2 – Description of the dataset**

<b>Panel A: Definitions of the variables</b>	
<b>Export variables</b>	
$\Delta Customer\ base_{f,m,t}$	Exports of firm $f$ realized in country $m$ with new customers at time $t$ minus the amount of exports of firm $f$ realized in country $m$ with customers lost at time $t - 1$ (scaled by the average of total exports in country $m$ between $t$ and $t - 1$ ). <i>Source: Customs.</i>
$\Delta Exports_{f,m,t}$	Variation in the amount of exports (in mid-point growth rate) of firm $f$ in country $m$ between $t$ and $t - 1$ conditional on firm $f$ being present in $m$ at $t$ and $t - 1$ . <i>Source: Customs.</i>
$\Delta Price_{f,m,p,t}$	Variation in prices of product $p$ in country $m$ charged by firm $f$ between time $t$ and time $t - 1$ . Prices are proxied by unit values, that is by the ratio of the volume of sales to the quantity of product sold. A product is defined as a 8-digit code of the Combined Nomenclature. <i>Source: Customs.</i>
$\Delta Stable\ customers_{f,m,t}$	Variation in the amount of exports of firm $f$ realized in country $m$ with customers with which firm $f$ trades at both $t$ and $t - 1$ (scaled by the average of total exports in country $m$ between $t$ and $t - 1$ ). <i>Source: Customs.</i>
$Entry_{f,m,t}$	Probability of firm $f$ entering country $m$ at time $t$ conditional on firm $f$ being not present in $m$ at time $t - 1$ . <i>Source: Customs.</i>
$Exit_{f,m,t}$	Probability of firm $f$ exiting country $m$ at time $t$ conditional on firm $f$ being present in $m$ at time $t - 1$ . <i>Source: Customs.</i>
$\log(Exports/customer)_{f,m,t}$	Average sales per customer <i>Source: Customs.</i>
$\log(Herfindahl)_{f,m,t}$	Logarithm of the Herfindahl index of sales across customers of firm $f$ in country $m$ at time $t$ . The Herfindahl index is computed by squaring the share of sales realized with each customer (expressed in percentage) and then summing the resulting numbers. <i>Source: Customs.</i>

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**Panel A: Definitions of the variables (continued)**

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<i>Lost customers</i> <sub><i>f,m,t</i></sub>	Exports of firm <i>f</i> realized in country <i>m</i> with customers lost at time <i>t</i> – 1 (scaled by the average of total exports in country <i>m</i> between <i>t</i> and <i>t</i> – 1). <i>Source: Customs.</i>
<i>New customers</i> <sub><i>f,m,t</i></sub>	Exports of firm <i>f</i> realized in country <i>m</i> with new customers at time <i>t</i> (scaled by the average of total exports in country <i>m</i> between <i>t</i> and <i>t</i> – 1). <i>Source: Customs.</i>
<b>Firm variables</b>	
$\Delta$ <i>Payment periods</i> <sub><i>f,t</i></sub>	Variation in payment periods from customers. Payment periods from customers are defined as the ratio of accounts receivable over sales multiplied by 365. <i>Source: Tax returns.</i>
<i>Age</i> <sub><i>f,t</i></sub>	Age of the firm. <i>Source: Tax returns.</i>
<i>Cash/TA</i> <sub><i>f,t</i></sub>	Ratio of cash holdings to total assets. <i>Source: Tax returns.</i>
<i>Credit lines/TA</i> <sub><i>f,t</i></sub>	Ratio of drawn credit lines to total assets. <i>Source: Tax returns.</i>
<i>Labor productivity</i> <sub><i>f,t-1</i></sub>	Value-added over the number of employees (lagged value). <i>Source: Tax returns.</i>
$\log(\text{Total Assets})$ <sub><i>f,t-1</i></sub>	Logarithm of total assets (lagged value, thousands of euros). <i>Source: Tax returns.</i>
$\log(\text{Turnover})$ <sub><i>f,t</i></sub>	Logarithm of turnover (thousands of euros). <i>Source: Tax returns.</i>
$\frac{\text{Long-term debt}}{\text{TA}}$ <sub><i>f,t-1</i></sub>	Ratio of long-term debt to total assets (lagged value). <i>Source: Tax returns.</i>
<i>Sales growth rate</i> <sub><i>f,t</i></sub>	Sales-weighted average of sectoral sales growth rates between <i>t</i> – 1 and <i>t</i> . <i>Source: EAE, Tax returns.</i>
<b>Instruments</b>	
<i>Distance to 60-day rule</i> <sub><i>f,t</i></sub>	Sales-weighted average of the 2007 sectoral distance of payment periods from customers to the 60-day threshold multiplied by a dummy equal to one after 2007 (see section 2.4). <i>Source: EAE, Tax returns.</i>

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**Panel B: Summary Statistics**

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	# Obs.	Mean	Std. Dev.	Percentiles				
				5 <sup>th</sup>	25 <sup>th</sup>	50 <sup>th</sup>	75 <sup>th</sup>	95 <sup>th</sup>
<b>Export variables</b>								
$\Delta Customer\ base_{f,m,t}$	807,650	0.02	0.52	-0.85	-0.02	0.00	0.03	0.96
$\Delta Exports_{f,m,t}$	807,650	-0.01	0.81	-1.51	-0.44	0.00	0.42	1.48
$\Delta Price_{f,m,p,t}$	3,758,105	0.63	10.86	-0.64	-0.16	0.01	0.22	1.81
$\Delta Product\ base_{f,m,p,t}$	807,650	-0.00	0.46	-0.72	-0.01	0.00	0.01	0.71
$\Delta Stable\ customers_{f,m,t}$	807,650	-0.02	0.62	-1.16	-0.30	0.00	0.26	1.06
$Entry_{f,m,t}$	2,817,999	0.05	0.22	0.00	0.00	0.00	0.00	1.00
$Exit_{f,m,t}$	939,299	0.14	0.35	0.00	0.00	0.00	0.00	1.00
$\log(Exports/customer)_{f,m,t}$	807,650	10.25	2.16	6.78	8.79	10.23	11.68	13.86
$\log(Herfindahl)_{f,m,t}$	807,650	8.70	0.68	7.33	8.42	9.00	9.21	9.21
$Lost\ customers_{f,m,t}$	807,650	0.18	0.39	0.00	0.00	0.00	0.14	1.13
$New\ customers_{f,m,t}$	807,650	0.20	0.41	0.00	0.00	0.00	0.16	1.22
<b>Firm variables</b>								
$\Delta Payment\ periods_{f,t}$	96,758	0.10	2.53	-3.64	-0.94	0.06	1.07	3.84
$\Delta Hours_{f,m,t}$	87,336	-0.01	0.17	-0.23	-0.06	-0.00	0.05	0.20
$\Delta Net\ payment\ periods_{f,t}$	96,758	-0.03	2.43	-3.64	-1.07	-0.01	1.02	3.55
$Age_{f,t}$	96,758	24.74	18.37	3.00	12.00	21.00	34.00	54.00
$Cash/TA_{f,t}$	96,758	0.08	0.11	0.00	0.01	0.04	0.11	0.30
$Credit\ lines/TA_{f,t}$	96,758	0.02	0.06	0.00	0.00	0.00	0.01	0.15
$Labor\ productivity_{f,t-1}$	96,758	0.07	0.05	0.03	0.04	0.06	0.08	0.15
$\log(Total\ Assets)_{f,t-1}$	96,758	9.55	1.27	7.78	8.63	9.37	10.33	11.95
$\log(Turnover)_{f,t-1}$	96,758	9.76	1.22	8.04	8.89	9.62	10.51	12.03
$Sales\ growth\ rate_{f,t}$	96,758	0.01	0.13	-0.22	-0.03	0.03	0.07	0.17
<b>Instruments</b>								
$Distance\ to\ 60\text{-day}\ rule_{f,t}$	96,758	2.14	1.93	0.00	0.00	2.33	3.82	4.95
$Distance\ to\ 60\text{-day}\ rule\ (supplier)_{f,t}$	96,758	9.86	11.36	0.00	0.00	7.35	15.91	31.56
$Net\ payment\ periods_{f,t}$	96,758	0.83	1.78	-1.50	0.00	0.00	1.83	4.22



**Table A3 – Export values and number of destinations served**

	Mean	Std. Dev.	P5	P25	P50	P75	P95
<i>Total exports</i> <sub>f,t</sub> (k€)	8690.75	47072.19	12.07	202.36	907.22	3767.93	32769.12
<i>Exports by country</i> <sub>f,m,t</sub> (k€)	1058.47	8345.16	5.95	48.01	156.18	527.72	3757.11
<i>#Countries served</i> <sub>f,t</sub>	7.18	5.26	1.00	3.00	6.00	10.00	18.00
<i>#Customers by country</i> <sub>f,m,t</sub>	4.99	10.24	1.00	1.50	2.50	4.80	15.86

*Note:* On average over the period 2003-2012, a French firm exports 985 k€ per year and destination, serves 7 destinations and is in contact with 5 buyers within a country.

**Table A4 – Description of export dynamics at the customer and country level**

<b>Level</b>	<b>#Years after entry:</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<i>Customer</i>	Export value (mean)	74,969	154,827	215,396	266,420	424,528
	Exit rate (%)	55	39	32	29	31
<i>Market</i>	Export value (mean)	529,195	842,330	1,071,760	1,225,000	1,776,048
	Exit rate (%)	27	15	11	9	6
	# customers (mean, UE)	4	5	6	7	9

*Note:* The table displays the average export value and exit rate at the customer and country level for the five years following entry into a country or to the formation of a new supplier-customer relationship. The last line indicates the evolution of the average number of customers per country in the five years following the time of entry.

**Table A5 – Duration of trade relationships**

	All	Multiple trades	
	1(Multiple)	Duration (m)	Time between trades (m)
<b>All relationships</b>			
Mean	0.54	24.64	4.69
SD	0.50	20.73	4.97
Observations	539,929		
<b>Initial export value &lt; Median</b>			
Mean	0.47	24.23	5.25
SD	0.50	20.45	5.27
Observations	258,350		
<b>Initial export value &gt; Median</b>			
Mean	0.60	24.94	4.29
SD	0.49	20.93	4.71
Observations	281,579		

*Note:* The variable in the first column is a dummy equal to one if the foreign importer and the French exporter trade more than once. We only retain trade relationships that start in the year 2007 and that end before December 2012. The variable in the second column measures the duration in months of the trading relationship (conditional on trading more than once). The variable in the third column gives the average time (in months) between transactions (conditional on trading more than once). There are three panels. In the first panel, we retain all trade relationships. In the second (third) panel, we only retain transactions for which the initial export value is lower (higher) than the median initial export value in the country of the importer. In each panel, we compute the mean and the standard deviation of each variable.

## X Derogations

This Appendix gives the maximum contractual payment terms after the date of the invoice authorized by the LME reform. When the limit varies in 2009 (*e.g.* 120 days between January 01 and May 31 2009 and 80 days between June 01 and December 31 2009), we report the average number of days (100 days). When the supplier and the customer face different thresholds, the minimum payment limit prevails for the transaction.

- *Purchases of living cattle:* 20 days
- *Purchases of perishable products, purchases of alcoholic beverages:* 30 days
- *Manufacture and sale of metal food packaging; record industry; recreational fishing; manual, creative and recreational activities:* 75 days
- *Construction industry; bathroom and heating equipment; sailing stores; industrial tooling; industrial hardware; steel products for the construction industry; automotive tools wholesaling:* 85 days
- *DIY stores; stationery and office supplies; tire industry; drugs with optional medical prescriptions; pet trade; garden stores; coatings, paints, glues, adhesives and inks; sports stores ; leather industry; clothing sector:* 90 days
- *Jewellery, gold- and silversmiths' trade; round wooden elements; food supplements; optical-eyewear industry; cooperage :* 105 days
- *Firearms and ammunition for hunting:* 115 days
- *Quads, two- or three-wheeled vehicles, recreational vehicles::* 125 days
- *Agricultural supplies:* 150 days
- *Toy stores:* 170 days
- *Book edition, agricultural machines:* 195 days

## **XI Robustness checks**

In Table A6, we re-estimate the baseline regression using various alternative specifications. In the column 1, we tweak the definition of the instrument so as to incorporate the deviations to the 60-day rule introduced by the law. While the sign of the coefficient stays unchanged, the magnitude in absolute value becomes much bigger. Since the derogations are likely to be endogenously determined, however, we tend to see our baseline coefficient as being closer to the actual elasticity.

[Insert Table A6 here]

Strikingly, the OLS regression yields a positive coefficient for the variation in payment periods. This is expected, as payment periods decreased simultaneously to the collapse in international trade caused by the financial crisis. The OLS regression captures this simultaneous decrease, which leads to a positive coefficient for the variation in payment periods. This exercise highlights the necessity of an instrumentation strategy to capture the causal effect of the reform. In column 4, the specification is estimated without country-year fixed effects (only firm and year fixed effects). Both coefficients are close to the baseline estimate, but not statistically different from zero.

[Insert Table A7 here]

In Table A7, we assess the effect of the variation in domestic payment periods on international sales using different units of aggregation for exports. In an influential paper, Bertrand, Duflo and Mullainathan (2004) argue that in presence of serially correlated outcomes, econometric estimations based on panel data with a limited number of individual entities might under-reject the null hypothesis as standard errors are likely to be under-estimated. As a robustness check, they recommend collapsing the data in a "pre" and "post" period and estimating the coefficient of interest on the resulting dataset so as to limit the influence of the time dimension.

Accordingly, we reduce the dimension of our data in two steps. First, we sum all the exports at the firm-year level and estimate our baseline specification without the country dimension and with  $Y =$

$\Delta Exports$  (columns 1 and 2). We can see that the negative and significant relationship between the variation in payment periods and export growth is still present even when abstracting from country level-variations. In a second stage (columns 3 and 4), we remove the time dimension of the dataset by computing the growth rate of firm total exports between 2006 and 2009.  $\Delta Payment\ periods$  is defined in this context as the long difference of payment periods between 2006 and 2009. It is instrumented by  $\overline{Distance\ to\ 60\text{-}day\ rule}_{f,07}$ . Once again, the causal relationship that we uncover resists to the change in the unit of observation and stays significant at the 5% whether we include controls or not.

[Insert Table A8 here]

Another potential concern with our empirical strategy relates the weights used to compute the instrumental variable. We use firms' past sectoral sales as weights to compute the firm-level average distance to the 60-day threshold. We argue that the weights are likely to depend primarily on technological constraints and on the sectoral specialization of the firm. It may be possible, however, that the portfolio of sectors of a firm may be related to its capacity of acquiring customers. The statistical link between the exposure to the reform and the export behavior would as a consequence reflect the presence of these confounding factors. Since those factors are likely to vary little over time, we should under this hypothesis find evidence of a statistical link between the exposure to the reform and the variation in exports even before the implementation of the reform. Subsection 2.6.1 shows that we don't.

Still, we check in Table A8 that our results are not affected by the method of construction of the instrument. Column 1 displays the baseline estimate. In column 2 and 3, the weights are based on 2006 sectoral sales and average sectoral sales between 2003 and 2006. The estimates are barely changed, which implies that our results are not driven by the precise timing of construction of the shift-share variable. In column 4 we compute the instrument as the simple average of the sectoral distance to the 60-day threshold (based on the presence of the firm in downstream sectors in 2007)

so as to remove the influence of the weights. The coefficient is statistically indistinguishable from the baseline estimate.

[Insert Table A9 here]

In Table A9, we use several alternative methods to adjust standard errors for clustering. We successively cluster standard errors by sector (baseline), sector-year, firm, firm-year, and country-year. We find the effects of the reduction in payment periods on exports to be always significant at the 5% level.

[Insert Table A10 here]

Lastly, in Table A10, we re-estimate the decomposition of the effects of the reform between the evolution of the customer base and the evolution of sales to stable customers using the standard growth rate. Compared to the mid-point growth rate, the standard computation of the growth rate has the disadvantage of being unbounded. To deal with the presence of outliers, we remove the observations with growth rates exceeding 1000%. This procedure discards 3.2% of the observations. The results of the decomposition using the standard growth rate are very close to the baseline estimates. In particular, the coefficient for the variation in payment periods (column 1) is not statistically different from the baseline estimated elasticity. Moreover, we find once again that the entirety of the effect of the reform on international sales comes from the expansion of the customer base.

**Table A6 – Alternative specifications**

	$\Delta Exports$				
	Baseline (1)	Derogations (2)	OLS (3)	No Country-Year FE (4)	No firm FE (5)
$\Delta Payment\ periods_{f,t}$	-0.053** (0.025)	-0.205* (0.122)	0.012*** (0.001)	-0.042 (0.026)	-0.066 (0.069)
Observations	807,650	788,665	807,650	807,650	807,650
Firm FE	Yes	Yes	Yes	Yes	No
Country-Year FE	Yes	Yes	Yes	No	Yes
Year FE	No	No	No	Yes	No
Controls	Yes	Yes	Yes	Yes	Yes
F-stat	37.7	4.8	-	37.9	8.0

The dependent variable is the variation in exports in country  $m$  for firms that stay in the country between  $t - 1$  and  $t$ . The instrumented variable is  $\Delta Payment\ periods_{f,t}$  and is defined at the firm level as the ratio of accounts receivable over sales multiplied by 365. The instrument for the variation in payment periods is  $\overline{Distance\ to\ 60\text{-day\ rule}_{f,t}}$ , and is defined as the sales-weighted average of the 2007 sectoral distance of payment periods to the 60-day threshold multiplied by a dummy equal to one after 2007. Control variables include  $\overline{Labor\ productivity}_{f,t-1}$  (value-added over the number of employees),  $\log(Total\ Assets)_{f,t-1}$  (total assets in logarithm),  $\overline{Long\text{-term\ debt}/TA}_{f,t-1}$  (ratio of long-term debt to total assets),  $\overline{Sales\ growth\ rate}_{f,t}$  (sales-weighted average of sectoral sales growth rates). In the Derogations column, the instrumented variable is modified so as to take into account the sectoral derogations to the 60-day rule (see the Appendix for a list of the derogations). Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.

**Table A7 – Alternative units of aggregation**

Unit of aggregation:	$\Delta Exports$			
	Firm-year		Firm	
	(1)	(2)	(3)	(4)
$\Delta Payment\ periods$	-0.120*** (0.032)	-0.120*** (0.030)	-0.050*** (0.018)	-0.083*** (0.021)
Observations	142,427	125,926	13,025	12,406
# Firms	20,831	17,013	13,025	12,406
Firm FE	Yes	Yes	No	No
Year FE	Yes	Yes	No	No
Controls	No	Yes	No	Yes

In the first two columns, we sum all the exports at the firm-year level and estimate our baseline specification without the country dimension. The instrumented variable is  $\Delta Payment\ periods_{f,t}$  and is defined at the firm level as the ratio of accounts receivable over sales multiplied by 365. The instrument for the variation in payment periods is  $\overline{Distance\ to\ 60\text{-day\ rule}}_{f,t}$  which is defined as the sales-weighted average of the 2007 sectoral distance of payment periods to the 60-day threshold multiplied by a dummy equal to one after 2007. Control variables include  $Labor\ productivity_{f,t-1}$  (value-added over the number of employees),  $\log(Total\ Assets)_{f,t-1}$  (total assets in logarithm),  $Long\text{-term\ debt}/TA_{f,t-1}$  (ratio of long-term debt to total assets),  $Sales\ growth\ rate_{f,t}$  (sales-weighted average of sectoral sales growth rates). In the next two columns, we remove the time dimension of the data by calculating the growth rate of firm total exports between 2006 and 2009.  $\Delta Payment\ periods$  is defined in this context as the long difference of payment periods between 2006 and 2009; it is instrumented by  $\overline{Distance\ to\ 60\text{-day\ rule}}_{f,07}$ . Controls include the logarithm of total assets in 2006, the average growth rate between 2006 and 2009 of the sectors in which the firm operates, leverage and labor productivity in 2006. Standard errors are clustered at the firm level in the first two columns and corrected for heteroskedasticity in the last two columns. Standard errors are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.



**Table A8 – Alternative measures of exposure to the reform**

	$\Delta Exports_{f,m,t}$			
	Baseline	2006 weights	2003-2006 weights	2007 dummies
	(1)	(2)	(3)	(4)
$\Delta Payment\ periods_{f,t}$	-0.053** (0.025)	-0.062** (0.024)	-0.056** (0.023)	-0.043* (0.025)
Observations	807,650	807,650	807,650	807,650
Firm FE	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
F-stat	37.7	50.6	54.6	34.7

The dependent variable is the variation in exports in country  $m$  for firms that stay in the country between  $t - 1$  and  $t$ . The instrumented variable is  $\Delta Payment\ periods_{f,t}$  and is defined at the firm level as the ratio of accounts receivable over sales multiplied by 365. Control variables include  $Labor\ productivity_{f,t-1}$  (value-added over the number of employees),  $\log(Total\ Assets)_{f,t-1}$  (total assets in logarithm),  $Long-term\ debt/TA_{f,t-1}$  (ratio of long-term debt to total assets),  $Sales\ growth\ rate_{f,t}$  (sales-weighted average of sectoral sales growth rates). In the Baseline column, the instrument for the variation in payment periods is defined as the average of the 2007 sectoral distance to the 60-day threshold weighted by the 2007 shares of sales of firm  $f$  realized in each sector (multiplied by a dummy equal to one after 2007). In the second (third) column, the weights are defined as the shares of sales of firm  $f$  realized in each sector in 2006 (realized on average between 2003 and 2006). In the fourth column, the instrument is defined as the simple average of the 2007 sectoral distance to the 60-day threshold in the sectors in which it operates in 2007 (multiplied by a dummy equal to one after 2007). Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.

**Table A9 – Alternative computations of standard errors**

	$\Delta Exports$				
	Sector (baseline)	Sector-Year	Firm	Firm-Year	Country-Year
	(1)	(2)	(3)	(4)	(5)
$\Delta Payment\ periods_{f,t}$	-0.053** (0.025)	-0.053* (0.029)	-0.053** (0.023)	-0.053** (0.022)	-0.053** (0.024)
Observations	807,650	807,650	807,650	807,650	807,650
Firm FE	Yes	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes	Yes
F-stat	37.7	32.3	38.5	38.9	37.9

The dependent variable is the variation in exports in country  $m$  for firms that stay in the country between  $t - 1$  and  $t$ . The instrumented variable is  $\Delta Payment\ periods_{f,t}$  and is defined at the firm level as the ratio of accounts receivable over sales multiplied by 365. The instrument for the variation in payment periods is  $\overline{Distance\ to\ 60\text{-day}\ rule}_{f,t}$  which is defined as the sales-weighted average of the 2007 sectoral distance of payment periods to the 60-day threshold multiplied by a dummy equal to one after 2007. Control variables include  $\overline{Labor\ productivity}_{f,t-1}$  (value-added over the number of employees),  $\overline{\log(Total\ Assets)}_{f,t-1}$  (total assets in logarithm),  $\overline{Long\text{-term}\ debt/TA}_{f,t-1}$  (ratio of long-term debt to total assets),  $\overline{Sales\ growth\ rate}_{f,t}$  (sales-weighted average of sectoral sales growth rates). Standard errors are clustered at the level of the sector (baseline), sector-year, firm, firm-year, and country-year level and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.

**Table A10 – Effects of payment periods on the formation of a customer base  
(standard growth rate)**

	$\Delta Exports_{f,m,t}$	$\Delta Stable\ customers_{f,m,t}$	$\Delta Customer\ base_{f,m,t}$	$New\ customers_{f,m,t}$	$Lost\ customers_{f,m,t-1}$
	(1)	(2)	(3)	(4)	(5)
$\Delta Payment\ periods_{f,t}$	-0.068* (0.039)	-0.011 (0.027)	-0.057** (0.024)	-0.064** (0.026)	-0.007 (0.007)
Observations	780,825	780,825	780,825	780,825	780,825
Firm FE	Yes	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
F-stat	37.5	37.5	37.5	37.5	37.5

The dependent variables are (in the order of the columns) the standard growth rate of exports in country  $m$  between times  $t$  and  $t - 1$ , the variation in exports to customers in country  $m$  with whom firm  $f$  has a trade relationship at  $t - 1$  and  $t$ , the variation in exports to customers in country  $m$  with whom firm  $f$  has a trade relationship only at  $t - 1$  or at  $t$ , the amount of exports to customers acquired at  $t$  (lost at  $t - 1$ ). All the dependent variables are defined only for firms that stay in country  $m$  between  $t - 1$  and  $t$ . Observation for which the export growth rate exceeds 1000% are excluded. The instrumented variable is  $\Delta Payment\ periods_{f,t}$  and is defined at the firm level as the ratio of accounts receivable over sales multiplied by 365. The instrument for the variation in payment periods is  $\overline{Distance\ to\ 60\text{-day\ rule}}_{f,t}$  which is defined as the sales-weighted average of the 2007 sectoral distance of payment periods to the 60-day threshold multiplied by a dummy equal to one after 2007. Control variables include  $Labor\ productivity_{f,t-1}$  (value-added over the number of employees),  $\log(Total\ Assets)_{f,t-1}$  (total assets in logarithm),  $Long\text{-term\ debt}/TA_{f,t-1}$  (ratio of long-term debt to total assets),  $\overline{Sales\ growth\ rate}_{f,t}$  (sales-weighted average of sectoral sales growth rates). Regressions include firm and year fixed effects. Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.

## XII Accounting for both demand and supply of trade credit

The baseline specification does not take into account the role of the demand of trade credit addressed to suppliers. Since firms are both customers and suppliers, the reduction of the provision of trade credit granted to customers could be entirely offset by the diminution of supplier payment periods. To tackle this issue, we compare customers payment periods to the time taken by firm  $f$  to pay its suppliers, a measure of payment periods in *net terms*:

$$Net\ payment\ periods_{f,t} = \frac{Accounts\ receivable_{f,t} - Accounts\ payable_{f,t}}{Sales_{f,t}}$$

Net payment periods are by construction equal to the difference between payment periods from customers and payment periods to suppliers. The baseline identification strategy is not relevant with this measure of payment periods as the distance to the 60-day rule should no longer predict the effect of the reform. It remains true, however, that payment periods (from customers or to suppliers) should decrease all the more after the reform than they were previously more distant to the 60-day threshold. This directly implies that a firm with large net payment periods in 2007 should have experienced a decrease in  $Net\ payment\ periods_{f,t}$  after the implementation of the reform as payment periods from customers should have decreased more than payment periods to suppliers.

[Insert Figure A2 here]

This idea is illustrated by Figure A2. In the industrial mechanical engineering sector, payment periods from customers (PPC) far exceeded payment periods to suppliers (PPS) before the reform with net payment periods of 54 days in 2007. As PPC were much more distant to the 60-day threshold, they decreased more than PPS. This resulted in net payment periods of 42 days in 2009. Conversely, PPS were higher than PPC for wholesalers of non-specialized food in 2007, leading to net payment periods of minus 12 days. Net payment periods in this case increased after the reform, reaching minus 2 days. This mechanism implies that previous imbalances between PPC and PPS

are predictive of the sign and the magnitude of the subsequent change in net payment periods. We formalize this idea by instrumenting  $\Delta Net\ payment\ periods_{f,t}$  by

$$\overline{Net\ payment\ periods}_{f,t} = 1[t \geq 2007] \cdot \sum_s \omega_{f,s,07} \cdot \overline{Net\ payment\ periods}_{s,07}$$

where  $\overline{Net\ payment\ periods}_{s,07}$  denotes the average value of net payment periods in sector  $s$  in 2007.

[Insert Tables A11 and A12 here]

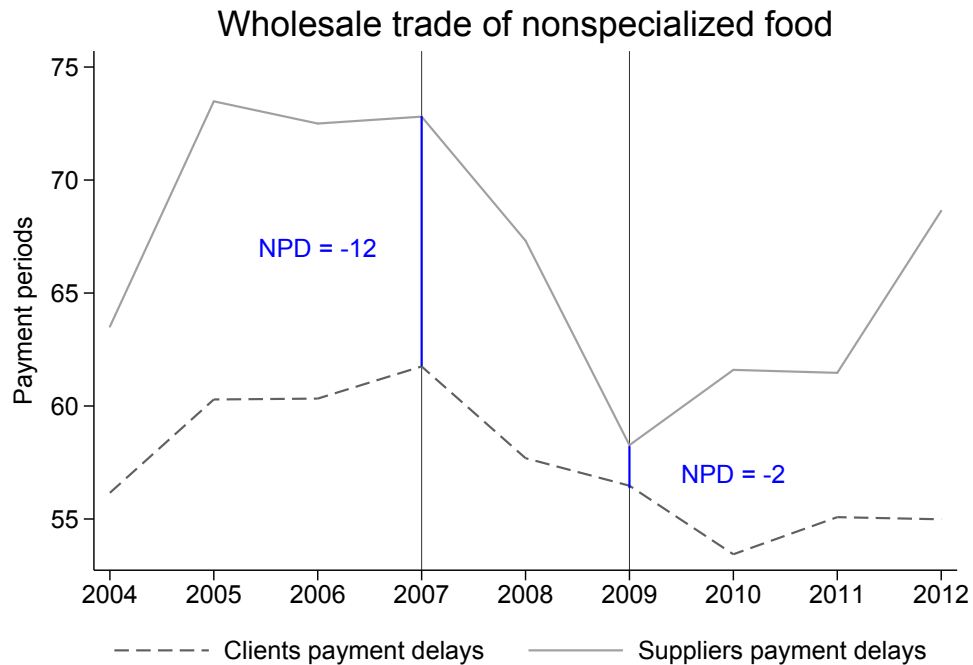
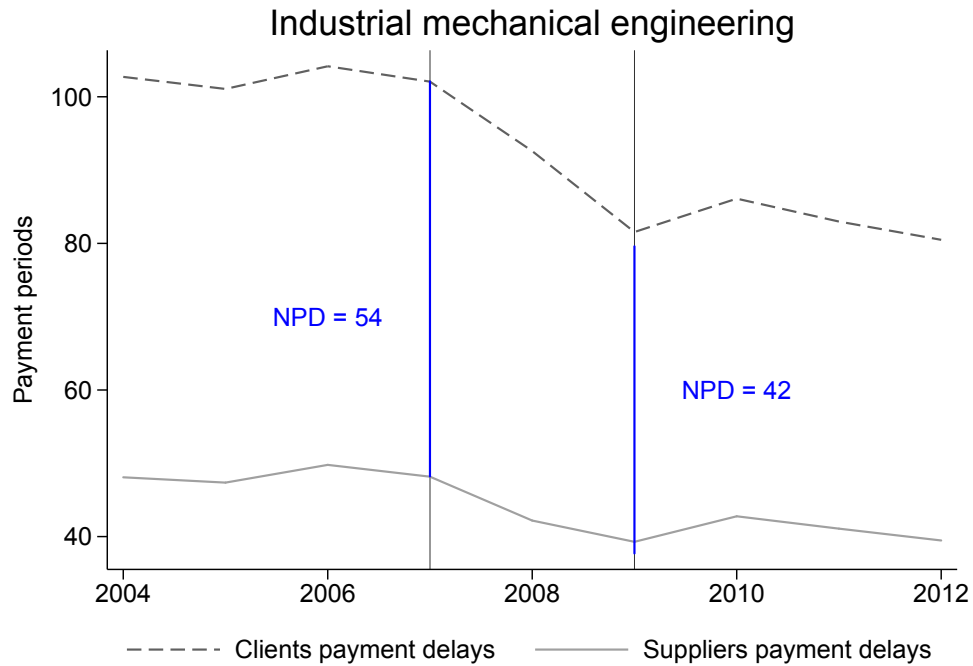
Tables A11 and A12 reproduce the results of the previous section using this alternative measure of payment periods. We can see that each additional day of imbalance between supplier and customer periods is associated with a subsequent decrease in 0.01 day, meaning that the adjustment was much less pronounced in net terms than for customer payment periods. We find that as with  $\Delta Payment\ periods_{f,t}$ , a decrease in net payment periods leads to higher growth of exports and a higher probability of entry. The effect on the probability of exiting a country is not significantly different from zero. Strikingly, the magnitudes of the effects are much larger. This is in line with the intuition that a decrease in payment periods from customers *compared to payment periods to suppliers* is more important for the firm than the sole decrease in payment periods from customers.

**Table A11 – Net payment periods and exports**

	$\Delta Payment\ periods_{f,t}$	$\Delta Exports_{f,m,t}$	$Exit_{f,m,t}$	$Entry_{f,m,t}$
	(1)	(2)	(3)	(4)
$\overline{Net\ payment\ periods}_{f,t}$	-0.042*** (0.010)			
$\Delta Net\ payment\ periods_{f,t}$		-0.121*** (0.044)	0.007 (0.018)	-0.011*** (0.003)
Observations	803,918	803,918	935,337	2,809,036
Firm FE	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
F-stat	-	15.7	16.2	40.4

*Note:* The dependent variables are (in the order of the columns) the variation in net payment periods (which are defined as the difference between payment periods from customers payment periods to suppliers), the variation in exports in country  $m$  for firms that remain in the country between times  $t$  and  $t - 1$ , a dummy indicating whether firm  $f$  exits country  $m$  at time  $t$  and a dummy indicating whether firm  $f$  enters country  $m$  at time  $t$ . The instrument for the variation in payment periods is the sales-weighted average of 2007 sectoral net payment periods multiplied by a dummy equal to one after 2007. Control variables include  $Labor\ productivity_{f,t-1}$  (value-added over the number of employees),  $\log(Total\ Assets)_{f,t-1}$  (total assets in logarithm),  $Long-term\ debt/TA_{f,t-1}$  (ratio of long-term debt to total assets),  $\overline{Sales\ growth\ rate}_{f,t}$  (sales-weighted average of sectoral sales growth rates). Regressions include firm and year fixed effects. Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.

**Figure A2 – Effects of the reform on net payment periods**



*Note:* This graph displays the evolution of payment periods from customers and payment periods to suppliers between 2004 and 2012 in the industrial mechanical engineering and wholesale trade of nonspecialized food. Payment periods from customers are computed as the average ratio of accounts receivable over sales multiplied by 365. Payment periods to suppliers are computed as the average ratio of accounts payable over sales multiplied by 365. Net payment periods are defined as the difference between payment periods from customers and payment periods to suppliers. Lower net payment periods means that payment periods from customers decreased more than payment periods to suppliers.

**Table A12 – Effects of net payment periods on the formation of a customer base**

	$\Delta Exports_{f,m,t}$	$\Delta Stable\ customers_{f,m,t}$	$\Delta Customer\ base_{f,m,t}$	$New\ customers_{f,m,t}$	$Lost\ customers_{f,m,t-1}$
	(1)	(2)	(3)	(4)	(5)
$\Delta Net\ payment\ periods_{f,t}$	-0.121*** (0.044)	-0.034 (0.028)	-0.087*** (0.029)	-0.078*** (0.025)	0.009 (0.014)
Observations	803,918	803,918	803,918	803,918	803,918
Firm FE	Yes	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
F-stat	15.7	15.7	15.7	15.7	15.7

*Note:* The dependent variables are (in the order of the columns) (1) the variation in exports in country  $m$  between times  $t$  and  $t - 1$ , (2) the variation in exports to customers in country  $m$  with whom firm  $f$  has a trade relationship at  $t - 1$  and  $t$ , (3) the variation in exports to customers in country  $m$  with whom firm  $f$  has a trade relationship only at  $t - 1$  or at  $t$ , and (4) the amount of exports to customers acquired at  $t$  and (5) lost at  $t - 1$  standardized by the average of total exports in country  $m$  of firm  $f$  between times  $t$  and  $t - 1$ . All the dependent variables are defined only for firms that stay in country  $m$  between  $t - 1$  and  $t$ . The instrumented variable is  $\Delta Net\ payment\ periods_{f,t}$  and is defined as the temporal variation in the difference between payment periods from customers and payment periods to suppliers. The instrument for the variation in net payment periods is the sales-weighted average of 2007 sectoral net payment periods multiplied by a dummy equal to one after 2007. Control variables include  $Labor\ productivity_{f,t-1}$  (value-added over the number of employees),  $\log(Total\ Assets)_{f,t-1}$  (total assets in logarithm),  $Long-term\ debt/TA_{f,t-1}$  (ratio of long-term debt to total assets),  $Sales\ growth\ rate_{f,t}$  (sales-weighted average of sectoral sales growth rates). Regressions include firm and year fixed effects. Standard errors are clustered at the sector-level (5-digit NACE code) and are given in parentheses. \*, \*\*, and \*\*\* denote statistical significance at 10, 5 and 1%.



## XIII Relationship stickiness

The index of relationship stickiness developed by Martin, Mejean and Parenti (2018) is based on the average length of trade relationships for a given product. In practice, the duration of a trade relationship is measured as the time (in months) between the first transaction of a given product between a seller and customer and the first time the same customer imports the same product from a different French exporter.<sup>60</sup> Interpreting the length of trade relationships at the individual level is however not straightforward as a long spell can either be reflective of high switching costs or a good match quality between the buyer and the seller. Martin, Mejean and Parenti (2018) use the average export volume over the length of the transaction ( $Size_{b,s,p}$  for a buyer  $b$ , a seller  $s$  and a product  $p$ ) as an indicator of the quality of the match. More precisely, denoting  $d$  a decile of  $Size_{b,s,p}$  for a given product and a given importing country  $c$ , we compute the average trade duration  $Duration_{c,p,d}$  in size-bin  $d$  and estimate<sup>61</sup>

$$\log(Duration_{c,p,d}) = FE_c + FE_p + FE_d + \epsilon_{c,p,d}$$

A high product fixed-effect  $\widehat{FE}_p$  (“relationship stickiness index”) is interpreted as reflecting the presence of significant costs of changing suppliers of a product  $p$ .

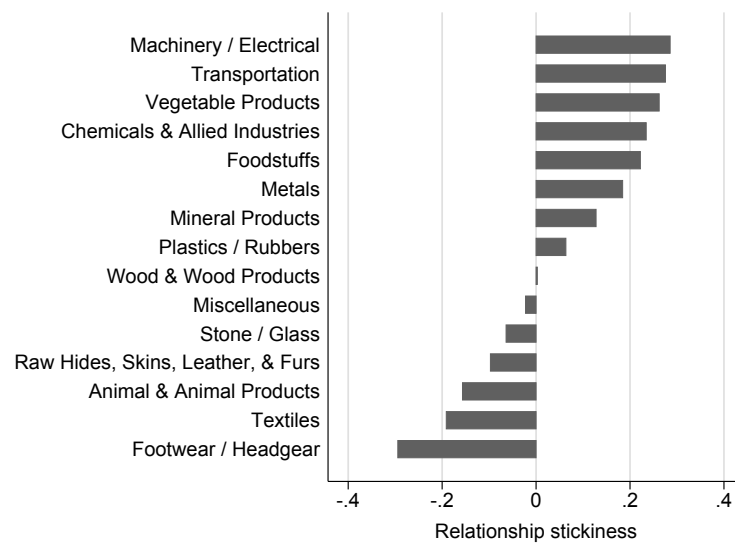
Figure displays the export-weighted average “relationship stickiness index” index for different broad categories of products (e.g., “textiles”). We can see that relationship stickiness is higher for products that are more likely to be differentiated (“machinery/electrical”, “transportation”) and lower for products that are more likely to be homogeneous (“footwear/headwear”, “animal/animal products”).

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<sup>60</sup>To avoid having to deal with left- and right-censored data, we focus on transactions initiated after 2004 and terminated before 2011. If the buyer starts trading with a supplier he already interacted with, we consider that a new relationship is created. The duration of the second relationship is calculated independently of the first one.

<sup>61</sup>We trim the dataset so as to remove the observations that belong to the bottom and top 1% of  $Size_{c,s,p}$ .

**Figure A3 – Relationship stickiness by product category**



## XIV A stylized model of investment in customer capital

In this section, we conduct a partial equilibrium analysis of the role of liquidity constraints in the accumulation of customer capital. Our stylized model delivers testable predictions which will guide the empirical analysis.

We consider a unique representative firm facing a continuum of identical customers present in one single product market. There are two periods denoted by 1 and 2. By simplicity, the risk-free interest rate is set equal to zero. A commercial transaction with a customer delivers with certainty profit  $a > 0$  to the firm at time 2. The exogenous parameter  $a$  reflects both the profitability of the firm and the level of demand in the product market

Firms must undertake marketing activities to match with  $x$  customers. The level of marketing expenditures rise with the targeted number of customers and is given by  $cx^\rho$ . Both  $c > 0$  and  $\rho > 1$  are exogenously determined. The matching with customers is assumed to take place in two steps: potential customers are made aware of the existence of the firm at time 1 ("customer acquisition"), and induced to trade with firm  $f$  at time 2 ("customer retention"). Accordingly, the firm spends a fraction  $0 < \gamma < 1$  of total marketing expenditures at time 1 in customer acquisition and the remaining share  $1 - \gamma$  at time 2 in customer retention.

The temporal structure of marketing expenditures (governed by the parameter  $\gamma$ ) is determined by the intensity of informational frictions. When it is costly to identify customers (high search costs) or to switch suppliers (high input specificity), customer acquisition is likely to be more important for the firm (high  $\gamma$ ). Conversely, firms operating in fluid product markets are likely to devote relatively more effort to maintain their existing customer base (low  $\gamma$ ).<sup>62</sup>

Liquidity constraints are introduced by assuming that the firm can not obtain more than a

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<sup>62</sup>The optimal mix between acquisition and retention spending is the subject of a wide literature in marketing (for instance, see Reinartz, Thomas and Kumar (2005); Ovchinnikov, Boulu-Reshef and Pfeifer (2014)). Min et al. (2016) show in particular that retention spending is the most cost-efficient way of investing in customer capital in competitive markets.

fraction  $0 < \kappa < 1$  of its future sales to finance customer acquisition spending in period 1:

$$\gamma c x^\rho \leq \kappa a x \quad (2.5)$$

We borrow this specification of the working capital constraint from Bigio and La'o (2016).<sup>63</sup> A low parameter  $\kappa$  makes the liquidity constraint more severe.

The specification of marketing costs implies that without liquidity constraints, the firm would spend a fraction  $1/\rho$  of its sales in marketing. It follows that the firm is liquidity constrained if and only if

$$\frac{\kappa}{\gamma} < \frac{1}{\rho} \quad (2.6)$$

Equation 2.7 states that all other things equal, a firm is more likely to be liquidity-constrained when the product market is frictional (high  $\gamma$ ). The reason for this is that a greater share of marketing expenditures has to be financed in advance, leading the working capital constraint to bind more easily. Firms are also more likely to be liquidity constrained when marketing costs increase less quickly with the number of targeted customers (lower  $\rho$ ). Writing  $\xi = \min(1/\rho, \kappa/\gamma)$ , it follows immediately that at the optimum, the number of customers  $x^*$  is given by

$$x^* = \left( \frac{a\xi}{c} \right)^{\frac{1}{\rho-1}} \quad (2.7)$$

Investment in customer capital is increasing in the value of a customer  $a$  and decreasing in the cost of marketing  $c$ . We can see moreover that the size of the customer base does not depend on informational frictions when the firm is not liquidity constrained. This allows us to write

**Proposition 1.** *Following a positive liquidity shock (increase in  $\kappa$ ), investment in customer capital will increase more in the presence of high financing or informational frictions. In particular, investment in customer capital is not affected by the shock if the firm is not liquidity constrained*

<sup>63</sup>Bigio and La'o (2016) show in particular how the constraint can be micro-founded in a limited commitment setting.

*ex ante* (ie,  $\kappa/\gamma \geq 1/\rho$ ).

## XV Bibliography

- Adão, Rodrigo, Michal Kolesár, and Eduardo Morales.** 2019. “Shift-Share Designs: Theory and Inference.” *The Quarterly Journal of Economics*, 134(4): 1949–2010.
- Almeida, Heitor, Murillo Campello, and Michael S Weisbach.** 2004. “The Cash Flow Sensitivity of Cash.” *The Journal of Finance*, 59(4): 1777–1804.
- Amiti, Mary, and David E. Weinstein.** 2011. “Exports and Financial Shocks.” *The Quarterly Journal of Economics*, 126(4): 1841–1877.
- Antràs, Pol, and C Fritz Foley.** 2015. “Poultry in Motion: A Study of International Trade Finance Practices.” *Journal of Political Economy*, 123(4): 853–901.
- Arkolakis, Costas.** 2010. “Market Penetration Costs and the New Consumers Margin in International Trade.” *Journal of Political Economy*, 118(6): 1151–1199.
- Atkin, David, Amit K Khandelwal, and Adam Osman.** 2017. “Exporting and Firm Performance: Evidence from a Randomized Experiment.” *The Quarterly Journal of Economics*, 132(2): 551–615.
- Bagwell, Kyle.** 2007. “The Economic Analysis of Advertising.” *Handbook of Industrial Organization*, 3: 1701–1844.
- Barrot, Jean-Noël.** 2016. “Trade Credit and Industry Dynamics: Evidence from Trucking Firms.” *The Journal of Finance*, 71(5): 1975–2016.
- Barrot, Jean-Noël, and Ramana Nanda.** 2016. “Can Paying Firms Quicker Affect Aggregate Employment?” NBER Working Paper.
- Bartik, Timothy J.** 1991. “Who Benefits from State and Local Economic Development Policies?” Chapter 1, 1–16. WE Upjohn Institute for Employment Research.
- Bates, Thomas W, Kathleen M Kahle, and René M Stulz.** 2009. “Why do US firms Hold so Much More Cash than They Used to?” *The Journal of Finance*, 64(5): 1985–2021.
- Bau, Natalie, and Adrien Matray.** 2019. “Misallocation and Capital Market Integration: Evidence from India.” Working Paper.
- Bergounhon, Flora, Clemence Lenoir, and Isabelle Mejean.** 2018. “A Guideline to French Firm-level Trade Data.” CREST Working Paper.
- Bernard, Andrew B, Andreas Moxnes, and Yukiko U Saito.** 2019. “Production Networks, Geography, and Firm Performance.” *Journal of Political Economy*, 127(2).
- Bernard, Andrew B, Emmanuel Dhyne, Glenn Magerman, Kalina Manova, and Andreas Moxnes.** 2019. “The Origins of Firm Heterogeneity: a Production Network Approach.” NBER Working Paper.
- Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan.** 2004. “How Much Should We Trust Differences-In-Differences Estimates?” *The Quarterly Journal of Economics*, 119(1): 249–275.
- Biais, Bruno, and Christian Gollier.** 1997. “Trade Credit and Credit Rationing.” *The Review of Financial Studies*, 10(4): 903–937.
- Bigio, Saki, and Jennifer La’o.** 2016. “Financial Frictions in Production Networks.” NBER Working Paper.

- Boissay, Frederic, and Reint Gropp.** 2013. “Payment Defaults and Interfirm Liquidity Provision.” *Review of Finance*, 17(6): 1853–1894.
- Bolton, Patrick, and David S Scharfstein.** 1990. “A Theory of Predation Based on Agency Problems in Financial Contracting.” *American Economic Review*, 93–106.
- Borusyak, Kirill, Peter Hull, and Xavier Jaravel.** 2018. “Quasi-Experimental Shift-Share Research Designs.” NBER Working Paper.
- Boutin, Xavier, Giacinta Cestone, Chiara Fumagalli, Giovanni Pica, and Nicolas Serrano-Velarde.** 2013. “The Deep-Pocket Effect of Internal Capital Markets.” *Journal of Financial Economics*, 109: 122–145.
- Brander, James A, and Tracy R Lewis.** 1986. “Oligopoly and Financial Structure: The Limited Liability Effect.” *American Economic Review*, 956–970.
- Brennan, Michael J, Vojislav Maksimovic, and Josef Zechner.** 1988. “Vendor Financing.” *The Journal of Finance*, 43(5): 1127–1141.
- Breza, Emily, and Andres Liberman.** 2017. “Financial Contracting and Organizational Form: Evidence from the Regulation of Trade Credit.” *The Journal of Finance*.
- Bronnenberg, Bart J, Jean-Pierre H Dubé, and Matthew Gentzkow.** 2012. “The Evolution Of Brand Preferences: Evidence From Consumer Migration.” *American Economic Review*, 102(6): 2472–2508.
- Burkart, Mike, and Tore Ellingsen.** 2004. “In-Kind Finance: A Theory Of Trade Credit.” *American Economic Review*, 569–590.
- Caggese, Andrea, and Vicente Cuñat.** 2013. “Financing constraints, firm dynamics, export decisions, and aggregate productivity.” *Review of Economic Dynamics*, 16(1): 177–193.
- Cai, Jing, and Adam Szeidl.** 2017. “Interfirm Relationships And Business Performance.” *The Quarterly Journal of Economics*, 133(3): 1229–1282.
- Campello, Murillo.** 2003. “Capital Structure And Product Markets Interactions: Evidence From Business Cycles.” *Journal of Financial Economics*, 68(3): 353–378.
- Cetorelli, Nicola, and Philip E Strahan.** 2006. “Finance As A Barrier To Entry: Bank Competition And Industry Structure In Local Us Markets.” *The Journal of Finance*, 61(1): 437–461.
- Chaney, Thomas.** 2014. “The Network Structure Of International Trade.” *American Economic Review*, 104(11): 3600–3634.
- Chaney, Thomas.** 2016. “Liquidity Constrained Exporters.” *Journal of Economic Dynamics and Control*, 72: 141 – 154.
- Chemla, Gilles, and Antoine Faure-Grimaud.** 2001. “Dynamic Adverse Selection And Debt.” *European Economic Review*, 45(9): 1773–1792.
- Chevalier, Judith A.** 1995a. “Capital Structure And Product-Market Competition: Empirical Evidence From The Supermarket Industry.” *American Economic Review*, 415–435.
- Chevalier, Judith A.** 1995b. “Do LBO Supermarkets Charge More? An Empirical Analysis Of The Effects Of Lbos On Supermarket Pricing.” *The Journal of Finance*, 50(4): 1095–1112.
- Chevalier, Judith A, and David S Scharfstein.** 1996. “Capital-Market Imperfections And Countercyclical Markups: Theory And Evidence.” *American Economic Review*, 86(4): 703.

- Clark, C Robert, Ulrich Doraszelski, and Michaela Draganska.** 2009. “The Effect Of Advertising On Brand Awareness And Perceived Quality: An Empirical Investigation Using Panel Data.” *QME*, 7(2): 207–236.
- Corrado, Carol, Charles Hulten, and Daniel Sichel.** 2009. “Intangible Capital And Us Economic Growth.” *Review of Income and Wealth*, 55(3): 661–685.
- Cunat, Vicente.** 2007. “Trade Credit: Suppliers As Debt Collectors And Insurance Providers.” *The Review of Financial Studies*, 20(2): 491–527.
- Davis, Steven J, John Haltiwanger, and Scott Schuh.** 1996. “Small Business And Job Creation: Dissecting The Myth And Reassessing The Facts.” *Small Business Economics*, 8(4): 297–315.
- Demir, Banu, and Beata Javorcik.** 2018. “Don’t Throw In The Towel, Throw In Trade Credit!” *Journal of International Economics*, 111: 177 – 189.
- Demir, Banu, Tomasz K Michalski, and Evren Ors.** 2017. “Risk-Based Capital Requirements For Banks And International Trade.” *The Review of Financial Studies*, 30(11): 3970–4002.
- Donaldson, Dave.** 2018. “Railroads Of The Raj: Estimating The Impact Of Transportation Infrastructure.” *American Economic Review*, 108(4-5): 899–934.
- Dou, Winston Wei, and Yan Ji.** 2018. “External Financing and Customer Capital: A Financial Theory of Markups.” Working Paper.
- Dou, Winston Wei, Yan Ji, David Reibstein, and Wei Wu.** forthcoming. “Customer Capital, Financial Constraints, and Stock Returns.” *The Journal of Finance*.
- Drozd, Lukasz A., and Jaromir B. Nosal.** 2012. “Understanding International Prices: Customers as Capital.” *American Economic Review*, 102(1): 364–395.
- Duranton, Gilles, Peter M Morrow, and Matthew A Turner.** 2014. “Roads and Trade: Evidence from the US.” *Review of Economic Studies*, 81(2): 681–724.
- Eaton, Jonathan, Samuel Kortum, Brent Neiman, and John Romalis.** 2016. “Trade And The Global Recession.” *American Economic Review*, 106(11): 3401–38.
- Eslava, Marcela, and John Haltiwanger.** 2019. “The Life-Cycle Growth of Plants: The Role of Productivity, Demand and Wedges.” NBER Working Paper.
- Esty, Benjamin, Scott E Mayfield, and David Lane.** 2016. “Supply Chain Finance at Procter & Gamble.” *HBS Case Study*.
- Fabbri, Daniela, and Leora F Klapper.** 2016. “Bargaining Power And Trade Credit.” *Journal of Corporate Finance*, 41: 66–80.
- Fafchamps, Marcel, and Simon Quinn.** 2016. “Networks And Manufacturing Firms In Africa: Results From A Randomized Field Experiment.” *The World Bank Economic Review*, 32(3): 656–675.
- Fazzari, Steven M, R Glenn Hubbard, Bruce C Petersen, Alan S Blinder, and James M Poterba.** 1988. “Financing Constraints and Corporate Investment; Comments and Discussion.” *Brookings Papers on Economic Activity*, , (1): 141.
- Feenstra, Robert C., Zhiyuan Li, and Miaojie Yu.** 2014. “Exports and Credit Constraints under Incomplete Information: Theory and Evidence from China.” *The Review of Economics and Statistics*, 96(4): 729–744.
- Fitzgerald, Doireann, Stefanie Haller, and Yaniv Yedid-Levi.** 2016. “How Exporters Grow.” NBER Working Paper.



- Foster, Lucia, John Haltiwanger, and Chad Syverson.** 2016. “The Slow Growth Of New Plants: Learning About Demand?” *Economica*, 83(329): 91–129.
- Fraumeni, Barbara.** 1997. “The Measurement Of Depreciation In The Us National Income And Product Accounts.” *Survey of Current Business*, 77: 7–23.
- Frésard, Laurent.** 2010. “Financial Strength and Product Market Behavior: The Real Effects of Corporate Cash Holdings.” *The Journal of Finance*, 65: 1097–1122.
- Gadene, Lucie, Tushar K Nandi, and Roland Rathelot.** 2019. “Taxation and Supplier Networks: Evidence from India.” Oxford University Centre for Business Taxation Working Paper.
- Garcia-Appendini, Emilia, and Judit Montoriol-Garriga.** 2013. “Firms As Liquidity Providers: Evidence From The 2007–2008 Financial Crisis.” *Journal of Financial Economics*, 109(1): 272–291.
- Garcin, Cedric, and Jean-Michel Charpin.** 2013. “Analyse du marché de l’affacturage.” *Rapport de l’IGF*.
- Giannetti, Mariassunta, Nicolas Serrano-Velarde, and Emanuele Tarantino.** 2017. “Cheap Trade Credit and Competition in Downstream Markets.”
- Gilchrist, Simon, Raphael Schoenle, Jae Sim, and Egon Zakrajsek.** 2017. “Inflation Dynamics during the Financial Crisis.” *American Economic Review*, 107(3): 785–823.
- Goldsmith-Pinkham, Paul, Isaac Sorkin, and Henry Swift.** 2018. “Bartik Instruments: What, When, Why, And How.” NBER Working Paper.
- Gourio, François, and Leena Rudanko.** 2014. “Customer Capital.” *Review of Economic Studies*, 81: 1102–1136.
- Hadlock, Charles J, and Joshua R Pierce.** 2010. “New Evidence On Measuring Financial Constraints: Moving Beyond The Kz Index.” *The Review of Financial Studies*, 23(5): 1909–1940.
- Hellmann, Thomas, and Manju Puri.** 2000. “The Interaction Between Product Market And Financing Strategy: The Role Of Venture Capital.” *The Review of Financial Studies*, 13(4): 959–984.
- Hoberg, Gerard, and Vojislav Maksimovic.** 2019. “Product Life Cycles in Corporate Finance.” Working Paper.
- Hombert, Johan, and Adrien Matray.** 2018. “Can Innovation Help Us Manufacturing Firms Escape Import Competition From China?” *The Journal of Finance*, 73(5): 2003–2039.
- Hortaçsu, Ali, and Chad Syverson.** 2004. “Product Differentiation, Search Costs, And Competition In The Mutual Fund Industry: A Case Study Of S&P 500 Index Funds.” *The Quarterly Journal of Economics*, 119(2): 403–456.
- Hottman, Colin J, Stephen J Redding, and David E Weinstein.** 2016. “Quantifying The Sources Of Firm Heterogeneity.” *The Quarterly Journal of Economics*, 131(3): 1291–1364.
- Insee.** 2007. “Insee Références - L’industrie en France.” Insee.
- Khandelwal, Amit.** 2010. “The Long And Short (Of) Quality Ladders.” *The Review of Economic Studies*, 77(4): 1450–1476.
- Khanna, Naveen, and Sheri Tice.** 2005. “Pricing, Exit, And Location Decisions Of Firms: Evidence On The Role Of Debt And Operating Efficiency.” *Journal of Financial Economics*, 75(2): 397–427.

- Kim, Se-Jik, and Hyun Song Shin.** 2012. “Sustaining Production Chains Through Financial Linkages.” *American Economic Review*, 102(3): 402–06.
- Klapper, Leora, Luc Laeven, and Raghuram Rajan.** 2012. “Trade Credit Contracts.” *The Review of Financial Studies*, 25(3): 838–867.
- Kovenock, Dan, and Gordon M Phillips.** 1997. “Capital Structure And Product Market Behavior: An Examination Of Plant Exit And Investment Decisions.” *The Review of Financial Studies*, 10(3): 767–803.
- Lee, Yul W, and John D Stowe.** 1993. “Product Risk, Asymmetric Information, And Trade Credit.” *Journal of Financial and Quantitative Analysis*, 28(02): 285–300.
- Le Roch, Jean-Pierre, and Nicole Bricq.** 2013. “Question number 25523.” Minutes of the French National Assembly.
- Long, Michael S, Ileen B Malitz, and S Abraham Ravid.** 1993. “Trade Credit, Quality Guarantees, And Product Marketability.” *Financial Management*, 117–127.
- Maksimovic, Vojislav, and Sheridan Titman.** 1991. “Financial Policy And Reputation For Product Quality.” *The Review of Financial Studies*, 4(1): 175–200.
- Maksimovic, Vojislav, Gordon M Phillips, and Liu Yang.** 2019. “Do Public Firms Respond to Industry Opportunities More Than Private Firms? The Impact of Initial Firm Quality.” NBER Working Paper.
- Manova, Kalina.** 2013. “Credit Constraints, Heterogeneous Firms and International Trade.” *The Review of Economic Studies*, 80: 711–744.
- Martin, Julien, Isabelle Mejean, and Mathieu Parenti.** 2018. “Relationship Stickiness: Measurement and Applications to International Economics.” Working Paper.
- Matsa, David A.** 2011. “Running On Empty? Financial Leverage And Product Quality In The Supermarket Industry.” *American Economic Journal: Microeconomics*, 3(1): 137–73.
- Minetti, Raoul, and Susan Chun Zhu.** 2011. “Credit Constraints And Firm Export: Microeconomic Evidence From Italy.” *Journal of International Economics*, 83: 109–125.
- Min, Sungwook, Xubing Zhang, Namwoon Kim, and Rajendra K Srivastava.** 2016. “Customer Acquisition And Retention Spending: An Analytical Model And Empirical Investigation In Wireless Telecommunications Markets.” *Journal of Marketing Research*, 53(5): 728–744.
- Morales, Eduardo, Gloria Sheu, and Andrés Zahler.** 2019. “Extended Gravity.” *The Review of Economic Studies*, 86(6): 2668–2712.
- Moreira, Sara.** 2016. “Firm Dynamics, Persistent Effects Of Entry Conditions, And Business Cycles.” Kellogg School of Management Working Paper.
- Murfin, Justin, and Ken Njoroge.** 2015. “The Implicit Costs Of Trade Credit Borrowing By Large Firms.” *The Review of Financial Studies*, 28(1): 112–145.
- Ng, Chee, Janet Smith, and Richard Smith.** 1999. “Evidence on the Determinants of Credit Terms Used in Interfirm Trade.” *The Journal of Finance*, 54(3): 1109–1129.
- ODDP.** 2009. “Rapport de l’observatoire des délais de paiement.” Observatoire des délais de paiement.
- Ovchinnikov, Anton, Béatrice Boulu-Reshef, and Phillip E Pfeifer.** 2014. “Balancing acquisition and retention spending for firms with limited capacity.” *Management Science*, 60(8): 2002–2019.

- Paravisini, Daniel, Veronica Rappoport, Philipp Schnabl, and Daniel Wolfenzon.** 2014. “Dissecting the Effect of Credit Supply on Trade: Evidence from Matched Credit-Export Data.” *Review of Economic Studies*, 1–26.
- Phillips, Gordon, and Giorgio Sertsios.** 2013. “How Do Firm Financial Conditions Affect Product Quality And Pricing?” *Management Science*, 59(8): 1764–1782.
- Phillips, Gordon M.** 1995. “Increased Debt And Industry Product Markets: An Empirical Analysis.” *Journal of Financial Economics*, 37(2): 189–238.
- Phillips, Gordon M, and Giorgio Sertsios.** 2016. “Financing And New Product Decisions Of Private And Publicly Traded Firms.” *The Review of Financial Studies*, 30(5): 1744–1789.
- Pierce, Justin R., and Peter K. Schott.** 2012. “Concording U.S. Harmonized System Categories Over Time.” *Journal of Official Statistics*, 28(1): 53–68.
- Rauch, James E.** 1999. “Networks Versus Markets In International Trade.” *Journal of International Economics*, 48(1): 7–35.
- Reinartz, Werner, Jacquelyn S Thomas, and Viswanathan Kumar.** 2005. “Balancing Acquisition And Retention Resources To Maximize Customer Profitability.” *Journal of Marketing*, 69(1): 63–79.
- Restrepo, Felipe, Lina Cardona Sosa, and Philip E Strahan.** forthcoming. “Funding Liquidity Without Banks: Evidence From A Shock To The Cost Of Very Short-Term Debt.” *The Journal of Finance*.
- Schmidt-Eisenlohr, Tim.** 2013. “Towards a Theory of Trade Finance.” *Journal of International Economics*, 91(1): 96–112.
- Sedláček, Petr, and Vincent Sterk.** 2017. “The Growth Potential Of Startups Over The Business Cycle.” *American Economic Review*, 107(10): 3182–3210.
- Singh, Manpreet.** 2017. “Financial Constraints and Trade Credit as a Strategic Tool: Evidence from Small-Scale Reservation Reforms in India.” Working paper.
- Smith, Janet Kiholm.** 1987. “Trade Credit And Informational Asymmetry.” *The Journal of Finance*, 42(4): 863–872.
- Steinwender, Claudia.** 2018. “Real Effects Of Information Frictions: When The States And The Kingdom Became United.” *American Economic Review*, 108(3): 657–96.
- Stock, James, and Motohiro Yogo.** 2005. “Testing for Weak Instruments in Linear IV Regression.” *Identification and Inference for Econometric Models*, , ed. Donald W.K. Andrews, 80–108. New York:Cambridge University Press.
- Syverson, Chad.** 2004a. “Market Structure And Productivity: A Concrete Example.” *Journal of Political Economy*, 112(6): 1181–1222.
- Syverson, Chad.** 2004b. “dispersion.” *Review of Economics and Statistics*, 86(2): 534–550.
- TelecomPaper.com. 2015. *Link to the article*.
- Xu, Chenzi.** 2019. “Reshaping Global Trade: The Immediate and Long-Run Effects of Bank Failures.”
- Zingales, Luigi.** 1998. “Survival of the Fittest or the Fattest? Exit and Financing in the Trucking Industry.” *The Journal of Finance*, 53(3): 905–938.



# Chapter 3

## Granular Borrowers

with **Christophe Hurlin (Laboratoire d'Économie d'Orléans)** and **Thibault Libert (Paris School of Economics)**

### Abstract

This paper uses a credit registry covering the quasi universe of firm-bank relationships in France for the period 1999-2016 to provide a detailed account of the role of very large borrowers ("granular borrowers") in shaping bank-level and aggregate credit variations. We document that the distribution of borrowers is fat-tailed, the top 100 borrowers making up on average for 18% of the aggregate amount of long-term credit and 64% of total undrawn credit lines. We adapt the methodology of Amiti and Weinstein (2018) to identify the contributions of firm, bank, and aggregate shocks to credit variations at any level of aggregation. At the macroeconomic level, we show that the aggregate properties of credit largely reflect the idiosyncratic shocks of granular borrowers. This finding highlights the limitations of using time series of aggregate credit to assess the magnitude of financial frictions in the economy. At the bank-level, we find that the concentration of the portfolio of credit lines exposes lenders to considerable borrower idiosyncratic risk and leads liquidity flows to be more synchronized across banks. This suggests that shocks on granular borrowers may represent a source of systemic risk.

# 1 Introduction

The "granular view" conceptualized by Gabaix (2011) has put the size distribution of firms (and in particular the recurrent presence of fat tails) at the forefront of empirical research in macroeconomics. As the law of large numbers does not apply in the presence of very large actors, idiosyncratic shocks do not average out and, instead, can be important drivers of aggregate fluctuations. According to this approach, the analysis of the microeconomic behavior of such actors can yield new answers to long-standing macroeconomic questions.<sup>1</sup> In finance, the prevalence of big banks throughout the world has therefore prompted researchers to explore the role of the distribution of bank size for the propagation of credit shocks to the real economy.<sup>2</sup>

By contrast, however, the presence of heavy tails in the distribution of borrowers has been so far largely overlooked. Using a data set covering the quasi universe of firm-bank relationships in France including both private and public companies between 1999-Q1 and 2016-Q4, we provide novel evidence of an extreme degree of concentration of credit on the borrower side. Our analysis reveals that the top 100 borrowing firms make up for 18% of the aggregate amount of long-term credit and 64% of total undrawn credit lines.

The presence in the economy of firms borrowing non-trivial fractions of aggregate credit ("granular borrowers") has two broad sets of implications. First, aggregate properties of credit are likely to be driven to a large extent by the characteristics and behaviour of granular borrowers. A "representative" agent model calibrated using moments of the aggregate credit time series, it follows, would effectively reproduce the economic behavior of a restricted sample of firms with extensive access to credit. Second, the ability of banks to diversify risk is limited as the set of borrowers is itself very concentrated. This statement challenges in particular the idea that

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<sup>1</sup>These include the origins of business cycles (Di Giovanni, Levchenko and Mejean, 2014; Carvalho and Grassi, 2019), of country comparative advantage (Gaubert and Itkhoki, 2018), or the presence of international business cycles comovements (Di Giovanni, Levchenko and Mejean, 2017, 2018).

<sup>2</sup>See Buch and Neugebauer (2011); Bremus and Buch (2017); Bremus et al. (2018) for cross-country analysis of granular banks and Amiti and Weinstein (2018); Alfaro, García-Santana and Moral-Benito (2019) for studies of the transmission of bank shocks through lending and input-output relationships.

banks are able to provide liquidity under the form of credit lines by smoothing fund withdrawals on a diversified portfolio of borrowers (Holmström and Tirole, 1998; Kashyap, Rajan and Stein, 2002). In a granular economy, granting credit lines could expose banks to a non-diversifiable and potentially non-negligible amount of liquidity risk. This paper provides a careful assessment of the empirical validity of these two assertions.

The main empirical challenge that we face is to separately identify idiosyncratic credit variations originating from individual borrowers ("firm components") from bank-level shocks affecting the different pools of borrowers ("bank components"). Building on Amiti and Weinstein (2018), we perform to that end a weighted linear regression of the credit growth rate at the firm-bank level on a full set of bank-time and firm-time fixed effects. The two sets of fixed effects respectively identify (up to a constant term) factors that simultaneously shift the evolution of credit in all the firm relationships of a bank and in all the bank relationships of a firm. We define idiosyncratic components as the deviation of the estimated fixed effects from a common trend. In the end, credit variations can be expressed as the sum of two terms, respectively reflecting the aggregation of firm and bank idiosyncratic shocks, and of a third term common to all lending relationships ("macro component").

We propose a simple modification of the procedure proposed by Amiti and Weinstein (2018). We show that using the mid-point growth rate defined by Davis, Haltiwanger and Schuh (1996) not only considerably simplifies the estimation but also allows to account for the entry and exit of firms and banks, a necessary feature when dealing with the universe of borrower-lender relationships. With this procedure, the loan-weighted averages of the estimated firm and bank components at time  $t$  exactly match the bank, firm, and aggregate credit growth for all the lending relationships active either at  $t - 1$  or  $t$ .

Armed with this decomposition, we first inspect the implications of the presence of granular borrowers for the properties of aggregate credit. We devote our attention to a moment of key

interest in the macro-finance literature, namely the comovement of credit borrowed by non-financial corporations with the business cycle. The presence of a robust, positive relationship between the two is largely considered as reflecting to some extent the manifestation of financial frictions affecting firms.<sup>3</sup> Based on this insight, numerous studies have relied on the analysis of the evolution of aggregate credit over the business cycle to infer the importance of financial frictions in determining macroeconomic outcomes.<sup>4</sup>

Our methodology allows to assess the respective contribution to the cyclicity of aggregate credit of idiosyncratic variations originating from the borrower and the lender side. Should the loan size distribution of firms and banks not be fat-tailed, these contributions would be negligible and the large majority of the correlation between credit and GDP would be explained by the macro component.

On the contrary, we find that firm idiosyncratic shocks explain between 60% and 80% of the comovement of aggregate credit with the business cycle. Bank idiosyncratic variations, by contrast, do not seem to significantly contribute to the correlation with GDP fluctuations. The skewness of the credit distribution confers moreover a disproportionate importance to large borrowers compared to the loan volume they represent, with more than two thirds of the contribution of firm idiosyncratic shocks originating from the top 100 borrowers. It follows that the properties of aggregate credit are to a large extent determined by the behavior of granular borrowers. All in all, we contribute to the granularity literature by quantitatively showing that idiosyncratic shocks shape not only real macro variables, but also aggregate financial flows; and by showing that granularity on the borrower side is the essential driver of aggregate credit fluctuations, in sharp contrast with common wisdom.

Our findings imply that the analysis of the cyclicity of aggregate credit is unlikely to give useful

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<sup>3</sup>The interpretation is that the ability of firms to borrow is linked to their net worth because of the presence of financial constraints, and net worth mechanically fluctuates with the business cycle. The cyclicity of aggregate credit is therefore largely considered as a manifestation of the "financial accelerator" (Bernanke, Gertler and Gilchrist, 1996; Kiyotaki and Moore, 1997), *i.e.* the magnifying role of the financial sector in the propagation of negative shocks.

<sup>4</sup>For instance, see Chari, Kehoe and McGrattan (2007), Smets and Wouters (2007), Justiniano, Primiceri and Tambalotti (2010) or Jermann and Quadrini (2012).



insights on the intensity or the nature of financing frictions applying to the bulk of non-financial firms. Instead of tightening credit constraints, the decrease in aggregate bank lending during downturns could actually reflect the differential cyclicalities of investment opportunities of granular borrowers or the presence of substitution patterns between credit and other types of financing.<sup>5</sup> In that respect, our paper strongly advocates for removing the largest borrowers when studying the determinants of firm financing over the business cycle.<sup>6</sup>

We then turn to the bank-level implications of the presence of granular borrowers. When borrowers face idiosyncratic and diversifiable funding shocks, Holmström and Tirole (1998) shows that granting credit lines allows banks to optimally reallocate liquidity between liquidity-poor firms and firms with excess liquidity. In the presence of aggregate shocks, however, the reallocation process breaks down and there is a need for an external supply of liquidity.<sup>7</sup> Our paper documents a different yet complementary limit to the capacity of banks to act as "liquidity pools". When the distribution of borrowers is fat-tailed, banks can not diversify idiosyncratic liquidity risk even when the number of borrowers gets infinitely large. Holding liquid assets becomes therefore necessary not only to hedge against the possibility of runs on credit lines but also against negative idiosyncratic shocks affecting granular borrowers.

In line with the presence of under-diversification, we document a positive, strong relationship between the bank-level concentration of the portfolio of borrowers and the variance of total undrawn credit lines. Relying on our decomposition of credit variations, we estimate further that in the absence of borrower idiosyncratic shocks, the variance of credit lines would fall on average by 18% to 31%. The role of borrower shocks on bank-level credit line variations is therefore sizeable and

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<sup>5</sup>See Covas and Den Haan (2011) and Begenau and Salomao (2018) for evidence for large firms of substitution patterns between debt and equity over the business cycle.

<sup>6</sup>The fact that the disproportionate influence of large borrowers on aggregate financing flows occult the behaviour of smaller firms has been recognized by Covas and Den Haan (2011) and acknowledged in particular by Eisfeldt and Muir (2016) or Begenau and Salomao (2018). This paper, however, is the first to provide a quantitative assessment of the influence of large borrowers in shaping aggregate credit fluctuations.

<sup>7</sup>See Ivashina and Scharfstein (2010); Cornett et al. (2011); Bord and Santos (2014); Ippolito et al. (2016) for evidence of bank runs on credit lines during the 2008 financial crisis.

comparable in magnitude to the effect of macro shocks, for instance.

In the aggregate, firm-specific shocks contribute substantially to credit lines fluctuations. The variance of the aggregate firm component amounts to 84% of the variance of aggregate credit line variations. There are two main channels that explain the importance of borrower shocks in aggregate fluctuation. As explained above, high borrower portfolio concentration first leads to high bank-level variance of credit lines. Since large borrowers have credit commitments in multiple banks, however, borrower idiosyncratic shocks may also increase aggregate variance by making banks more correlated with each other. We find that most of the variance of the aggregate firm component comes from the linkages between banks. This result suggests that granular borrowers may represent a source of systemic risk for the banking system as they lead commitment takedowns to be less diversifiable and more coordinated between banks.

The remainder of the paper is organized as follows. We present our data set and provide descriptive statistics on the credit distribution in section 2. Section 3 describes our estimation methodology. The results on the cyclicity of aggregate credit are presented and discussed in section 4. We analyze the role of granular borrowers for bank-level liquidity risk in section 5. Section 6 concludes.

## 1.1 Related literature

This paper draws on and contributes to three separate strands of research. The first body of research has been initiated by Covas and Den Haan (2011) and explores the cross-sectional heterogeneity of firms' financing over the business cycle to infer the distribution of financial frictions in the economy (Begenau and Salomao, 2018; Crouzet and Mehrotra, 2019).<sup>8</sup> While this literature zooms in on the differences in cyclicity of debt between firms, our focus is on assessing

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<sup>8</sup>The use of firm size as a proxy for financial constraints to analyse the differential sensitivity of firms to macroeconomic shocks dates back at least to Gertler and Gilchrist (1994). Recently, Chodorow-Reich (2014) and Mian and Sufi (2014) relied on the size of firms to analyze the real effects of financial constraints during the Great Recession.

the contributions of large borrowers to the fluctuations of aggregate credit over the cycle. Overall, the heterogeneity in firm financing policies combined with the large influence of granular borrowers highlights the limitations of using aggregate credit data to assess the magnitude of financial frictions in the economy.

Our paper then adds to the literature on the role of banks as "liquidity providers" (Kashyap, Rajan and Stein, 2002). Acharya, Almeida and Campello (2013) show in particular that bank lines of credit to firms with greater aggregate risk (high beta) are more expensive as the liquidity risk they pose cannot be diversified away. We document another limit to diversification, namely the high degree of concentration of the credit lines portfolios. More broadly, this paper indicates that the composition of the portfolio of loan commitments is in itself a useful object of study to assess the liquidity risk faced by banks.<sup>9</sup>

The last stream of research aims at exploring the implications in macroeconomics and in finance of the existence of granular economic agents. Previous work has focused on the role of banks in the transmission of financial shocks to the real economy (Buch and Neugebauer, 2011; Amiti and Weinstein, 2018; Alfaro, García-Santana and Moral-Benito, 2019) and in the formation of sovereign bond yields (Gabaix and Koijen, 2019), on the effects of the presence of large institutional investors on stock and CDS prices (Greenwood and Thesmar, 2011; Ben-David et al., 2019; Siriwardane, forthcoming), and on the asset pricing consequences of a granular production network (Herskovic, 2018). This paper is to our knowledge the first to provide a detailed account of the importance of granular borrowers in shaping bank-level and aggregate credit variations.

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<sup>9</sup>Following Kashyap, Rajan and Stein (2002), the literature has mostly focused on the correlation between deposit outflows and credit line takedowns to assess banks' ability to provide liquidity on demand. See Gatev and Strahan (2006); Ivashina and Scharfstein (2010); Acharya and Mora (2015); Ippolito et al. (2016).

## 2 Granular borrowers

### 2.1 Presentation of the data set

We use a comprehensive dataset on quarterly bank-firm level credit issued from the French credit registry covering the period 1999-Q1 to 2016-Q4. The credit registry contains information on loans granted by every national or foreign bank (credit institution or investment company) to every firm located in France. At the end of each month, all financial institutions which are subject to the 1984 Banking Act have to report the total loan amount extended to any borrowing firm located in France as soon as this amount exceeds a given reporting threshold.<sup>10</sup> The data set records for each bank-firm relationship the breakdown of credit by type of exposure.<sup>11</sup> We focus in the analysis on two main types of exposure. Long-term credit is defined as credit with a maturity of more than year at issuance. Credit lines are computed as the sum of all undrawn commitments (including documentary credits). The exposure of a bank to a firm is the sum of its individual loans as well as of the bank's share in syndicated loans.

[Insert figure 3.1 here]

On top of credit exposures, the data set gives basic information on the firm (location, size indicator, 5-digits sector). The registry also includes the credit score attributed by the Bank of France, which assesses the medium-term probability of default of the firm.<sup>12</sup> It is assigned by

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<sup>10</sup>The threshold was set to €75,000 at the firm-bank level until January 2006. It has then been lowered to €25,000 at the firm-agency level and has stayed that way ever since. In order to ensure a constant coverage over the full period, we only consider loan-level data associated to borrowers for which banks have an aggregate exposure exceeding the pre-2006 reporting threshold.

<sup>11</sup>The different types of exposure are: current accounts, commercial debts, factoring, other short-term debt, property leasing, equipment leasing, credit with maturity of more than one year at issuance, export credit and securitized loans, undrawn commitments and available documentary credits. Undrawn commitments can have various maturities, ranging from less than a year (operating credit lines) to several years (investment credit lines). We do not include in the analysis the different types of short-term loans as their definitions in the data set have significantly evolved over time.

<sup>12</sup>The categories of the credit score are (in descending order): 3++, 3+, 3, 4+, 4, 5+, 5, 6, 7, 8, 9, P. Credit ratings below 7 indicate that at least one payment incident has been recently recorded for the firm. See Cahn, Girotti and Salvade (2018) for more information on the credit score.

analysts based on hard information (tax returns, trade bills) as well as interviews conducted with managers. While all firms could in principle receive a credit score, only firms with sales exceeding €750,000 are in fact assessed by the Bank of France<sup>13</sup>. The credit score is communicated on demand to credit institutions.

To construct our sample, we consider only French non-financial firms and we exclude self-employed entrepreneurs. We also choose to remove public credit institutions from the analysis. Public supply of credit is large in France (about 30% of total long-term credit), but primarily directed towards specific entities and sectors (motorway companies, public housing sector, ...). It is therefore likely to be determined by different objectives from the private supply of credit which constitutes our main object of focus.

Whenever a bank disappears because of an absorption, all credit exposures are reallocated to the absorbing bank, leading to unwanted interruptions of banking relationships. The French Supervision and Prudential Authority (ACPR) keeps track of all the M&A operations involving banks located on the French territory. The date of the transaction as well as the identity of the acquiring and acquired bank are provided.<sup>14</sup> We checked the date of transaction by looking at when the acquired bank exits our data set and modified it where appropriate. We then neutralized the effects of M&As as following. Assume that bank B acquires bank A between quarters  $q$  and  $q+4$ . When comparing the evolution of credit over these two quarters we reprocess the data so that at quarter  $q$  and for each firm the amount of loan granted by B includes loans that were granted by A ( $Credit_{f,B,q-4}^* = Credit_{f,A,q-4} + Credit_{f,B,q-4}$ ).<sup>15</sup>

[Insert tables 3.1, 3.2 and 3.3 here]

The coverage of our data set is assessed in figure 3.1. Figure 3.1 compares the time series of

<sup>13</sup>Only 23.5% of firms on average do have a credit score each quarter in our data set.

<sup>14</sup>We moreover looked for every exiting bank whether there were any mention in the media of a M&A at that time. In some rare cases, the transaction was missing from the ACPR list. We added those cases to the list of transactions.

<sup>15</sup>We treat the cases where banks  $A$  and  $B$  merge to form a new bank  $C$  as the simultaneous acquisition of bank  $A$  and  $B$  by bank  $C$ . In some occurrences, a given bank is acquired several times in a short period of time (less than two years). We deal with this issue by assuming that the bank is acquired only once by the last acquiror.

aggregate long-term credit to the non-financial sector obtained from the initial data set (blue curve), after imposing a constant reporting threshold (red curve) and after excluding public banks (green curve), with the time series recorded in the balance of payments ("Flow-of-funds" black line). Firm-bank loans higher than the 75k euros threshold account for 86.5% of total credit. Overall, aggregate long-term credit as reported in our final data set represents on average 65% of the value reported in the balance of payments. The two time series moreover exhibit very similar dynamics (correlation of 94%).

[Insert figures 3.2a and 3.2b here]

Tables 3.1, 3.2 and 3.3 present descriptive statistics at the firm-bank, bank, and aggregate level. There are 502 banks per quarter on average and 682 (211) thousands firms with positive long-term credit (credit lines) exposure. Aggregate long-term credit amounts to €307 billions and credit lines represents €146 billions. While most banks (79%) have positive long-term credit exposures, about one third of banks (38%) do not have any undrawn commitments to their creditors. Overall, the average bank lends long-term to 1573 firms and has opened 476 credit lines. The sectoral decomposition of total credit for 2007 Q1 is reported in Figure 2. Firms operating in the housing sector represent nearly 45% of aggregate long-term credit. By contrast, head offices and firms in other service activities concentrate most of the credit lines (respectively 32% and 23%). At a later stage our analysis will focus on multiple-bank firms. We find 77 thousands firms with positive long-term credit in at least two banks and 19 thousands with several opened credit lines.

## **2.2 Credit concentration: evidence at the bank and aggregate level**

We use our data set to explore the empirical distribution of credit. Figure 3.3 shows that the distribution of banks is heavy-tailed as well: the top 10% of banks account in our sample for 63% of long-term credit in 2007Q1. Concentration appears again to be higher for credit lines, with 78%

of total undrawn commitments issued by the top decile of banks. These figures are line with the high degree of concentration observed in most large banking systems.

[Insert figure 3.3 here]

We then turn to the properties of the empirical distribution of borrowers which, by comparison, have not been subject to the same intense scrutiny. Figure 3.4a and 3.4b give a graphical representation of the distribution of long-term credit and credit lines. Firms are ordered by percentile according to the size of their credit exposure: a firm in the top 1% of borrowers will therefore belong to the [99,100] interval. Long-term credit exhibits a high degree of concentration: while firms in the bottom half of the distribution represent on average less than 10% of total credit, 47% of credit is attributed to firms in the top 1% of borrowers. This pattern is very stable over time though slightly more pronounced at the height of the financial crisis (2009-Q1). Strikingly, credit lines appear to be even more concentrated: firms in the bottom 99% represent a mere 17% of total exposure. By contrast, almost two thirds (64%) of the aggregate amount of credit lines can be traced down to a group of 100 top borrowers.

[Insert figures 3.4a and 3.4b here]

What does the presence of very large borrowers imply for banks? Faced with a concentrated distribution of borrowers, the ability of banks to diversify borrower risk is mechanically limited. Some banks will necessarily have, to a certain extent, to bear the risk associated with an under-diversification of their credit portfolio.

We formalize this idea by calculating for each bank  $b$  and each quarter  $q$  the Herfindahl-Hirschmann index of the loan portfolio. For each bank present in at least three consecutive years (12 quarters) in the data set, we then compare the average of its HHI index to the standard deviation of its total credit growth rate. Following Di Giovanni, Levchenko and Mejean (2014), we take the standard deviation and the square root of the HHI index in logs.

[Insert figures 3.5a and 3.5b here]

The corresponding scatter plots are displayed in figures 3.5a and 3.5b. There is a strong, positive relationship between the average degree of concentration of the bank and the volatility of its credit growth rate.<sup>16</sup> In the case of long-term credit, it shows that banks which display large lending volatility (and therefore potentially large comovements with the business cycle) are also those that are plausibly affected by borrowers idiosyncratic shocks. Indeed, firms credit shocks are less likely to cancel out when the HHI index of the loan portfolio is high. In the case of credit lines, this pattern suggests that banks with under-diversified borrower portfolios are subject to larger variations of undrawn commitments. This makes banks more vulnerable to off-balance sheet liquidity risk, which when materialized can have adverse consequences on their financial health and their ability to originate new loans (Ivashina and Scharfstein, 2010; Cornett et al., 2011; Acharya and Mora, 2015).

The graphical representation of the link between volatility and concentration is however not sufficient in itself to conclude that the idiosyncratic shocks hitting granular borrowers drive credit fluctuations. Other bank-level variables (such as the business model of the bank or its reliance on certain types of funding) might simultaneously determine the variance of its credit exposure and the degree of diversification of the portfolio of borrowers. In order to explore further the role of granular borrowers, we need to be able to disentangle the contribution of firms and banks in the magnitude of credit fluctuations, a task we now turn to.

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<sup>16</sup>The correlation between both variables is equal to 0.8 for long-term credit and 0.6 for undrawn credit lines.



### 3 Estimating firm and bank shocks

#### 3.1 Presentation of the methodology

Our ultimate goal is to assess the role of granular borrowers on credit fluctuations. We focus in the following on credit at the aggregate level, but the analysis is easily adaptable to other degrees of aggregation. Total credit  $Credit_q$  is by definition given by  $Credit_q = \sum_{f,b \in R_q} Credit_{fbq}$  where  $R_q$  is the set of banking relationships between firms  $f$  and bank  $b$  at time  $q$ . We then compute the evolution of aggregate credit between  $q - 4$  and  $q$  as

$$\Delta Credit_q = 2 * \frac{(Credit_q - Credit_{q-4})}{Credit_q + Credit_{q-4}}$$

This alternative specification of the growth rate has been put forward by Davis, Haltiwanger and Schuh (1996) and is referred to as the "mid-point growth rate" (or MPGR). Defining weights  $w_{fbq}$  as  $w_{fbq} = (Credit_{fbq-4} + Credit_{fbq}) / (Credit_{q-4} + Credit_q)$ , we get that

$$\Delta Credit_q = \sum_{f,b \in R_q \cup R_{q-4}} w_{fbq} \Delta Credit_{fbq} \quad (3.1)$$

where  $\Delta Credit_{fbq}$  is the MPGR of credit at the firm-bank level. This decomposition simply states that aggregate credit fluctuations can be expressed as a weighted sum of individual variations.

Credit variations as such are not informative to assess the role of the loan distribution of borrowers as they reflect the outcome of a joint process between the lender and the borrower. Following Khwaja and Mian (2008), the introduction of firm-time fixed effects (and then bank-time fixed effects) has become a standard tool in the empirical banking literature to separate the role of firms and banks in the evolution of credit.<sup>17</sup> We decompose accordingly the growth rate of credit

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<sup>17</sup>See Paravisini (2008); Chodorow-Reich (2014); Jiménez et al. (2014); Behn, Haselmann and Wachtel (2016); Jiménez et al. (2017); Carletti et al. (2019); Fraise, Lé and Thesmar (forthcoming) for examples of causal analysis relying on firm-time fixed effects. See Paravisini, Rappoport and Schnabl (2017); Amiti and Weinstein (2018); Alfaro,

$\Delta Credit_{fbq}$  in a firm-specific, bank-specific, and match-specific component

$$\Delta Credit_{fbq} = \alpha_{fq} + \beta_{bq} + \epsilon_{fbq} \quad (3.2)$$

The firm-time  $\alpha_{fq}$  and bank-time  $\beta_{bq}$  components capture factors that simultaneously shift the evolution of credit in all the banking relationships of a firm and all the borrower relationships of a bank.<sup>18</sup> It follows that equation 3.2 can only be estimated for firms with multiple banking relationships ("multiple-bank firms").<sup>19</sup> We explore the implications of this restriction in the next subsection.

By construction, the match-specific component measures the deviation of the actual variation of credit at the firm-bank level from the sum of the two trends. Whether most of the cross-sectional variance is captured by the bank and firm components or the match-specific residual will then depend on the degree of heterogeneity in firms' borrowing across banks and banks' lending between firms.<sup>20</sup>

Our methodology aims at identifying firm and bank shocks so as to assess their role in the fluctuations of aggregate credit. Our research question, however, does not require us to take a strong stance on the structural interpretation of the different types of components. We therefore remain largely agnostic throughout the analysis about the economic origins of the shocks. The firm-time component may as well relate to demand (variations in input costs, productivity shocks) as to supply. In the event of a default on a trade bill, for instance, all banks might want to cut lending to the defaulting firm at the same time, leading to a low value of  $\alpha_{fq}$ . Similarly, a low bank-specific

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García-Santana and Moral-Benito (2019) for examples of settings including both bank-time and firm-time fixed effects.

<sup>18</sup>Note that this specification encompasses any empirical model that would regress growth in lending on a set of variables measuring bank-level and firm-level characteristics.

<sup>19</sup>All the banks in our data set have more than two clients.

<sup>20</sup>If in particular banks are specialized in certain sectors of markets (Paravisini, Rappoport and Schnabl, 2017), firms will be unable to substitute between banks and the firm-specific component will explain a small share of the firm's credit variation. For that reason, we perform the analysis in a robustness check at the level of the banking group as groups are less likely to be specialized than bank units. We also try to focus on precisely defined categories of credit so as to maximize the degree of substitutability between bank relationships.

component  $\beta_{bq}$  may either indicate that the bank is cutting back lending due to funding constraints or that borrowers are all reducing their credit exposure to this particular bank. This latter case is particularly relevant in the case of credit lines where the existence of "runs" (simultaneous drawdowns in periods of reduced access to liquidity) is well-known by the finance literature (*e.g.*, Ivashina and Scharfstein (2010); Ippolito et al. (2016)).

We need a method to estimate firm and bank components at the individual level that can be consistently used to decompose the evolution of credit at higher degrees of aggregation. Amiti and Weinstein (2018) recommends to that end to estimate equation 3.2 with weighted least squares (WLS). With this procedure, the loan-weighted average of the estimated firm and bank components will exactly match the bank, firm, and aggregate credit growth rates. Formally,  $\hat{\alpha}_{fq}$  and  $\hat{\beta}_{bq}$  verify the equations:

$$\Delta Credit_{fq} = \hat{\alpha}_{fq} + \sum_{b \in R_{fq}} w(f)_{bq} \hat{\beta}_{bq} \quad (3.3)$$

$$\Delta Credit_{bq} = \hat{\beta}_{bq} + \sum_{f \in R_{bq}} w(b)_{fq} \hat{\alpha}_{fq} \quad (3.4)$$

$$\Delta Credit_q = \sum_{b \in B_q} w_{bq} \hat{\beta}_{bq} + \sum_{f \in F_q} w_{fq} \hat{\alpha}_{fq} \quad (3.5)$$

where  $R_{fq}$  is the set of banks lending to firm  $f$  at time  $q$  or  $q - 4$ ,  $R_{bq}$  is the set of firms borrowing from bank  $b$  at time  $q$  or  $q - 4$ ,  $F_q$  and  $B_q$  are the set of banks with positive credit exposure at time  $q$  or  $q - 4$ ,  $w(f)_{bq}$  is the weight of bank  $b$  in total borrowing of firm  $f$  and  $w(b)_{fq}$  is the weight of firm  $f$  in total lending of bank  $b$ . Credit variations are expressed in mid-point growth rates; accordingly, the size of a credit exposure is computed as the average exposure between time  $q - 4$  and  $q$ .

We depart from the methodology of Amiti and Weinstein (2018) by replacing the standard growth rate (*i.e.*,  $(Credit_{fbq} - Credit_{fbq-4})/Credit_{fbq-4}$ ) with the mid-point growth rate. This simple

modification has important implications for the estimation process. First, the mid-point growth rate is by definition bounded between -2 and 2. As a result, the estimates of the bank and firm components are naturally less sensitive to large credit increases and therefore more robust to outliers.

Second, the MPGR is defined both for new loans ( $Credit_{fbq-4} = 0$ ) and for terminated loans ( $Credit_{fbq} = 0$ ) while the standard growth rate is only defined in the latter case. Amiti and Weinstein (2018) address this issue by modifying the WLS moment equations to account for the formation of new lending relationships. The resulting estimation procedure becomes however computationally demanding in the presence of a large number of firms.<sup>21</sup> By contrast, our approach can be readily estimated using the high-dimensional fixed-effects estimation routines that are now implemented on most econometric softwares. Third, while the Amiti-Weinstein procedure can account for new loans, it can not deal with the entry of firms or banks. Using the mid-point growth rate enables us to cover the whole distribution of multiple-bank borrowers, including new ones.<sup>22</sup>

### 3.2 Single- and multiple-bank borrowers

Our methodology relies on the presence of multiple-bank firms. This restriction may limit the validity of our analysis if aggregate credit fluctuations vary a lot whether single-bank firms are included or not. We show in this section that to a large extent, restricting the sample to multiple-bank firms preserves credit dynamics at various levels of aggregation.

[Insert figures 3.6a, 3.6b, 3.6c and 3.6d here]

Firms with multiple bank relationships constitute a small subset of the universe of borrowers.

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<sup>21</sup>Amiti and Weinstein focus on listed Japanese firms. Their data set includes as a consequence less than 2,000 firms a year. By contrast, we estimate on average 75,000 firm shocks per quarter. This type of computational issues to estimate bank-time and firm-time fixed effects on large data sets has also been raised by Alfaro, García-Santana and Moral-Benito (2019) and Degryse et al. (forthcoming).

<sup>22</sup>A last advantage of using the midpoint growth rate is that it increases the set of multiple-bank firms. When variation in lending is measured by the standard growth rate, being a multiple-bank firms is equivalent to having multiple preexisting relationships. When it is measured using the midpoint growth rate, it is equivalent to having multiple preexisting *or* new relationships. This increases the number of firm-bank-time observations by 31%.

Only 11% of firms borrow long-term in more than two banks, and 9% of firms have multiple credit lines (table 3.3). Yet, multiple-bank firms represent 50% of the aggregate long-term credit and 83% of the credit lines. Figure 3.6 compares the times series of aggregate credit including or excluding single-bank firms over the period 1999-Q1 to 2016-Q4. The level of the aggregate credit to multiple-bank firms mimics total credit quite well (Panel A). In growth rates, long-term credit borrowed by such firms appears to be a bit more volatile than total long-term credit.<sup>23</sup> Still, the two series co-moves closely together with a correlation of 94%. For credit lines, the correlation is almost perfect (97%).

[Insert figures 3.7a and 3.7b here]

Does the restriction to multiple-bank borrowers also preserve credit dynamics at the bank level? Figure 3.7 gives a graphical representation of the banks' mean credit growth rate including ( $x$ -axis) and excluding single-bank firms ( $y$ -axis). Each point represents a bank and the average growth rates are computed over the entire period of existence of the bank. Restricting the sample does not appear to alter the dynamics of the banks' credit portfolio, either for long-term credit (correlation of 92%) or credit lines (89%). The banks for which there are some apparent divergences are small banks which have few firms at each period. In this case, withdrawing the loans granted to multiple-bank clients results in zero total credit and in a mid-point growth rate equal to  $-200\%$  or  $200\%$ . In the following, we further restrict the data set to banks having more than 100 multiple-bank borrowers in order to avoid this kind of issue. By simplicity, we refer to the resulting data set as the "connected set".

### 3.3 Aggregation and normalization of the shocks

At each time period the estimates  $\hat{\alpha}_{fq}$  and  $\hat{\beta}_{bq}$  are identified up to two normalizations. We choose to remove the cross-sectional medians of the firm and the bank components so as to make

<sup>23</sup>Unless specified otherwise, credit variations are always computed in midpoint growth rates.

them directly interpretable as deviations from a common trend. The deviation to the median will serve as our baseline definition for an idiosyncratic shock.<sup>24</sup> We use alternative definitions such as the deviation to the (simple) mean as well as others specifications in section 4.3. Denoting  $\bar{\alpha}_q$  and  $\bar{\beta}_q$  the medians of  $\hat{\alpha}_{fq}$  and  $\hat{\beta}_{bq}$ , equation 3.5 can be rewritten as

$$\Delta Credit_q = \underbrace{\bar{\beta}_q + \bar{\alpha}_q}_{Macro_q} + \underbrace{\sum_{f \in F_q} w_{fq}(\hat{\alpha}_{fq} - \bar{\alpha}_q)}_{Firm_q} + \underbrace{\sum_{b \in B_q} w_{bq}(\hat{\beta}_{bq} - \bar{\beta}_q)}_{Bank_q} \quad (3.6)$$

This equation states that the variation of credit is the sum of three terms:  $Macro_q$ ,  $Firm_q$  and  $Bank_q$ .  $Macro_q$  is a common term that shifts all firm-bank lending in the same direction.  $Firm_q$  and  $Bank_q$  are defined as the weighted sum of firm and bank idiosyncratic shocks and captures the effects of microeconomic shocks on the borrower and lender side on the evolution of aggregate credit over time.<sup>25</sup>

[Insert figures 3.8a, 3.8b, 3.8c and 3.8d here]

Figure 3.8 presents the different time series of the estimates of  $Macro_q$ ,  $Firm_q$  and  $Bank_q$  for long-term credit.<sup>26</sup> The time series corresponding to the normalization by the median (solid red line) and by the mean (dotted green line) are displayed. As is apparent on the graph, the exact specification of the common trend does not impact much the decomposition of aggregate credit. Both  $Firm_q$  and  $Bank_q$  fall markedly around 2010-Q1, indicating that some big firms and banks experienced large negative idiosyncratic shocks at the time. In the case of banks, one potential interpretation is that this sudden decrease may reflect the fact that banks were heterogeneously affected by the interbank market freeze (Iyer et al., 2013). By contrast, the  $Macro_q$  component is essentially flat during that period. Taken together, this pattern suggests that the fall in aggregate

<sup>24</sup>Empirically, the normalization using the median proved to yield the most consistent results across specifications.

<sup>25</sup>When idiosyncratic shocks are defined as deviations to the mean,  $Firm_q$  and  $Bank_q$  represent according the decomposition of Olley and Pakes (1996) the cross-sectional covariances  $Cov(w_{fq}, \hat{\alpha}_{fq})$  and  $Cov(w_{bq}, \hat{\beta}_{bq})$ .

<sup>26</sup>To save some space, the corresponding figures for the case of credit lines are relegated to the online appendix.

credit following the financial crisis did not originate in an uniform decrease across all firm-bank relationships, but instead took its origins in idiosyncratic negative shocks along the distribution of borrowers and lenders.

### 3.4 External validation of the firm components

The methodology estimates idiosyncratic components that can be aggregated to match the evolution of credit at the firm, bank or economy level. Before using the resulting decomposition, it is interesting to assess whether the estimated idiosyncratic components are able to effectively capture the presence of factors likely to affect microeconomic credit variations. While we do not need in general to characterize the economic origins of the idiosyncratic shocks, this exercise allows to externally validate the informativeness of our estimates.

[Insert figure 3.9 here]

A natural source of information on firm-level credit shocks is provided by the default status of firms made available in the credit registry. This status indicates whether the firm has recently defaulted on a trade bill or entered a procedure to safeguard or to liquidate the firm ("distressed firm"). Using an event study setting, a firm is said to be treated at  $q = 0$  if its default status switches from "non-distressed" to "distressed" at that time.<sup>27</sup> The control group is defined as the set of firms in the same department, in the same risk category, in the same industry and of similar size as treated firms at  $q = -1$  but that never become distressed.<sup>28</sup> When multiple control firms are found for a single treated firms, we select the one that minimize the absolute distance in terms of total long-term credit exposures at  $q = -1$ . At the end of the process, each treated firm is matched

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<sup>27</sup>For the sake of readability, we make use in this subsection of the vocabulary of randomized controlled trials ("treated firms", "control firms"). This is admittedly not completely appropriate in our context as the "treatment" is probably not random. This is however not a problem for our econometric analysis as we do not attempt to obtain causal links.

<sup>28</sup>Firms are sorted in 16 industries, 4 size and risk categories as well as 101 departments.

with zero (in which case it is dropped) or exactly one control firm. We impose that all treated and control firms are present in the database between  $q = -4$  and  $q = 0$ .

This procedure leads us to retain 3516 control and treated firms. Figure 3.9 presents the evolution of the mean idiosyncratic shock  $\tilde{\alpha}_{fq} = \hat{\alpha}_{fq} - \bar{\alpha}_q$  four quarters before and after the default event for treated firms and control firms. Before the treatment, firm components evolve similarly for control firms and treated firms. At  $q = 0$ , the idiosyncratic components of treated firms fall sharply on average. By comparison, the curve follows its pre-existing trend for control firms. Table 3.9 validates this graphical illustration. The table displays the results of the regression

$$\tilde{\alpha}_{fq} = \mu_f + \gamma Post_q + \delta Post_q \times Treated_f + \epsilon_{fq}$$

$Post_q$  is a dummy variable equal to one (zero) when  $q$  is greater or equal (strictly inferior) to zero.  $Treated_f$  is equal to one when  $f$  belongs to the treated group, zero otherwise. In line with the figure, we find that idiosyncratic shocks fell relatively more after  $q = 0$  for treated than for control firms ( $\delta < 0$ ).

[Insert table 3.4 here]

After being declared in financial distress, treated firms may exit the credit registry as they go bankrupt or because their total credit exposure falls below the reporting threshold. This is reflected in the data by a credit growth rate equal to -200%, which leads by construction to a very low idiosyncratic component. The drop in idiosyncratic shocks may therefore be entirely driven by credit adjustments at the extensive margin. Column 2 shows that we find a negative and significant coefficient even when imposing that firms stay in the credit registry during the two year period around  $q = 0$  ("surviving firms"). This implies that firm components also capture idiosyncratic variations of the quantity of credit (intensive margin).



## 4 Granular borrowers and the cyclical of aggregate credit

### 4.1 Granularity and cyclical

This section explores the implications of the presence of granular borrowers for the cyclical of aggregate long-term credit. The empirical importance of large firms for the properties of aggregate credit is *a priori* unclear. Indeed, a peculiar and interesting feature of credit is that both the distribution of borrowers and lenders feature heavy tails (see subsection 2.2). While the granularity literature suggests that the cyclical of aggregate credit will be disproportionately determined by idiosyncratic shocks affecting large actors, it offers little guidance to determine whether firm or bank microeconomic variations will matter more in the aggregate.

Equation 3.6 provides a simple way to assess the respective contributions to the credit cycle of idiosyncratic shocks on the borrower and the lender side. Following Covas and Den Haan (2011), we measure the cyclical of aggregate credit as the comovement between the growth rate of aggregate credit and the growth rate of the non-financial sector real GDP.<sup>29</sup> Let  $\Delta Credit_{GDP,q-k}$  be the growth rate of real GDP between  $q - k - 4$  and  $q - k$  ( $k$  is an integer between 0 and 5).  $\Delta GDP_{q-k}$  is normalized so that its standard deviation is equal to one. Using equation 3.6, we get that

$$\begin{aligned} \text{Corr}(\Delta Credit_q, \Delta GDP_{q-k}) &= \pi^{Macro} \cdot \text{Corr}(Macro_q, \Delta GDP_{q-k}) \\ &+ \pi^{Bank} \cdot \text{Corr}(Bank_q, \Delta GDP_{q-k}) \\ &+ \pi^{Firm} \cdot \text{Corr}(Firm_q, \Delta GDP_{q-k}) \end{aligned} \quad (3.7)$$

where, for instance,  $\pi^{Firm}$  is the ratio of the standard deviation of  $Firm_q$  ( $\sigma^{Firm}$ ) to the standard deviation of  $\Delta Credit_q$  ( $\sigma^{Credit}$ ). For clarity, we refer to  $\pi^X \cdot \text{Corr}(X_q, \Delta GDP_{q-k})$  as  $Share(X_q, \Delta GDP_{q-k})$ .

Before presenting the results of the decomposition implied by equation 3.7, it is useful as a

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<sup>29</sup>Data on GDP comes from the French National Statistics Institute (Insee).

benchmark to estimate an upper bar of the contribution of firm idiosyncratic shocks in a non-granular setting. Assume that firm shocks  $\tilde{\alpha}_{fq}$  are independent random variables with identical variance  $\sigma$ . Following Gabaix (2011) we can show that the standard deviation of  $Firm_q$  is proportional to the square root of the Herfindahl-Hirschmann index of the repartition of credit across borrowers:

$$\sigma_{Firm} = \sigma \sqrt{\sum_{f \in F_t} w_{ft}^2}$$

As long as the variance of the loan distribution of borrowers is finite (a condition that is generally not satisfied in the presence of fat tails), the law of large numbers ensures that when the number of firms  $N$  becomes infinitely large, the square root of the Herfindahl will at the limit be proportional to  $1/\sqrt{N}$ . Since the covariance between two random variables is bounded by the product of the standard deviations, the maximal contribution of firms idiosyncratic shocks to aggregate credit cyclicity will also decay at rate  $1/\sqrt{N}$ . To simplify the analysis, consider the extreme example of an equal repartition of credit between firms (i.e.  $w_{ft} = 1/N$ ). In this case, we would have

$$|Share(Firm_q, \Delta GDP_{q-k})| \leq \frac{\sigma}{\sigma_{Credit}} \cdot \frac{1}{\sqrt{N}}$$

To get an estimate of  $\sigma$ , we calculate for each time period the cross-sectional standard deviation of the firm shocks and take the average over time. We find  $\sigma$  equal to 76%, set  $k$  equal to 4 quarters and take  $N$  equal to the average number of firms per quarter (approximately 75,000 firms). We obtain that if credit was equally distributed between borrowers, the contribution of idiosyncratic shocks affecting borrowers would not exceed 8% of the observed comovement between the evolution of credit and GDP growth.

## 4.2 Dissecting the cyclicality of aggregate credit

Figure 3.8d displays the time series of the growth rate of long-term credit (aggregated over all the bank-firm relationships in the connected set) and of the real GDP of the non-financial sector. We choose the value of  $k$ , the lag of the GDP growth rate, to be equal to one year (4 quarters) so as to maximize the observed correlation (49.4%) with the growth rate of credit.<sup>30</sup> The statistical relationship between the two series is clearly visible on the graph: one year after a decrease in real GDP, credit appears to fall in sizeable proportions.

[Insert table 3.4 here]

Table 3.4 give the results of the decomposition of the cyclicality of aggregate credit given by equation 3.7. Following Di Giovanni, Levchenko and Mejean (2014), we compute standard errors using a block bootstrap procedure to account for the small sample size (68 observations) and the presence of serial correlation in the residuals.<sup>31</sup> The correlation between GDP and credit is only significant at 5% for  $k$  between 3 and 5 quarters and decreases in magnitude after  $k = 4$ . Strikingly, only firm idiosyncratic shocks appear to be significantly related to the business cycle. About 80% of the total correlation with lag 4 of GDP is attributable to  $Firm_q$ , meaning that the importance of firm idiosyncratic variations is about 10 times higher than it would have been in the absence of borrower granularity.

By contrast, bank idiosyncratic shocks  $Bank_q$  appear to play a limited role in the cyclicality of aggregate credit. This in itself should not be taken a sign that bank granular shocks do not affect real activity.<sup>32</sup> Our results suggest, however, that the credit cycle does not find its origins in shocks affecting homogeneously the lending relationships of large banks. The heterogeneity in loan size

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<sup>30</sup>Correlation with leads of GDP are either non-significantly different from zero or negative in some cases. We chose therefore to focus on lags of GDP for the sake of clarity.

<sup>31</sup>Our moving block bootstrap procedure (Kunsch, 1989) is based on 1000 replications and a block length of 4 observations.

<sup>32</sup>Amiti and Weinstein (2018) and Alfaro, García-Santana and Moral-Benito (2019) show that bank shocks have a sizeable impact on firm-level and aggregate real variables such as investment or employment.

within the pool of borrowers is actually so large that most of the correlation between credit and GDP can be traced to shocks affecting individual borrowers.

We explore further the role of granular borrowers by breaking down the weighted sum of firm components  $Firm_q$  by borrower loan size. Consider a partition of  $F_q$ , the set of firms present at time  $q$ , in  $S$  subsets  $F_{1q}, \dots, F_{Sq}$ . For example, one simple partition would consist in dividing  $F_q$  in firms in the bottom 99% of the credit distribution and firms in the top 1%. The firm component can be in this line decomposed as

$$Firm_q = \sum_{s=1}^S \mu_{sq} \left( \sum_{f \in F_{sq}} v_{fsq} (\hat{\alpha}_{fq} - \bar{\alpha}_q) \right) = \sum_{s=1}^S \mu_{sq} Firm_q^s$$

where  $\mu_{sq}$  denotes the share of subset  $s$  in aggregate credit at time  $q$  and  $v_{fsq}$  the weight of firm  $f$  in subset  $s$ . This decomposition, however, is impractical for the decomposition of the correlation of credit with GDP as weights  $\mu_{sq}$  also vary with time. We define to that end an alternative firm component,  $Firm_q^*$  by replacing weights  $\mu_{sq}$  with their average over time. As a result, we are able to further decompose the aggregate impact of firm idiosyncratic shocks into the weighted sum of each subset's own contribution:

$$\text{Corr}(Firm_q^*, \Delta GDP_{q-k}) = \sum_{s=1}^S \bar{\mu}_s \rho_s \text{Corr}(Firm_q^s, \Delta GDP_{q-k}) \quad (3.8)$$

where  $\rho_s$  is the ratio of the standard deviation of  $Firm_q^s$  to the standard deviation of  $Firm_q^*$ .

[Insert table 3.5 here]

Table 3.5 presents the results of the decomposition obtained with equation 3.8. Column 1 first shows that replacing  $Firm_q$  with  $Firm_q^*$  does not alter much the correlations with the different lags of GDP. The weighted sum of idiosyncratic shocks to firms below the 95th percentile of the credit distribution  $Firm_q^{0-95}$  appears to be significantly correlated to GDP for all values of  $k$ , although the

coefficient is only significant at the 10% level for contemporaneous GDP. On the other hand, its contribution to the cyclicality of aggregate credit does not exceed 11% for the lag 4 of GDP, which is somewhat consistent with the benchmark given in section 4.1. By comparison, idiosyncratic shocks to firms in the top 100 of borrowers represent 55% of the correlation.

Perhaps more importantly, we can see that the top 100 borrowers actually imposes its structure of cyclicality to the aggregate time series. While  $Firm_q^{0-95}$  comoves with contemporaneous GDP, the correlation becomes not significant once the rest of the distribution is included. The cyclicality of the firm component increases sharply when considering lagged values of GDP, this surge being largely driven by the top 100 borrowers. To a large extent, therefore, relying on aggregate data to analyze the evolution of credit over the business cycle amounts to focusing on the microeconomic behavior of a restricted set of large borrowers. As the latter are presumably financially unconstrained, inferring the intensity of financial frictions in the economy by matching aggregate credit fluctuations is likely to lead to biased conclusions.

[Insert figure 3.10 here]

Figure 3.10 gives a graphical illustration of the role of the loan distribution. We compare the contribution of each size bucket to total credit in volume (dark grey) and to  $\text{Corr}(Firm_q^*, \Delta GDP_{q-4})$ , the correlation of firm idiosyncratic shocks to GDP (light grey). Firms below the 95th percentile of the credit distribution, for instance, represent on average 31% of total credit and 14% of the correlation. Strikingly, the weight in total credit increases much faster than the contribution to cyclicality as we progressively add firms from the right tail of the distribution. This graph shows that granularity is not a pure size effect: the influence of idiosyncratic shocks affecting the top 100 borrowers is disproportionate compared to their weight in total credit.

The weights  $\bar{\mu}_s, \rho_s$  present in equation 3.8 allows to rationalize the over-representation of granular borrowers. Imagine that we progressively zoom in on the right tail of distribution, by defining  $s$  as the top 10,000, then 1,000, and eventually 100 borrowers for instance. As we focus on a

smaller sample, the variance of the weighted sum of idiosyncratic shocks will increase, hence a higher variance share  $\rho_s$ . In normal-tailed distributions,  $\bar{\mu}_s$  should however become very small, leading in total to a negligible contribution of top borrowers. The slow convergence of  $\bar{\mu}_s$  towards zero as  $s$  moves to the top of the credit distribution makes shocks to granular borrowers exert a disproportionate influence on aggregate credit.

### 4.3 Robustness checks

We assess in this subsection the sensitivity of our findings to the specification of the methodology. In table 3.5, we report for each specification the decomposition of the correlation between the credit growth rate and the four-quarter lag of the GDP growth rate. The top panel displays the decomposition obtained with the baseline specification. Remember that the baseline decomposition is obtained by (i) setting the median of the shocks at zero, (ii) keeping only firms with two banking relationships in a given quarter and (iii) keeping only banks with at least 100 relationships in a given quarter.

[Insert table 3.5 here]

Defining both bank and firm idiosyncratic components as deviations to the mean (instead of the median) leads to slightly different results (see second panel of table 3.5). The contribution of  $Firm_q$  to the cyclicity of aggregate credit (44%), in particular, is significantly reduced by comparison to the baseline case (80%). The correlations are however imprecisely estimated. Since the behavior of the different components does not appear moreover to be very affected by the choice of the normalization (see figure 3.8), we favor the results obtained with the deviation to the median in the analysis. Eventually we notice that in the mean normalization case the impact of borrowers idiosyncratic shocks (although attenuated) remains large, close to the effect of the macro component, and way higher than both the non-granular benchmark and the contribution of bank shocks.

The third panel shows that imposing a minimum number of borrowers by bank of 10 firms do not change much our conclusions. The largest part of the correlation between the credit growth rate and the lagged GDP growth rate (0.553) is still explained by the correlation of the firm component with the GDP growth rate (0.381). Symmetrically, increasing the minimum required number of banking relationships for firms to 4 banks decreases the number of multiple-bank firms but may improve the precision of estimates of the firm components. Still, the correlation of aggregate credit to the business cycle remains primarily explained by firm idiosyncratic shocks.

[Insert table 3.6 here]

Foreign banks might be less sensitive to the French business cycle, which may lower the cyclicity of aggregate credit. Panel 2 of table 3.6 shows that it is not the case: if anything, the correlation of aggregate credit to the business cycle is slightly lower when excluding foreign banks. Panel 3 then displays the results of the estimations obtained when excluding the housing sector. The housing sector represents a disproportionate part of long-term credit (see subsection 2.1). Since real estate firms financing decisions are determined by very specific mechanisms, it is interesting to assess how our results change after excluding them from the data set.<sup>33</sup> We find that the decomposition of the cyclicity of aggregate credit remains very similar to the baseline results. This suggests that the presence of the housing sector does not drive in itself our findings.

In an other robustness exercise, we consolidate banks at the group-level. An immediate drawback of this approach is that it mechanically reduces the number of multiple-bank firms. However, as banking groups are less likely to be specialized in some sector of activities or geographical markets (the French banking sector is dominated by so-called "universal" banks), firms might be more able to substitute credit between lenders. This may lead to a better identification of both bank and firm fixed effects in equation 3.2, which, in turn, could affect the decomposition of the

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<sup>33</sup>In particular, real estate firms are not scored by the Bank of France. A significant fraction of real estate firms are created to isolate and regroup the real estate assets of business groups and as such do not generate any cash-flows. Traditional financial analysis does not apply for this type of firms, hence the absence of credit score.

cyclicality of aggregate credit. Panel 4 shows however that our results are not modified when banks are consolidated at a higher degree of aggregation.

A potential explanation of the fact that bank idiosyncratic components do not contribute much to the cyclicality of aggregate credit is that we do not allow for enough heterogeneity in the behavior of banks. Bank lending behavior might indeed vary between different groups of borrowers. Our specification may in that sense impose too much constraints in that it assumes an homogeneous bank component. In particular, if banking lending behavior depends on the loan size of the borrower, the firm aggregate component  $Firm_q$  might erroneously capture some part of the variation of aggregate credit that should in theory be attributed to  $Bank_q$ . We use therefore a statistical rule to break down banks in sub-units. A borrower is classified as being small (large) if it borrows less (more) than the bank average. We then break each bank in a "retail" bank (which lends to small borrowers) and a "wholesale" bank (which lends to large ones) and rerun the estimations with twice as much bank components as in the baseline specification. We find that allowing heterogeneous bank idiosyncratic shocks does not significantly alter our results.

[Insert table 3.7 here]

In order to rule out sectoral or geographical variations from  $Firm_q$ , we use as alternative definition of idiosyncratic shocks the deviation to the *conditional* median. We successively take the median by industry, credit score category, size category, administrative division ("département") and by the category defined by the intersection of all the precedent variables ("cell"). Table 3.7 reports the contemporaneous and lagged correlations between the GDP growth rate and the different time series of  $Firm_q$  obtained with these definitions. The correlations of the firm component with the one-year lag of the GDP growth rate are all positive and significant and represent 62% to 80% of the aggregate correlation.

[Insert table 3.8 here]



The estimation of equation 3.2 with weighted least squares gives by construction more importance to firms and banks with larger outstanding volumes of credit. One may therefore suspect that the importance of firm idiosyncratic shocks in the aggregate fluctuations of credit mechanically derives from the estimation method. In table 3.8, we present the results obtained by estimating equation with ordinary least squares instead of WLS. A drawback of this specification is that the weighted sum of residuals does not cancel out in the aggregate: we add therefore a fourth term to the decomposition (match-specific component) that we name  $Match_q$ . The resulting decomposition is close to the one obtained with the baseline specification. The correlation between aggregate credit and GDP, when high and significant, is mainly driven by the firm component. The contribution of the match-specific component is large when focusing on contemporaneous GDP, but then slowly fades out as we consider lagged time series.

By construction, the decomposition of the cyclicity of aggregate credit excludes single-bank firms. In a last robustness exercise, we attempt to assess the relative contributions of the different components when including the entire population of borrowers. To that end, we first compute the mid-point growth rate  $\Delta Credit_q^{agg}$  of aggregate long-term credit using the data set we obtained before restricting it to the connected set. This time series therefore includes credit borrowed by single-bank firms. We then regress  $\Delta Credit_q^{agg}$  on the time series  $Macro_q$ ,  $Bank_q$  and  $Firm_q$  obtained from equation 3.6. Table 3.8 displays the results obtained with the baseline specification and by defining idiosyncratic shocks as the deviation to the mean.<sup>34</sup>

[Insert table 3.8 here]

We use the estimated coefficients to compute the contribution of each of the three terms to the correlation of  $\Delta Credit_q^{agg}$  with  $\Delta GDP_{q-4}$ . The total correlation is given in the bottom of the table and

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<sup>34</sup>Note that if  $\Delta Credit_q^{agg}$  was exactly equal to  $\Delta Credit_q$ , all the coefficients would be equal to one. Interestingly, we find for both specifications that the coefficients for  $Macro_q$  and  $Bank_q$  are not statistically different from one. The  $Firm_q$  coefficient appears by contrast to be lower than one. Also notice that for both normalizations the R2 is high, respectively equal to 91.3 and 93.4%. Our aggregate time series estimated on the set of multi-bank firms are therefore able to capture the bulk of aggregate credit fluctuations, even when including single-bank firms.

is equal to 0.601. The respective contributions of each component are displayed below the standard errors of the coefficients. The decomposition now includes a fourth element, corresponding to the comovement of the estimated error term with the business cycle and displayed in the "Residual" line. We find that in our baseline specification firm idiosyncratic shocks would remain a first order determinant of the cyclicity of aggregate credit (58% of the total correlation). In the specification with the mean,  $Firm_q$  becomes the second contributing factor behind  $Macro_q$  but still explains 29% of the link between credit and the business cycle.

## 5 Bank liquidity risk and borrower concentration

### 5.1 Can banks pool borrower idiosyncratic risk?

We turn in this section to the implications of the presence of granular borrowers on bank-level variations of undrawn credit lines. Banks' ability to provide liquidity on demand through credit lines or deposits will depend on the distribution of liquidity outflows (Holmström and Tirole, 1998; Kashyap, Rajan and Stein, 2002). In particular, if banks are unable to pool the idiosyncratic risk of their borrowers, they may have to hoard more liquid assets to hedge against negative shocks affecting individual borrowers.

We obtain with our decomposition the following equality for the evolution of undrawn credit lines at the bank-level:

$$\begin{aligned}\Delta Credit_{bq} &= Macro_q + \tilde{\beta}_{bq} + \sum w(b)_{fq} \tilde{\alpha}_{fq} \\ &= Macro_q + Bank_{bq} + Firm_{bq}\end{aligned}\tag{3.9}$$

It is easy to see following the logic of section 4.1 that a bank's exposure to borrower idiosyncratic risk will depend on whether the distribution of its borrower base  $w(b)$  is fat-tailed or not. Given

the extreme degree of concentration of credit lines (see section 2.2), there are reasons to believe that the ability of banks to pool idiosyncratic risk is actually limited.

[Insert table 3.9 here]

We have to slightly adjust our methodology to quantify the importance of idiosyncratic risk in banks' credit line portfolios. First, since the portfolio of borrowers is likely to be managed at the level of the group, we consolidate banks by banking group in the remainder of the analysis. Second, we focus our study on the six largest banking groups.<sup>35</sup> This choice allows first to keep only banks with very large borrower bases for which the law of large numbers should apply in the absence of granular borrowers. Moreover, the selected banks are present during the whole time period, which greatly simplifies the analysis in the following. Third, because of a change in the treatment of short-term loans in the credit registry, the analysis of credit lines at the firm-level is not reliable around 2006. We choose therefore to focus on the period starting from 2008-Q1 and ending in 2016-Q4.

We incorporate these changes into our estimation procedure to get the firm, bank and macro components of bank-level variations of credit lines. In order to quantify the role of borrower idiosyncratic shocks, we compute for each bank the variance of the counterfactual time series of credit lines variations if  $Firm_{bq}$  was constantly equal to zero. In a second step, we compute the average across banks of the resulting variances that we compare to the average variance of the original  $\Delta Credit_{bq}$  time series.<sup>36</sup> We do the same counterfactual exercise by setting successively  $Macro_q$ ,  $Bank_{bq}$  and the weighted sum of firm components for the top 10 borrowers  $Firm_{bq}^{Top 10}$  to zero in equation 3.9.<sup>37</sup> The estimated counterfactual variances are displayed in table 3.9.

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<sup>35</sup>The six largest banking groups account in our sample for 84% of lending to firms.

<sup>36</sup>We build here on the methodology used by Kramarz, Martin and Mejean (2019) to estimate the level of under-diversification of French exporters.

<sup>37</sup>Note that this counterfactual exercises take the weights of firms in the bank credit lines portfolio as given. In practice, however, the weights are themselves a function of the past values of the different components. We chose to abstract from these indirect effects to keep the intuition simple.

From equation 3.9, it is apparent that muting borrower idiosyncratic shocks will have a large effect on bank-level credit lines variance if (i) firm idiosyncratic shocks are very volatile, (ii) borrower portfolios are not diversified, (iii) the weighted sum of borrower idiosyncratic shocks is positively correlated with the other components of the decomposition.

Our findings suggest that banks are substantially exposed to borrower idiosyncratic risk. Without borrower idiosyncratic shocks, bank-level variance of credit lines is reduced by 31%. The effect is larger than for the bank and macro components (respectively 29% and 9%). Muting the idiosyncratic shocks of the ten largest borrowers reduces the variance even more (44%). This is expected as  $Firm_{bq}^{Top 10}$  is likely to be more volatile than  $Firm_{bq}$ .

One may fear that the large role of borrower risk in our findings could be an artifact of our definition of idiosyncratic shocks. Since we look at deviations from a common macro trend, our shocks could actually incorporate sectoral or geographical factors. We therefore proceed to the same exercise using the deviation to the median by cell as a more demanding definition of idiosyncratic shocks (a cell being the intersection of a sector, a credit risk category, a size category and a geographical zone; see section 4.3). As expected, muting borrower idiosyncratic shocks reduces less the variance of credit lines (19%). By contrast, the importance of macro shocks becomes larger (31%). Still, the role of borrower idiosyncratic risk on credit line variations appears to be far from negligible. Overall, our results strongly supports the idea that on average, banks are not fully able to diversify away the idiosyncratic risk of borrowers in their credit lines portfolio.

## 5.2 Borrower concentration as a source of systemic risk

The previous subsection established that banks are exposed to borrower idiosyncratic risk. We turn now to the implications of this additional source of risk for the banking system as a whole. There are indeed several reasons to believe that borrower risk may be correlated across banks. Remember first that by construction, firms in our sample borrow from multiple banks. The

presence of granular borrowers in several credit lines portfolios could therefore lead credit lines variations to be synchronized across banks. Second, input-output linkages can make idiosyncratic shocks propagate across the production network. A supplier hit by a natural disaster, for instance, is likely to draw on its credit line to make up for the decrease in production. In turn, the customers of the firm may themselves need to rely on their credit lines to handle the disruption of their supply chain.<sup>38</sup>

[Insert table 3.9 here]

We test this hypothesis by decomposing the variance of aggregate borrower risk. To simplify the analysis, we set bank weights  $w_b$  equal to their time average in the computation of the time series  $Firm_q^*$ . This allows us to write

$$\begin{aligned} Var(Firm_q^*) &= \sum_b w_b^2 Var(Firm_{bq}^*) + \sum_b \sum_c w_b w_c Cov(Firm_{bq}^*, Firm_{cq}^*) \\ &= Direct_q + Link_q \end{aligned} \tag{3.10}$$

Equation 3.10 states that the aggregate variance of borrower idiosyncratic shocks is the sum of (i)  $Direct_q$ , the weighted sum of bank-level variances (ii)  $Link_q$ , the weighted sum of the covariances of borrower idiosyncratic shocks between banks.

Table 3.9 presents the results of the decomposition obtained with our standard definition of idiosyncratic shocks and with the deviation to the median by cell. The variance of borrower idiosyncratic shocks is large (21% to 34%) compared to an overall variance of credit lines of 41%. As expected, the variance of idiosyncratic shocks is reduced when using the median by cell but still amounts to more than half of the variance of credit lines.

Importantly, we observe in both specifications that the contribution of bank linkages  $Link_q$  far

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<sup>38</sup>For evidence of propagation of idiosyncratic shocks along the production network, see Barrot and Sauvagnat (2016).

exceed the sum of bank-level volatilities  $Direct_q$ , the latter representing less than 25% of  $Var(Firm_q^*)$ . This result highlights that the concentration of banks borrower bases is a source of systemic risk for the banking system as it makes credit lines takedowns (i) less diversifiable and (ii) more correlated between banks.

## 6 Conclusion

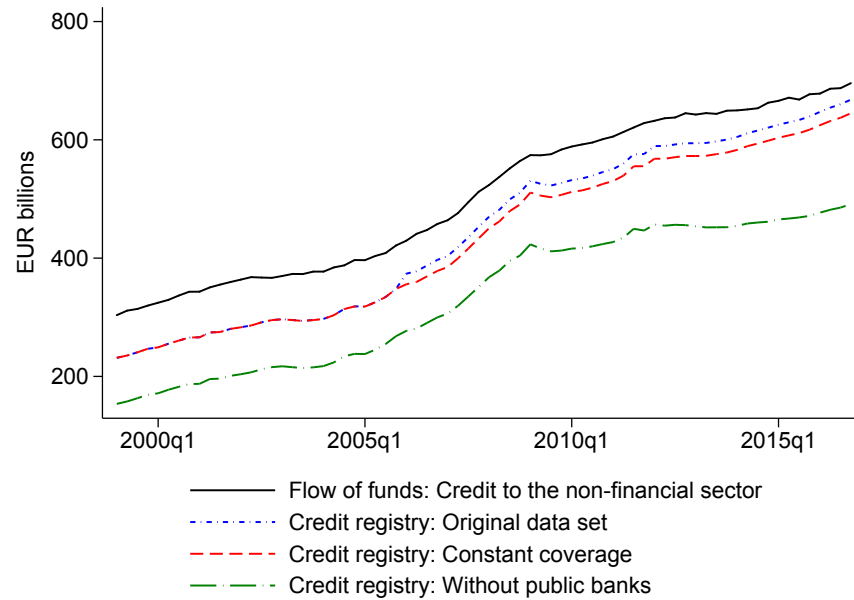
Using a data set covering the quasi universe of firm-bank relationships in France for the period 1999-2016, we document that the distribution of borrowers is fat-tailed, a necessary condition for borrower idiosyncratic shocks to matter for aggregate fluctuations. We quantify the role of microeconomic shocks affecting firms by designing an exact, empirically tractable decomposition of credit variations into a lender, borrower and macro components at any level of aggregation.

Our findings indicate first that the comovement of aggregate credit with the business cycle, a key moment in macro-finance, is largely determined by the behavior of granular borrowers. This implies that any analysis of financial frictions relying on the cyclicity of aggregate credit is in effect based on the microeconomic behavior of firms that are likely to have extensive access to credit. Second, we find that the under-diversification of borrower bases represents a source of systemic risk for the banking system as it makes credit line takedowns less diversifiable across borrowers and more correlated across banks.

While our paper documents the implications of the presence of granular borrowers, it is largely silent on the reasons leading to such high degrees of credit concentration. What are the costs of diversifying the base of borrowers? Does the funding structure of banks, and in particular their access to a stable base of deposits, play a role in determining the concentration of their loan portfolio? To which extent these granular borrowers rely on alternative sources of financing over the cycle? Answering those questions would help understanding the sources of the exposure of banks and ultimately of the aggregate credit market to borrower idiosyncratic risk.

## 7 Tables and figures

**Figure 3.1 – Coverage of the credit registry.**



The graph compares the time series of aggregate long-term credit (defined as credit with a maturity of more than one year at issuance) obtained from the balance of payments (black line) and from the credit registry. The blue curve presents the time series obtained from the original credit registry. In the second curve, we impose the €75,000 reporting threshold to the entire period so that the coverage of the data set is constant over time. In the green curve, public banks are removed from the aggregation. The coverage of our data set corresponds to this last case.

**Table 3.1 – Descriptive statistics: firm-bank level.**

	Mean	Std. Dev.	Min	P25	P50	P75	Max
<i>All firms : long-term credit</i>							
Long term credit (EUR Mns)	0.39	4.00	0.00	0.08	0.14	0.26	3924.97
Long term credit (growth rate, %)	4.50	112.89	-200.00	-22.22	-7.33	15.63	200.00
# of banks per firm	1.04	0.66	0.00	1.00	1.00	1.00	57.00
Observations	59,286,238						
<i>Multiple-bank firms: long-term credit</i>							
Long term credit (EUR Mns)	0.82	6.43	0.00	0.08	0.16	0.39	2560.00
Long term credit (growth rate, %)	-0.99	117.73	-200.00	-36.02	-10.11	27.61	200.00
# of banks per firm	2.42	1.12	2.00	2.00	2.00	2.00	57.00
Observations	17,542,781						
<i>All firms: credit lines</i>							
Credit lines (EUR Mns)	0.61	10.95	0.00	0.00	0.02	0.08	4657.50
Credit lines (growth rate, %)	7.78	159.02	-200.00	-200.00	0.00	200.00	200.00
# of banks per firm	0.31	0.60	0.00	0.00	0.00	1.00	43.00
Observations	16,258,331						
<i>Multiple-bank firms: credit lines</i>							
Credit lines (EUR Mns)	2.58	24.20	0.00	0.01	0.07	0.29	4657.50
Credit lines (growth rate, %)	6.15	154.54	-200.00	-182.80	0.00	200.00	200.00
# of banks per firm	2.47	1.44	2.00	2.00	2.00	2.00	43.00
Observations	3,205,012						

Descriptive statistics are given at the level of a firm-bank relationship in a given quarter. The table is divided in four panels. In the first (third) panel, the coverage includes all firm-bank relationships with positive long-term credit (credit lines) exposure at  $q$  or  $q - 4$ . In the second (fourth) panel, the coverage includes all firm-bank relationships with positive long-term credit (credit lines) exposure at  $q$  or  $q - 4$  for multiple-bank firms. The data set is an extraction of the French credit registry and covers the 1999 Q1-2016 Q4 time period. Public banks, financial firms and self-employed entrepreneurs are excluded. Long-term credit is defined as credit with a maturity of more than one year at issuance. Credit lines are defined as the sum of all undrawn commitments (including documentary credit).



**Table 3.2 – Descriptive statistics: bank-level.**

	Mean	Std. Dev.	Min	P25	P50	P75	Max
<i>Long-term credit</i>							
Long term credit (EUR Bns)	0.76	2.45	0.00	0.01	0.10	0.58	42.95
Long term credit (growth rate, %)	3.80	62.07	-200.00	-9.23	5.52	17.21	200.00
Observations	27,447						
<i>Credit lines</i>							
Credit lines (EUR Bns)	0.46	1.74	0.00	0.00	0.04	0.24	25.36
Credit lines (growth rate, %)	9.48	87.90	-200.00	-20.71	5.28	38.62	200.00
Observations	21,421						
<i>Number of firms</i>							
# of firms (long-term credit)	1573.92	4961.58	0.00	2.00	58.00	886.00	82195.00
# of firms (credit lines)	475.89	1448.02	0.00	0.00	8.00	173.00	26140.00
# of multiple-bank firms (long-term credit)	370.00	1149.49	0.00	1.00	24.00	250.00	20102.00
# of multiple-bank firms (credit lines)	93.81	278.49	0.00	0.00	2.00	45.00	4447.00
Observations	34,164						

Descriptive statistics are given at the bank-quarter level. The table is divided in three panels. In the first (second) panel, the coverage includes all bank-quarter observations with positive long-term credit (credit lines) exposure at  $q$  or  $q - 4$ . In the third panel, the coverage includes all bank-quarter observations. The data set is an extraction of the French credit registry and covers the 1999 Q1-2016 Q4 time period. Public banks, financial firms and self-employed entrepreneurs are excluded. Long-term credit is defined as credit with a maturity of more than one year at issuance. Credit lines are defined as the sum of all undrawn commitments (including documentary credit).

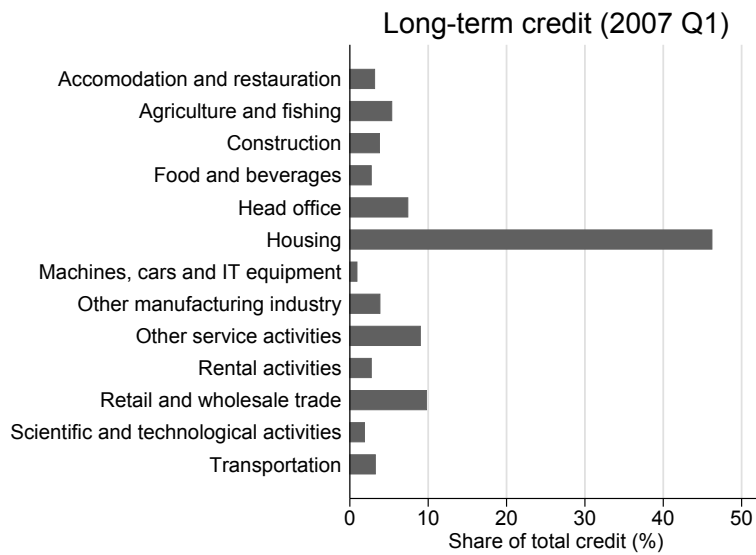
**Table 3.3 – Descriptive statistics: aggregate-level.**

	Mean	Std. Dev.	Min	P25	P50	P75	Max
Number of banks	502.40	88.77	365.00	421.50	494.00	579.00	666.00
<i>Long-term credit (all firms)</i>							
Long term credit (EUR Bns)	306.54	105.79	140.57	185.47	345.97	409.48	444.89
Long term credit (growth rate, %)	0.07	0.06	-0.02	0.02	0.06	0.11	0.20
Number of firms (in thousands)	681.69	196.06	346.20	493.95	740.58	869.14	937.46
<i>Long-term credit (multiple-bank firms)</i>							
Long term credit (EUR Bns)	152.56	46.78	80.99	100.70	174.92	195.00	209.52
Long term credit (growth rate, %)	0.05	0.08	-0.11	0.01	0.04	0.12	0.23
Number of firms (in thousands)	76.83	20.00	46.72	59.13	78.18	94.52	109.92
<i>Lines of credit (all firms)</i>							
Lines of credit (EUR Bns)	146.13	50.87	57.27	94.90	173.44	186.79	200.29
Lines of credit (growth rate, %)	0.07	0.10	-0.09	0.00	0.06	0.14	0.29
Number of firms (in thousands)	210.99	96.95	59.42	103.82	269.80	297.51	318.07
<i>Lines of credit (multiple-bank firms)</i>							
Lines of credit (EUR Bns)	121.89	40.77	49.04	82.48	141.75	154.48	162.95
Lines of credit (growth rate, %)	0.07	0.10	-0.08	-0.00	0.05	0.12	0.32
Number of firms (in thousands)	19.03	10.36	4.89	7.30	23.52	29.41	31.68
Observations	68						

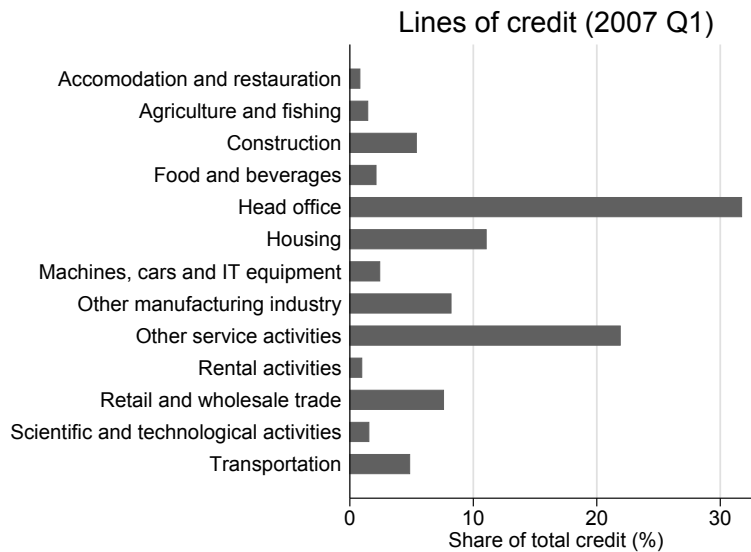
Descriptive statistics are given at the quarter level. The data set is an extraction of the French credit registry and covers the 1999 Q1-2016 Q4 time period. Public banks, financial firms and self-employed entrepreneurs are excluded. Long-term credit is defined as credit with a maturity of more than one year at issuance. Credit lines are defined as the sum of all undrawn commitments (including documentary credit).

**Figure 3.2 – Sectoral repartition of credit (2007).**

**(a) Long-term credit**

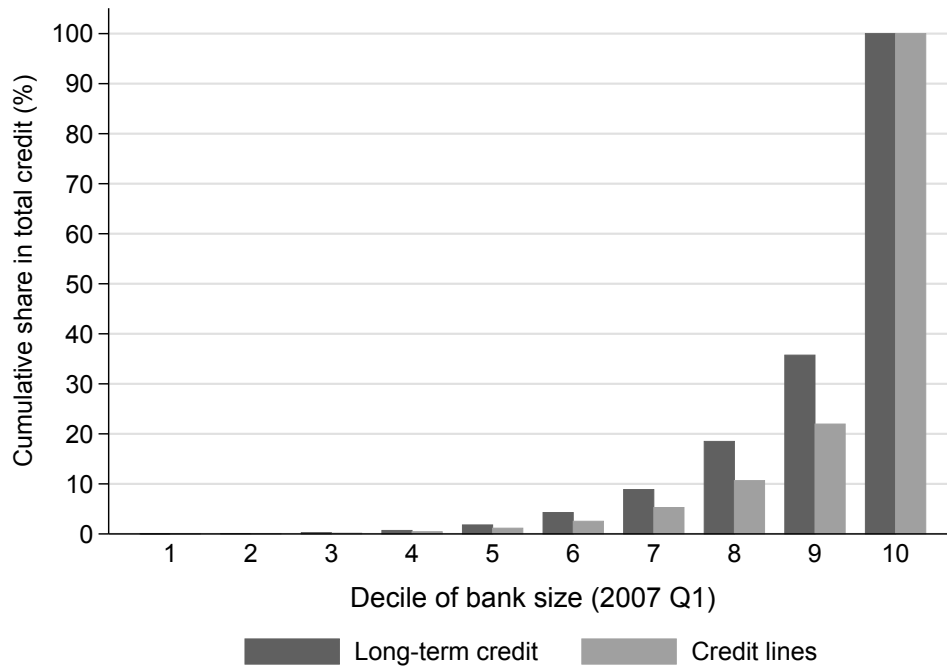


**(b) Credit lines**



The data set is an extraction of the French credit registry and covers the 1999 Q1-2016 Q4 time period. Public banks, financial firms and self-employed entrepreneurs are excluded. Long-term credit is defined as credit with a maturity of more than one year at issuance. Credit lines are defined as the sum of all undrawn commitments (including documentary credit).

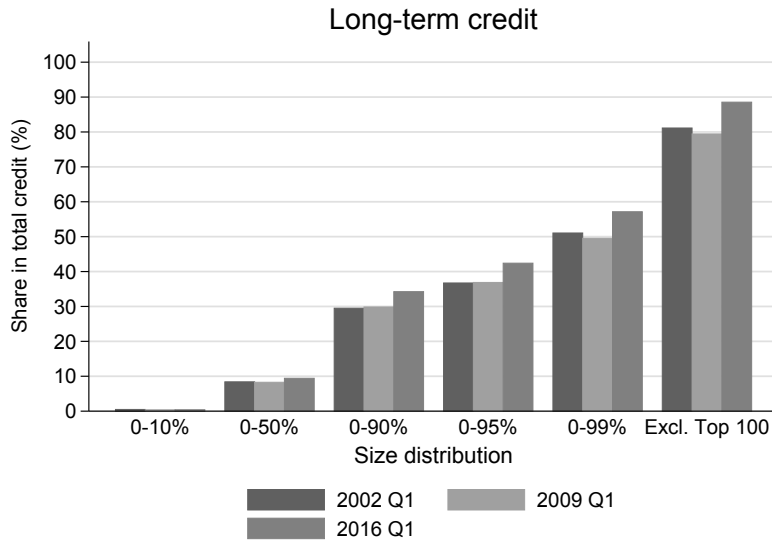
**Figure 3.3 – Distribution of credit (banks).**



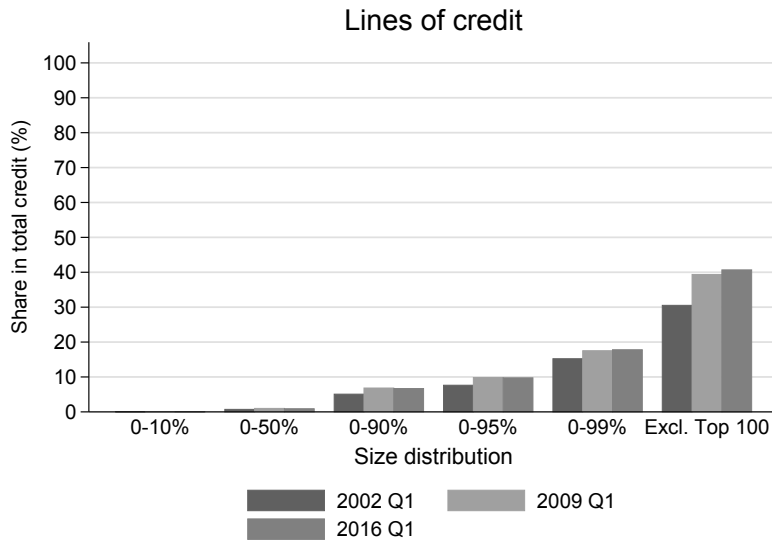
This graph gives the cumulative distribution of long-term credit and credit lines in 2007-Q1. Banks are sorted by deciles of credit exposure (long-term credit and credit lines). The data set is an extraction of the French credit registry and covers the 1999 Q1-2016 Q4 time period. Public banks, financial firms and self-employed entrepreneurs are excluded. Long-term credit is defined as credit with a maturity of more than one year at issuance. Credit lines are defined as the sum of all undrawn commitments (including documentary credit).

**Figure 3.4 – Distribution of credit (firms).**

**(a) Long-term credit**

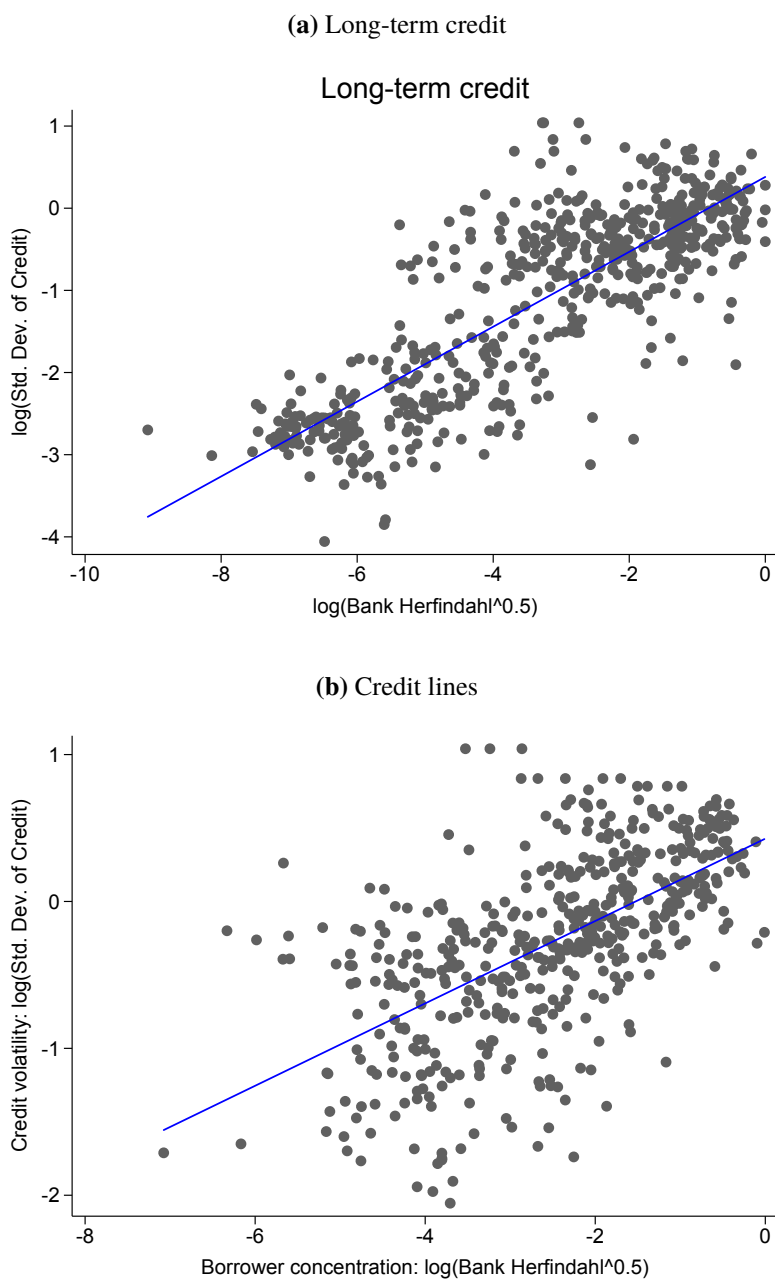


**(b) Credit lines**



These graphs give the cumulative distribution of long-term credit and undrawn credit lines in 2002-Q1, 2009-Q1 and 2016-Q1. Firms are ranked by percentiles of credit exposure (long-term credit and credit lines). "Excl. Top 100" regroups all firms excluding the top 100 borrowers. The data set is an extraction of the French credit registry and covers the 1999 Q1-2016 Q4 time period. Public banks, financial firms and self-employed entrepreneurs are excluded. Long-term credit is defined as credit with a maturity of more than one year at issuance. Credit lines are defined as the sum of all undrawn commitments (including documentary credit).

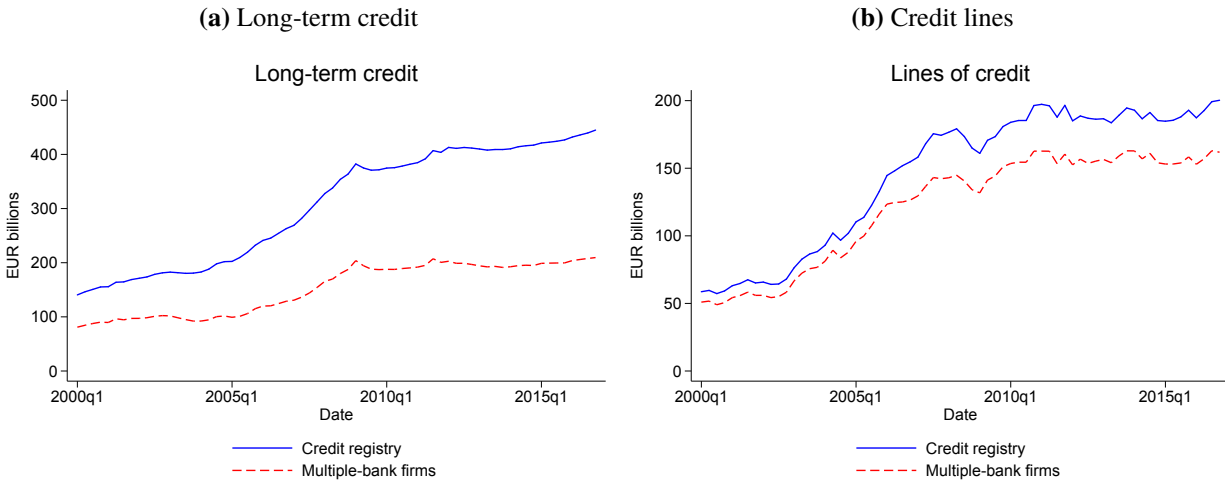
**Figure 3.5 – Concentration and volatility.**



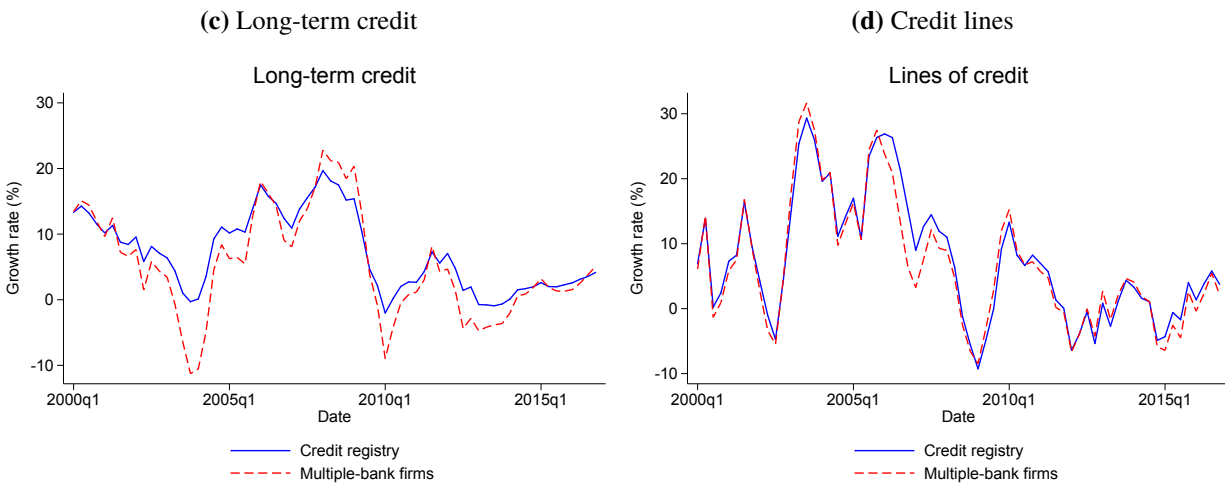
These graphs give a graphical representation of the relationship between banks' borrower portfolio concentration and credit volatility. We compute for each bank the average Herfindahl-Hirschmann index of its loan portfolio as well as the standard deviation of its credit growth. We only keep banks that are present in at least three consecutive years (12 quarters) in the data set. The volatility of credit and the square root of the HHI index are taken in logs. The data set is an extraction of the French credit registry and covers the 1999 Q1-2016 Q4 time period. Public banks, financial firms and self-employed entrepreneurs are excluded. Long-term credit is defined as credit with a maturity of more than one year at issuance. Credit lines are defined as the sum of all undrawn commitments (including documentary credit).

**Figure 3.6 – Single- and multiple-bank firms: aggregate variations.**

Panel A: Credit level.

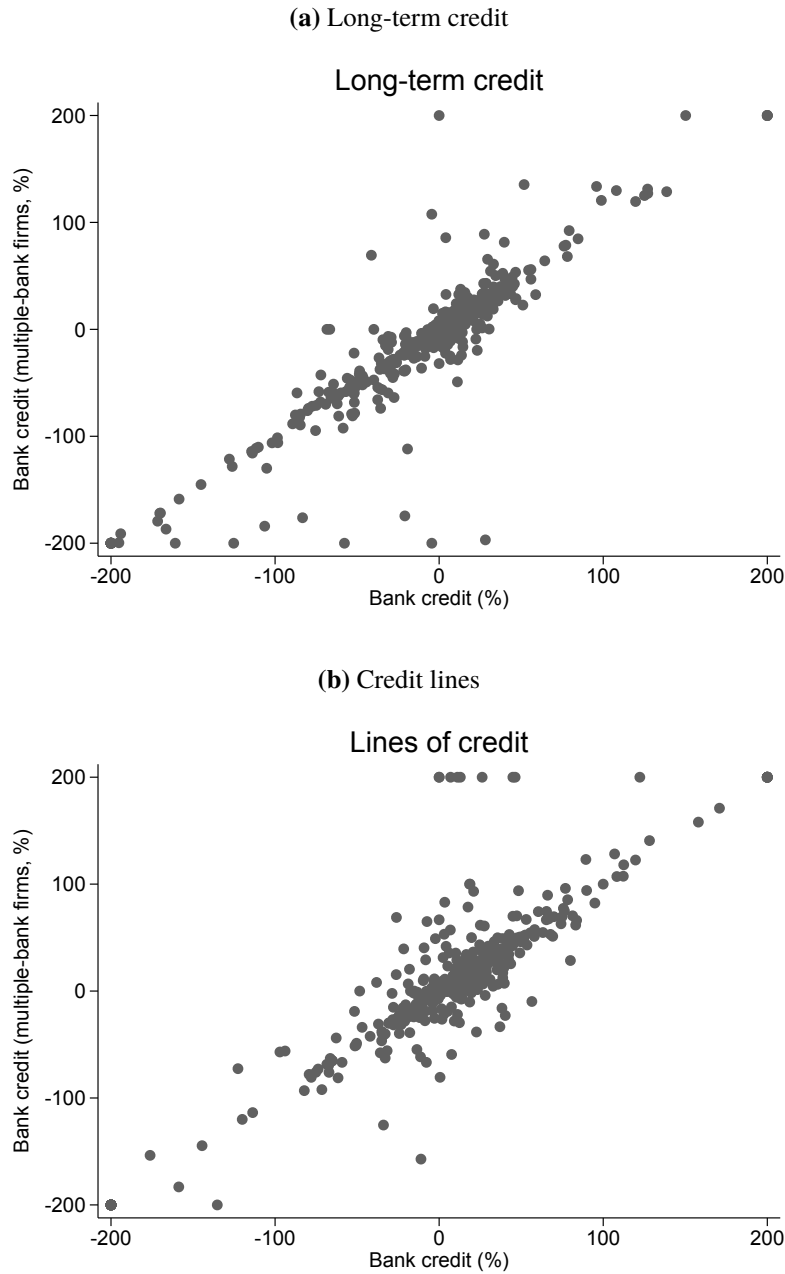


Panel B: Credit growth rates.



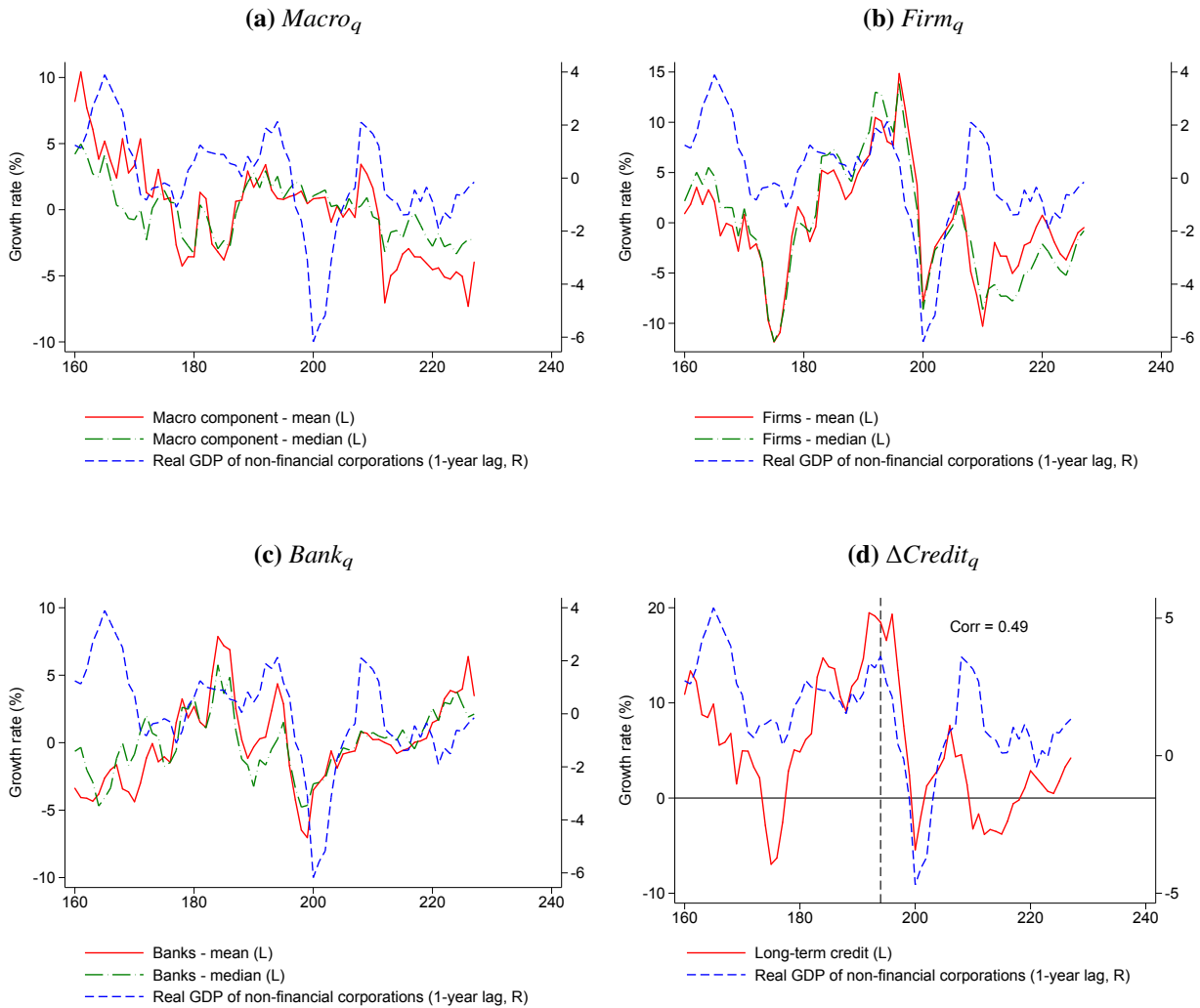
These graphs display the level and the variation of aggregate credit including and excluding single-bank firms. Panel A gives the time series of aggregate credit levels (long-term credit and credit lines) for the whole credit registry (red curve) and for multiple-bank firms (blue curve). Panel B gives the time series of the different credit growth rates. The data set is an extraction of the French credit registry and covers the 1999 Q1-2016 Q4 time period. Public banks, financial firms and self-employed entrepreneurs are excluded. Long-term credit is defined as credit with a maturity of more than one year at issuance. Credit lines are defined as the sum of all undrawn commitments (including documentary credit).

**Figure 3.7 – Single- and multiple-bank firms: bank-level variations.**



The figures give a graphical representation of the banks' mean credit growth rate including (*x*-axis) and excluding single-bank firms (*y*-axis). Credit growth rates are averaged for each bank over all the observations in which the bank is present. The data set is an extraction of the French credit registry and covers the 1999 Q1-2016 Q4 time period. Public banks, financial firms and self-employed entrepreneurs are excluded. Long-term credit is defined as credit with a maturity of more than one year at issuance. Credit lines are defined as the sum of all undrawn commitments (including documentary credit).

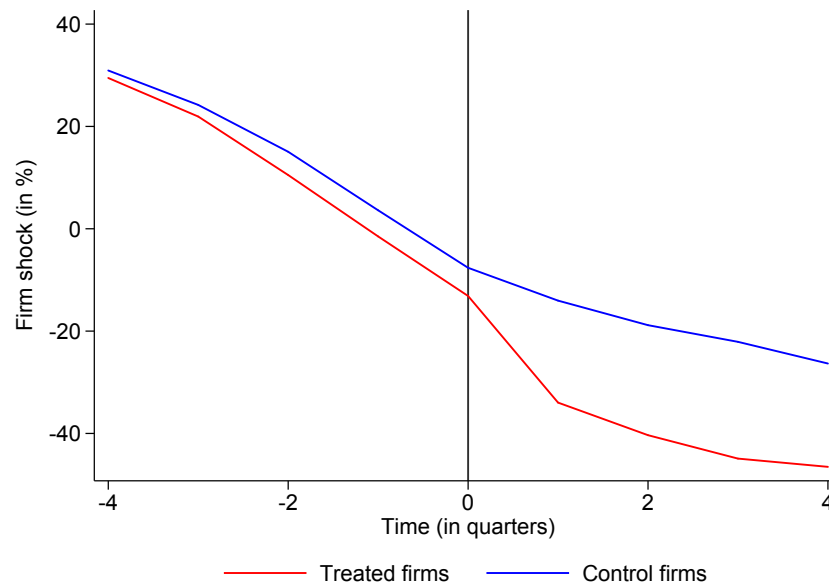
**Figure 3.8 – Time series of  $Macro_q$ ,  $Firm_q$  and  $Bank_q$ .**



These graphs display the time series of  $Macro_q$ ,  $Firm_q$ ,  $Bank_q$  and  $\Delta Credit_q$  (left axis) along with the growth rate of the non-financial sector real GDP lagged by one year (right axis). The different components verify the equality  $\Delta Credit_q = Macro_q + Firm_q + Bank_q$  where  $\Delta Credit_q$  is the growth rate of aggregate long-term credit. Long-term credit is defined as credit with a maturity of more than one year at issuance. Credit data comes from an extraction of the French credit registry and covers the period from 1999-Q1 to 2016-Q4. Public banks, financial firms and self-employed entrepreneurs are excluded. In order to use the decomposition displayed above, single-bank firms and banks lending to less than 100 multiple-bank firms are removed from the aggregation. Data on GDP comes from the French National Statistical Institute (Insee).



**Figure 3.9 – External validation of the firm components - graph.**



This graph presents the evolution of the average idiosyncratic shock  $\hat{\alpha}_{fq} - \bar{\alpha}_q$  four quarters before and after the default event for treated firms and control firms.  $\hat{\alpha}_{fq}$  is obtained by performing a WLS regression of the growth rate of long-term credit at the firm-bank level on a firm-time and bank-time fixed effects.  $\bar{\alpha}_q$  is the cross-sectional median of  $\hat{\alpha}_{fq}$ . At  $t = 0$ , treated firms default on at least one trade bills or enters a collective procedure. Control firms are defined as firms in the same department, in the same risk category, in the same industry and of similar size as treated firms but that never default or enter a collective procedure. When multiple control firms are found for a single treated firms, we select the one that minimizes the absolute distance in terms of total long-term credit exposures. The data set is an extraction of the French credit registry and covers the 1999 Q1-2016 Q4 time period. Public banks, financial firms and self-employed entrepreneurs are excluded. Long-term credit is defined as credit with a maturity of more than one year at issuance.

**Table 3.4 – External validation of the firm components - regression results.**

	Dependent variable: $\tilde{\alpha}_{fq} = \hat{\alpha}_{fq} - \bar{\alpha}_q$	
	All firms	Surviving firms
$Post_q$	-0.345*** (0.000)	-0.149*** (0.000)
$Post_q \times Treated_f$	-0.149*** (0.000)	-0.070*** (0.003)
Observations	31644	15129
Firm FE	Yes	Yes
R2	0.424	0.376

This table presents the results of the regression  $\tilde{\alpha}_{fq} = \mu_f + \gamma Post_q + \delta Post_q \times Treated_f + \epsilon_{fq}$  where  $\tilde{\alpha}_{fq} = \hat{\alpha}_{fq} - \bar{\alpha}_q$ .  $\hat{\alpha}_{fq}$  is obtained by performing a WLS regression of the growth rate of long-term credit at the firm-bank level on a firm-time and bank-time fixed effects.  $\bar{\alpha}_q$  is the cross-sectional median of  $\hat{\alpha}_{fq}$ . At  $t = 0$ , treated firms default on at least one trade bills or enters a collective procedure. Control firms are defined as firms in the same department, in the same risk category, in the same industry and of similar size as treated firms but that never default or enter a collective procedure. When multiple control firms are found for a single treated firms, we select the one that minimizes the absolute distance in terms of total long-term credit exposures.  $Post_q$  is a dummy variable equal to one (zero) when  $q$  is greater or equal (strictly inferior) to zero.  $Treated_f$  is equal to one when  $f$  belongs to the treated group, zero otherwise. *Surviving firms* is the set of firms that don't exit the credit registry during the two years (8 quarters) period around  $q = 0$  ( $\Delta Credit_{fq} > -2$ ). The data set is an extraction of the French credit registry and covers the period from 1999-Q1 to 2016-Q4. Public banks, financial firms and self-employed entrepreneurs are excluded. Long-term credit is defined as credit with a maturity of more than one year at issuance.

**Table 3.4 – Decomposition of the cyclicality of aggregate credit.**

	$Corr(\Delta Credit_q, Z)$	$Share(Macro_q, Z)$	$Share(Banks_q, Z)$	$Share(Firms_q, Z)$
$Z = \Delta GDP_{q-5}$	0.440** (0.186)	0.073 (0.074)	-0.002 (0.094)	0.370** (0.168)
$Z = \Delta GDP_{q-4}$	0.494*** (0.174)	0.080 (0.081)	0.016 (0.105)	0.398*** (0.162)
$Z = \Delta GDP_{q-3}$	0.462*** (0.180)	0.079 (0.085)	0.033 (0.115)	0.350** (0.183)
$Z = \Delta GDP_{q-2}$	0.404* (0.225)	0.082 (0.094)	0.039 (0.119)	0.283 (0.233)
$Z = \Delta GDP_{q-1}$	0.256 (0.278)	0.069 (0.096)	0.040 (0.114)	0.147 (0.279)
$Z = \Delta GDP_q$	0.071 (0.315)	0.054 (0.094)	0.027 (0.099)	-0.010 (0.299)
Observations	68			

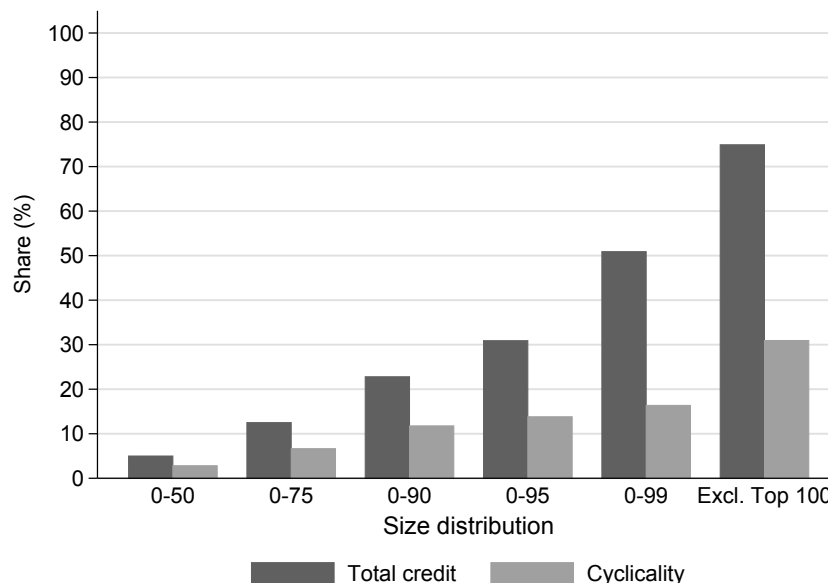
The table presents the results of the decomposition  $Corr(\Delta Credit_q, \Delta GDP_{q-k}) = Share(Macro_q, \Delta GDP_{q-k}) + Share(Bank_q, \Delta GDP_{q-k}) + Share(Firm_q, \Delta GDP_{q-k})$  where  $Share(X_q, \Delta GDP_{q-k}) = \pi^X \cdot Corr(X_q, \Delta GDP_{q-k})$  and  $\pi^X$  is the ratio of the standard deviation of  $X_q$  to the standard deviation of  $\Delta Credit_q$ .  $k$  is an integer between 0 and 5.  $Macro_q$ ,  $Firm_q$  and  $Bank_q$  are the credit-weighted average of the macro, firm and bank components defined in subsection 3.3.  $\Delta GDP_q$  is the growth rate of the real GDP of the non-financial sector. Data on GDP comes from the French National Statistical Institute (Insee). Credit data comes from an extraction of the French credit registry and covers the period from 1999-Q1 to 2016-Q4. Public banks, financial firms and self-employed entrepreneurs are excluded. In order to use the decomposition displayed above, single-bank firms and banks with less than 100 multiple-bank firms are removed from the aggregation. Standard errors are obtained by applying block-bootstrap with 1000 replications and a block length of 4 observations.

**Table 3.5 – Contribution of top borrowers.**

	$Share(Firm_q^*, Z)$	$\bar{\mu}_s \rho_s Share(X, Z)$			
		0 – 95	95 – 99	99 – Top100	Top100
$Z = \Delta GDP_{q-5}$	0.343** (0.028)	0.046** (0.020)	0.014 (0.309)	0.055** (0.033)	0.227** (0.030)
$Z = \Delta GDP_{q-4}$	0.369** (0.014)	0.054*** (0.009)	0.010 (0.448)	0.034*** (0.010)	0.270*** (0.004)
$Z = \Delta GDP_{q-3}$	0.327** (0.041)	0.055*** (0.006)	0.005 (0.742)	0.003** (0.033)	0.263*** (0.010)
$Z = \Delta GDP_{q-2}$	0.268 (0.208)	0.052** (0.015)	0.002 (0.899)	-0.023 (0.214)	0.236* (0.071)
$Z = \Delta GDP_{q-1}$	0.144 (0.526)	0.044** (0.025)	0.000 (0.989)	-0.048 (0.569)	0.148 (0.363)
$Z = \Delta GDP_q$	0.001 (0.996)	0.031* (0.083)	0.001 (0.981)	-0.066 (0.924)	0.035 (0.801)
Observations	68				

The table presents the results of the decomposition  $Share(Firm_q^*, \Delta GDP_{q-k}) = \sum_{s=1}^S \bar{\mu}_s \rho_s Share(Firm_q^s, \Delta GDP_{q-k})$ .  $Share(X_q, \Delta GDP_{q-k})$  is defined as  $\pi^{Firm,*} \cdot Corr(X_q, \Delta GDP_{q-k})$ ,  $\pi^{Firm,*}$  is the ratio of the standard deviation of  $Firm_q^*$  to the standard deviation of  $\Delta Credit_t$ ,  $s$  is a size bucket of borrowers,  $Firm_q^s$  is the credit-weighted sum of firm components for borrowers in size bucket  $s$ ,  $\bar{\mu}_s$  is the average weight of  $s$  in total credit and  $\rho_s$  is the ratio of the standard deviation of  $Firm_q^s$  to the standard deviation of  $Firm_q^*$ .  $k$  is an integer between 0 and 5.  $\Delta GDP_q$  is the growth rate of the real GDP of the non-financial sector. Data on GDP comes from the French National Statistical Institute (Insee). Credit data comes from an extraction of the French credit registry and covers the period from 1999-Q1 to 2016-Q4. Public banks, financial firms and self-employed entrepreneurs are excluded. Single-bank firms and banks with less than 100 multiple-bank firms are also removed from the aggregation. Standard errors are obtained by applying block-bootstrap with 1000 replications and a block length of 4 observations.

**Figure 3.10 – Illustration of the role of granularity.**



The figure compares the contribution in total credit and in the cyclical credit of different size buckets of borrowers. The  $x$ -axis corresponds to size buckets of borrowers. "0-95", for instance, regroups all firms below the 95th percentile of the credit distribution. Dark grey bars give the ratio (in percentage) of total credit for a given size bucket to total credit (averaged over the time period). Light grey bars then give the ratio of  $Share(Firm_q^s, \Delta GDP_{q-4})$  to  $Share(Firm_q^*, \Delta GDP_{q-4})$ . Firms in the "0-95" size bucket, therefore, represent on average 31% of total credit and 14% of the correlation between  $Firm_q^*$  and  $\Delta GDP_{q-4}$ .  $Share(X_q, \Delta GDP_{q-4})$  is defined as  $\pi^{Firm,*} \cdot Corr(X_q, \Delta GDP_{q-4})$  where  $\pi^{Firm,*}$  is the ratio of the standard deviation of  $Firm_q^*$  to the standard deviation of  $\Delta Credit_q$ . It can be decomposed

as  $Share(Firm_q^*, \Delta GDP_{q-4}) = \sum_{s=1}^S \bar{\mu}_s \rho_s Share(Firm_q^s, \Delta GDP_{q-4})$  where  $s$  is a size bucket of borrowers,  $Firm_{sq}$  is the credit-weighted sum of firm components for borrowers in size bucket  $s$ ,  $\bar{\mu}_s$  is the average weight of  $s$  in total credit and  $\rho_s$  is the ratio of the standard deviation of  $Firm_q^s$  to the standard deviation of  $Firm_q^*$ .  $\Delta GDP_{q-4}$  is the growth rate of the real GDP of the non-financial sector lagged by one year. Data on GDP comes from the French National Statistical Institute (Insee). Credit data comes from an extraction of the French credit registry and covers the period from 1999-Q1 to 2016-Q4. Public banks, financial firms and self-employed entrepreneurs are excluded. Single-bank firms and banks with less than 100 multiple-bank firms are also removed from the aggregation.

**Table 3.5 – Robustness checks I - Normalization, firm-bank relationships.**

	$Corr(\Delta Credit_q, Z)$	$Share(Macro_q, Z)$	$Share(Banks_q, Z)$	$Share(Firms_q, Z)$
Median, 2 banks, 100 firms (baseline)				
$Z = \Delta GDP_{q-4}$	0.494*** (0.174)	0.080 (0.081)	0.016 (0.105)	0.398*** (0.162)
Mean, 2 banks, 100 firms				
$Z = \Delta GDP_{q-4}$	0.494*** (0.174)	0.223 (0.142)	0.051 (0.115)	0.220* (0.128)
Median, 2 banks, 10 firms				
$Z = \Delta GDP_{q-4}$	0.553*** (0.160)	0.105** (0.049)	0.066 (0.059)	0.381*** (0.156)
Median, 4 banks, 100 firms				
$Z = \Delta GDP_{q-4}$	0.439*** (0.170)	-0.012 (0.068)	0.073** (0.033)	0.377*** (0.124)
Observations	68			

This table reports for each specification the decomposition of the correlation between the credit growth rate and the four-quarter lag of the GDP growth rate. The top panel displays the decomposition obtained with the baseline specification. The baseline decomposition is obtained by (i) setting the median of the shocks at zero, (ii) keeping only firms with two banking relationships in a given quarter and (iii) keeping only banks with at least 100 relationships in a given quarter. In the second panel, both bank and firm idiosyncratic components are defined as deviations to the mean. The third panel shows the results of the decomposition when imposing a minimum number of borrowers by bank of 10 firms. In the fourth panel, the minimum required level of banking relationships for firms is set to 4 banks.  $\Delta GDP_q$  is the growth rate of the real GDP of the non-financial sector. Data on GDP comes from the French National Statistical Institute (Insee). Credit data comes from an extraction of the French credit registry and covers the period from 1999-Q1 to 2016-Q4. Public banks, financial firms and self-employed entrepreneurs are excluded. Single-bank firms are also removed from the aggregation. Standard errors are obtained by applying block-bootstrap with 1000 replications and a block length of 4 observations.

**Table 3.6 – Robustness checks II - Coverage, unit of observation.**

	<i>Corr</i> ( $\Delta\text{Credit}_q, Z$ )	<i>Share</i> ( <i>Macro</i> <sub>q</sub> , Z)	<i>Share</i> ( <i>Banks</i> <sub>q</sub> , Z)	<i>Share</i> ( <i>Firms</i> <sub>q</sub> , Z)
Baseline				
$Z = \Delta\text{GDP}_{q-4}$	0.494*** (0.174)	0.080 (0.081)	0.016 (0.105)	0.398*** (0.162)
Only French banks				
$Z = \Delta\text{GDP}_{q-4}$	0.469*** (0.179)	0.113 (0.077)	-0.050 (0.106)	0.406*** (0.166)
Without housing sector				
$Z = \Delta\text{GDP}_{q-4}$	0.512*** (0.171)	0.068 (0.079)	0.057 (0.091)	0.387*** (0.139)
Banking group				
$Z = \Delta\text{GDP}_{q-4}$	0.511*** (0.173)	0.128 (0.089)	-0.033 (0.073)	0.415*** (0.158)
Wholesale banks and retail banks				
$Z = \Delta\text{GDP}_{q-4}$	0.483*** (0.187)	0.103* (0.056)	0.060 (0.091)	0.321* (0.170)
Observations	68			

This table reports for each specification the decomposition of the correlation between the credit growth rate and the four-quarter lag of the GDP growth rate. The top panel displays the decomposition obtained with the baseline specification. In the second and third panels, we respectively remove foreign banks and borrowers belonging to the housing sector from the data set. In the fourth panel, banks are consolidated at the level of the banking group. In the fifth panel, each bank is divided in a retail bank (which lends to small borrowers) and in a wholesale bank (which lends to large ones). A borrower is classified as being small (large) if it borrows less (more) than the bank-level average. Data on GDP comes from the French National Statistical Institute (Insee). Credit data comes from an extraction of the French credit registry and covers the period from 1999-Q1 to 2016-Q4. Public banks, financial firms and self-employed entrepreneurs are excluded. Single-bank firms are also removed from the aggregation. Standard errors are obtained by applying block-bootstrap with 1000 replications and a block length of 4 observations.

**Table 3.7 – Robustness checks III - Definition of firm idiosyncratic shocks.**

	Baseline	Industry	Risk	Sales	Location	Cell
	<i>Share(Firm<sub>q</sub>, Z)</i>					
$Z = \Delta GDP_{q-5}$	0.370** (0.024)	0.320** (0.038)	0.319** (0.042)	0.264** (0.028)	0.363** (0.023)	0.284** (0.011)
$Z = \Delta GDP_{q-4}$	0.398*** (0.009)	0.349** (0.013)	0.331** (0.028)	0.315*** (0.009)	0.393*** (0.006)	0.307*** (0.006)
$Z = \Delta GDP_{q-3}$	0.350** (0.033)	0.314** (0.035)	0.271* (0.088)	0.322** (0.011)	0.343** (0.026)	0.271** (0.011)
$Z = \Delta GDP_{q-2}$	0.283 (0.216)	0.260 (0.195)	0.203 (0.332)	0.312** (0.021)	0.278 (0.197)	0.223* (0.097)
$Z = \Delta GDP_{q-1}$	0.147 (0.550)	0.138 (0.512)	0.074 (0.732)	0.239 (0.143)	0.139 (0.553)	0.117 (0.469)
$Z = \Delta GDP_q$	-0.010 (0.970)	-0.006 (0.981)	-0.068 (0.737)	0.137 (0.382)	-0.019 (0.938)	-0.005 (0.977)
Observations	68					

This table reports the correlations between  $\Delta GDP_{q-k}$  and the different time series of  $Firm_q$  obtained with alternative definitions of idiosyncratic shocks. The first column gives the results with the baseline definition (deviation to the unconditional median). In the following columns, we use as alternative definition of idiosyncratic shocks the deviation to the conditional median. We successively take the median by industry, credit score category, size category, administrative division ("département") and by the category defined by the intersection of all the precedent variables ("cell").  $k$  is an integer between 0 and 5. Data on GDP comes from the French National Statistical Institute (Insee). Credit data comes from an extraction of the French credit registry and covers the period from 1999-Q1 to 2016-Q4. Public banks, financial firms and self-employed entrepreneurs are excluded. Single-bank firms are also removed from the aggregation. Standard errors are obtained by applying block-bootstrap with 1000 replications and a block length of 4 observations.



**Table 3.8 – Robustness checks IV - OLS regression.**

	$Corr(\Delta Credit_q, Z)$	$Share(Macro_q, Z)$	$Share(Banks_q, Z)$	$Share(Firms_q, Z)$	$Share(Match_q, Z)$
$Z = \Delta GDP_{q-5}$	0.440** (0.186)	0.079 (0.080)	0.000 (0.123)	0.377* (0.240)	-0.015 (0.103)
$Z = \Delta GDP_{q-4}$	0.494*** (0.174)	0.083 (0.082)	0.023 (0.115)	0.343* (0.220)	0.045 (0.102)
$Z = \Delta GDP_{q-3}$	0.462*** (0.180)	0.089 (0.081)	0.036 (0.115)	0.221 (0.256)	0.116 (0.107)
$Z = \Delta GDP_{q-2}$	0.404* (0.225)	0.097 (0.078)	0.037 (0.116)	0.098 (0.329)	0.171 (0.110)
$Z = \Delta GDP_{q-1}$	0.256 (0.278)	0.102 (0.075)	0.024 (0.117)	-0.076 (0.394)	0.207* (0.113)
$Z = \Delta GDP_q$	0.071 (0.315)	0.096 (0.070)	0.007 (0.115)	-0.240 (0.419)	0.208* (0.113)
Observations	68				

The table presents the results of the decomposition  $Corr(\Delta Credit_q, \Delta GDP_{q-k}) = Share(Macro_q, \Delta GDP_{q-k}) + Share(Bank_q, \Delta GDP_{q-k}) + Share(Firm_q, \Delta GDP_{q-k}) + Share(Match_q, \Delta GDP_{q-k})$  where  $Share(X_q, \Delta GDP_{q-k}) = \pi^X \cdot Corr(X_q, \Delta GDP_{q-k})$  and  $\pi^X$  is the ratio of the standard deviation of  $X_q$  to the standard deviation of  $\Delta Credit_q$ .  $k$  is an integer between 0 and 5.  $Macro_q$ ,  $Firm_q$  and  $Bank_q$  are the credit-weighted average of the macro, firm and bank components obtained from the OLS estimation of  $\Delta Credit_{fbq} = \alpha_{fq} + \beta_{bq} + \epsilon_{fbq}$ .  $Match_q$  is the credit-weighted average of the residual  $\epsilon_{fbq}$ .  $\Delta GDP_{q-k}$  is the growth rate of the real GDP of the non-financial sector, lagged by  $k$  quarters. Data on GDP comes from the French National Statistical Institute (Insee). Credit data comes from an extraction of the French credit registry and covers the period from 1999-Q1 to 2016-Q4. Public banks, financial firms and self-employed entrepreneurs are excluded. In order to use the decomposition displayed above, single-bank firms and banks with less than 100 multiple-bank firms are removed from the aggregation. Standard errors are obtained by applying block-bootstrap with 1000 replications and a block length of 4 observations.

**Table 3.8 – Including single-bank firms : out-of-sample test.**

	Dependent variable: $\Delta Credit_q^{agg}$	
	Median	Mean
<i>Macro<sub>q</sub></i>	1.296*** (0.248)	1.153*** (0.095)
<i>Bank<sub>q</sub></i>	0.118 1.276*** (0.226)	0.293 1.190*** (0.099)
<i>Firm<sub>q</sub></i>	0.024 0.771*** (0.064)	0.069 0.699*** (0.049)
	0.350	0.176
Residual	.11	.063
Total	.601	.601
Observations	68	68
R2	0.913	0.934

This table presents the decomposition of the cyclicity of aggregate credit when including the entire population of borrowers. In a first step, we compute the mid-point growth rate  $\Delta Credit_q^{agg}$  of aggregate long-term credit obtained before restricting our observations to the connected set (this time series therefore include single-bank firms). We then regress  $\Delta Credit_q^{agg}$  on the time series *Macro<sub>q</sub>*, *Bank<sub>q</sub>* and *Firm<sub>q</sub>* obtained from equation 3.6. The table presents the estimated coefficients and standard errors obtained with the baseline specification and by defining idiosyncratic shocks as the deviation to the mean. In a second step, we use the estimated coefficients to compute the contribution of each of the three terms to the correlation of  $\Delta Credit_q^{agg}$  with  $\Delta GDP_{q-4}$ . The total correlation is given in the bottom of the table. The respective contributions of each component are displayed below the standard errors of the coefficients. There is a fourth term in the decomposition which reflects the comovement of the estimated error term with the business cycle (displayed in the "Residual" line).  $\Delta GDP_{q-k}$  is the growth rate of the real GDP of the non-financial sector, lagged by k quarters. Data on GDP comes from the French National Statistical Institute (Insee). Credit data comes from an extraction of the French credit registry and covers the period from 1999-Q1 to 2016-Q4. Public banks, financial firms and self-employed entrepreneurs are excluded. In order to use the decomposition displayed above, single-bank firms and banks with less than 100 multiple-bank firms are removed from the aggregation. Standard errors are obtained by applying block-bootstrap with 1000 replications and a block length of 4 observations.

**Table 3.9 – Bank exposure to borrower liquidity shocks.**

Normalization:	Median		Median by cell	
	Variance	S.E.	Variance	S.E.
No $Macro_{bq}$	0.678	(0.093)	0.515	(0.090)
No $Bank_{bq}$	0.532	(0.045)	0.532	(0.045)
No $Firm_{bq}$	0.513	(0.128)	0.608	(0.188)
No $Firm_{bq}^{Top 10}$	0.421	(0.097)	0.585	(0.162)
$\Delta Credit_{bq}$	0.746	(0.113)	0.746	(0.113)

The table presents the results of the decomposition of bank-level variations of credit lines:  $\Delta Credit_{bq} = Macro_q + \tilde{\beta}_{bq} + \sum w(b)_{fq} \tilde{\alpha}_{fq} = Macro_q + Bank_{bq} + Firm_{bq}$ . We compute for each bank the variance of the counterfactual time series of credit lines variations if  $Firm_{bq}$  was constantly equal to zero. In a second step, we compute the average across banks of the resulting variances (No  $Firm_{bq}$ ) that we compare to the average variance of the original  $\Delta Credit_{bq}$  time series ( $\Delta Credit_{bq}$ ). We do the same counterfactual exercise by setting successively  $Macro_q$ ,  $Bank_{bq}$  and the weighted sum of firm components for the top 10 borrowers  $Firm_{bq}^{Top 10}$  to zero. Standard errors are reported between parentheses. The first column presents the results using the baseline definition of idiosyncratic shocks (deviation to the median). In the second column, idiosyncratic shocks are defined as deviations to the median by cell. A cell is defined as the intersection of an industry, a credit score category, a size category, and an administrative division ("département"). Credit data comes from an extraction of the French credit registry and covers the period from 2008-Q1 to 2016-Q4. Banks are consolidated at the level of the banking group. Only the six largest banking groups are retained. Financial firms and self-employed entrepreneurs are excluded. Credit lines are defined as the sum of all undrawn commitments (including documentary credit).

**Table 3.9 – The systemic role of borrower idiosyncratic shocks.**

Normalization:	Variance	
	Median	Median by cell
$Firm_q^*$	0.346	0.213
$Direct_q$	0.080	0.053
$Link_q$	0.266	0.160
$\Delta Credit_q$	0.410	0.410

The table presents the results of the decomposition of the aggregate variance of credit lines:  $Var(Firm_q^*) = Direct_q + Link_q$ . The first column presents the results of the decomposition using the baseline definition of idiosyncratic shocks (deviation to the median). In the second column, idiosyncratic shocks are defined as deviations to the median by cell. A cell is defined as the intersection of an industry, a credit score category, a size category, and an administrative division ("département"). Both columns also display the variance of aggregate credit lines. Credit data comes from an extraction of the French credit registry and covers the period from 2008-Q1 to 2016-Q4. Banks are consolidated at the level of the banking group. Only the six largest banking groups are retained. Financial firms and self-employed entrepreneurs are excluded. Credit lines are defined as the sum of all undrawn commitments (including documentary credit).

## 8 Bibliography

- Acharya, Viral V, and Nada Mora.** 2015. “A crisis of banks as liquidity providers.” *The Journal of Finance*, 70(1): 1–43.
- Acharya, Viral V, Heitor Almeida, and Murillo Campello.** 2013. “Aggregate risk and the choice between cash and lines of credit.” *The Journal of Finance*, 68(5): 2059–2116.
- Alfaro, Laura, Manuel García-Santana, and Enrique Moral-Benito.** 2019. “On the direct and indirect real effects of credit supply shocks.” NBER Working Paper.
- Amiti, Mary, and David E Weinstein.** 2018. “How much do idiosyncratic bank shocks affect investment? Evidence from matched bank-firm loan data.” *Journal of Political Economy*, 126(2): 525–587.
- Barrot, Jean-Noël, and Julien Sauvagnat.** 2016. “Input specificity and the propagation of idiosyncratic shocks in production networks.” *The Quarterly Journal of Economics*, 131(3): 1543–1592.
- Begenau, Juliane, and Juliana Salomao.** 2018. “Firm Financing over the Business Cycle.” *The Review of Financial Studies*.
- Behn, Markus, Rainer Haselmann, and Paul Wachtel.** 2016. “Procyclical capital regulation and lending.” *The Journal of Finance*, 71(2): 919–956.
- Ben-David, Itzhak, Francesco Franzoni, Rabih Moussawi, John Sedunov, et al.** 2019. “The Granular Nature of Large Institutional Investors.” CEPR Discussion Papers.
- Bernanke, Ben, Mark Gertler, and Simon Gilchrist.** 1996. “The financial accelerator and the flight to quality.” *Review of Economics and Statistics*, 78(1): 1–15.
- Bord, Vitaly M, and João AC Santos.** 2014. “Banks’ liquidity and the cost of liquidity to corporations.” *Journal of Money, Credit and Banking*, 46(s1): 13–45.
- Bremus, Franziska, and Claudia M Buch.** 2017. “Granularity in banking and growth: Does financial openness matter?” *Journal of Banking & Finance*, 77: 300–316.
- Bremus, Franziska, Claudia M Buch, Katheryn N Russ, and Monika Schnitzer.** 2018. “Big Banks and Macroeconomic Outcomes: Theory and Cross-Country Evidence of Granularity.” *Journal of Money, Credit and Banking*, 50(8): 1785–1825.
- Buch, Claudia M, and Katja Neugebauer.** 2011. “Bank-specific shocks and the real economy.” *Journal of Banking & Finance*, 35(8): 2179–2187.
- Cahn, Christophe, Mattia Girotti, and Federica Salvade.** 2018. “Coarse Credit Ratings, Corporate Financing, and Real Outcomes.” Banque de France Working Paper.
- Carletti, Elena, Filippo De Marco, Vasso Ioannidou, and Enrico Sette.** 2019. “Banks as Patient Lenders: Evidence from a Tax Reform.” Working Paper.
- Carvalho, Vasco M, and Basile Grassi.** 2019. “Large Firm Dynamics and the Business Cycle.” *American Economic Review*.
- Chari, Varadarajan V, Patrick J Kehoe, and Ellen R McGrattan.** 2007. “Business cycle accounting.” *Econometrica*, 75(3): 781–836.
- Chodorow-Reich, Gabriel.** 2014. “The employment effects of credit market disruptions: Firm-level evidence from the 2008–9 financial crisis.” *The Quarterly Journal of Economics*, 129(1): 1–59.

- Cornett, Marcia Millon, Jamie John McNutt, Philip E Strahan, and Hassan Tehranian.** 2011. “Liquidity risk management and credit supply in the financial crisis.” *Journal of Financial Economics*, 101(2): 297–312.
- Covas, Francisco, and Wouter J Den Haan.** 2011. “The cyclical behavior of debt and equity finance.” *American Economic Review*, 101(2): 877–99.
- Crouzet, Nicolas, and Neil R Mehrotra.** 2019. “Small and Large Firms over the Business Cycle.” NBER Working Paper.
- Davis, Steven J, John Haltiwanger, and Scott Schuh.** 1996. “Small business and job creation: Dissecting the myth and reassessing the facts.” *Small Business Economics*, 8(4): 297–315.
- Degryse, Hans, Olivier De Jonghe, Sanja Jakovljević, Klaas Mulier, and Glenn Schepens.** forthcoming. “Identifying credit supply shocks with bank-firm data: Methods and applications.” *Journal of Financial Intermediation*.
- Di Giovanni, Julian, Andrei A Levchenko, and Isabelle Mejean.** 2014. “Firms, destinations, and aggregate fluctuations.” *Econometrica*, 82(4): 1303–1340.
- Di Giovanni, Julian, Andrei A Levchenko, and Isabelle Mejean.** 2017. “Large firms and international business cycle comovement.” *American Economic Review*, 107(5): 598–602.
- Di Giovanni, Julian, Andrei A Levchenko, and Isabelle Mejean.** 2018. “The micro origins of international business-cycle comovement.” *American Economic Review*, 108(1): 82–108.
- Eisfeldt, Andrea L, and Tyler Muir.** 2016. “Aggregate external financing and savings waves.” *Journal of Monetary Economics*, 84: 116–133.
- Fraisse, Henri, Mathias Lé, and David Thesmar.** forthcoming. “The real effects of bank capital requirements.” *Management Science*.
- Gabaix, Xavier.** 2011. “The granular origins of aggregate fluctuations.” *Econometrica*, 79(3): 733–772.
- Gabaix, Xavier, and Ralph SJ Koijen.** 2019. “Granular Instrumental Variables.” NBER Working Paper.
- Gatev, Evan, and Philip E Strahan.** 2006. “Banks’ advantage in hedging liquidity risk: Theory and evidence from the commercial paper market.” *The Journal of Finance*, 61(2): 867–892.
- Gaubert, Cecile, and Oleg Itskhoki.** 2018. “Granular comparative advantage.” NBER Working Paper.
- Gertler, Mark, and Simon Gilchrist.** 1994. “Monetary policy, business cycles, and the behavior of small manufacturing firms.” *The Quarterly Journal of Economics*, 109(2): 309–340.
- Greenwood, Robin, and David Thesmar.** 2011. “Stock price fragility.” *Journal of Financial Economics*, 102(3): 471–490.
- Herskovic, Bernard.** 2018. “Networks in production: Asset pricing implications.” *The Journal of Finance*, 73(4): 1785–1818.
- Holmström, Bengt, and Jean Tirole.** 1998. “Private and public supply of liquidity.” *Journal of Political Economy*, 106(1): 1–40.
- Ippolito, Filippo, José-Luis Peydró, Andrea Polo, and Enrico Sette.** 2016. “Double bank runs and liquidity risk management.” *Journal of Financial Economics*, 122(1): 135–154.
- Ivashina, Victoria, and David Scharfstein.** 2010. “Bank lending during the financial crisis of 2008.” *Journal of Financial Economics*, 97(3): 319–338.

- Iyer, Rajkamal, José-Luis Peydró, Samuel da Rocha-Lopes, and Antoinette Schoar.** 2013. “Interbank liquidity crunch and the firm credit crunch: Evidence from the 2007–2009 crisis.” *The Review of Financial Studies*, 27(1): 347–372.
- Jermann, Urban, and Vincenzo Quadrini.** 2012. “Macroeconomic effects of financial shocks.” *American Economic Review*, 102(1): 238–71.
- Jiménez, Gabriel, Steven Ongena, José-Luis Peydró, and Jesús Saurina.** 2014. “Hazardous times for monetary policy: What do twenty-three million bank loans say about the effects of monetary policy on credit risk-taking?” *Econometrica*, 82(2): 463–505.
- Jiménez, Gabriel, Steven Ongena, José-Luis Peydró, and Jesús Saurina.** 2017. “Macroprudential policy, countercyclical bank capital buffers, and credit supply: evidence from the Spanish dynamic provisioning experiments.” *Journal of Political Economy*, 125(6): 2126–2177.
- Justiniano, Alejandro, Giorgio E Primiceri, and Andrea Tambalotti.** 2010. “Investment shocks and business cycles.” *Journal of Monetary Economics*, 57(2): 132–145.
- Kashyap, Anil K, Raghuram Rajan, and Jeremy C Stein.** 2002. “Banks as liquidity providers: An explanation for the coexistence of lending and deposit-taking.” *The Journal of Finance*, 57(1): 33–73.
- Khwaja, Asim Ijaz, and Atif Mian.** 2008. “Tracing the impact of bank liquidity shocks: Evidence from an emerging market.” *American Economic Review*, 98(4): 1413–42.
- Kiyotaki, Nobuhiro, and John Moore.** 1997. “Credit cycles.” *Journal of Political Economy*, 105(2): 211–248.
- Kramarz, Francis, Julien Martin, and Isabelle Mejean.** 2019. “Volatility in the Small and in the Large: The Lack of Diversification in International Trade.” CREST Working Paper.
- Kunsch, Hans R.** 1989. “The jackknife and the bootstrap for general stationary observations.” *The Annals of Statistics*, 1217–1241.
- Mian, Atif, and Amir Sufi.** 2014. “What explains the 2007–2009 drop in employment?” *Econometrica*, 82(6): 2197–2223.
- Olley, G Steven, and Ariel Pakes.** 1996. “The Dynamics of Productivity in the Telecommunications Equipment Industry.” *Econometrica*, 64(6): 1263–1297.
- Paravisini, Daniel.** 2008. “Local bank financial constraints and firm access to external finance.” *The Journal of Finance*, 63(5): 2161–2193.
- Paravisini, Daniel, Veronica Rappoport, and Philipp Schnabl.** 2017. “Specialization in bank lending: Evidence from exporting firms.” NBER Working Paper.
- Siriwardane, Emil.** forthcoming. “Limited investment capital and credit spreads.” *The Journal of Finance*.
- Smets, Frank, and Rafael Wouters.** 2007. “Shocks and frictions in US business cycles: A Bayesian DSGE approach.” *American Economic Review*, 97(3): 586–606.

## **Chapter 4**

# **Build or Buy? Human Capital and Corporate Diversification**

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### **Abstract**

Why do some firms enter a new sector by acquiring an existing company (“buy”), while others do so using their existing resources (“build”)? Using a novel data set constructed by merging French employer payrolls with commercial M&A data sets, we show that firms are more likely to buy when their existing workforce does not include skills needed in the sector of entry. This relationship is more pronounced when labor market frictions make it difficult to hire key workers. Firms that enter by building realize lower entry sales when their existing workforce is not adapted to the sector of entry, especially in the presence of labor market frictions. Our results suggest that firms buy to acquire their targets’ human capital when adapting their existing workforce is too costly.

# 1 Introduction

In 2017, more than twelve thousand cross-industry merger and acquisition (M&A) deals occurred worldwide for a total value of more than 900 billions of dollars.<sup>1</sup> Cross-industry M&As allow firms to diversify, to obtain specific assets and access new markets.<sup>2</sup> However, the magnitude of these figures can be misleading, concealing the fact that most diversifications result from firms entering new sectors directly by building on their existing capabilities. Why do some firms enter a new sector by acquiring an existing company (“buy”), while others do so using their existing resources (“build”)? This question has major implications for understanding the role played by M&As in the reallocation of resources in the economy.

In this paper, we compare firms that enter a new sector by building on existing resources (“build”) to firms that acquire an already existing company operating in the sector of entry (“buy”). We focus on the role of human capital as a key resource to successfully operate in the new sector. Although our analysis applies to other assets, the availability of employee-level information and the existence of specific labor market frictions motivate our focus on human capital. We study the costs and benefits associated with each alternative. When a firm buys to enter a new sector, it has to incur both the costs of acquiring and restructuring the target, but gets access to its productive resources.<sup>3</sup> When a firm builds on its existing resources to enter a new sector, it faces the search costs of hiring new workers to complement its existing workforce.<sup>4</sup> Therefore, the more key workers in a firm’s existing workforce, the lower the adjustment costs to the new sector and the more profitable it is for the firm to build.

We find that firms that have a workforce more adapted to the sector of entry are more likely to

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<sup>1</sup>Cross-sector M&As represent about 30% of the universe of M&A deals both in frequency and in volume. See KPMG M&A Predictor 2018 Annual Report.

<sup>2</sup>The motivations behind horizontal M&As are different and relate mostly to market power consolidation (see e.g., Eckbo, 1983; Farrell and Shapiro, 1990).

<sup>3</sup>Maksimovic, Phillips and Prabhala (2011) shows that acquiring firms enter a costly restructuring process and sell or close 46% of the plants they buy.

<sup>4</sup>Hiring costs have been estimated to be between one and two quarters of wage payments, and increasing in the specificity of skills (Abowd and Kramarz, 2003; Blatter, Muehleemann and Schenker, 2012).



“build” rather than to “buy”. The relation between internal human capital and the mode of entry in a new sector is stronger when specific skills are difficult to obtain on the external job market, i.e., when key worker occupations are in short supply. Firms that build have lower entry sales when their workforce is not adapted to the sector of entry, and especially when key workers are in short supply. These findings are consistent with the idea that firms must search for key assets to expand into a new sector. When search costs increase, buying an existing firm becomes relatively more attractive than building from scratch and hiring new workers.<sup>5</sup>

One key challenge to test this hypothesis consists in defining human capital and measuring it at the firm level. Human capital is neither directly observable nor easily defined. To overcome this difficulty, we propose a measure based on a model of diversification with endogenous choice of teams. In the model, the firm hires workers from different occupations that differ in their sector-specific skills. If the firm decides to build, it can draw workers from its existing pool of workers (internal labor market) or from the external job market. Instead if the firm decides to buy, it can pick workers in the workforce of the acquired firm but has to pay the fixed costs of acquiring another firm. The model draws two predictions. First, in equilibrium, the firm chooses to build when its existing *internal human capital* is adapted to operate in the sector of entry. Instead, the firm buys when its workforce does not include the key worker occupations needed to operate in the sector of entry, and this despite restructuring costs. Second, the relationship between human capital and the decision to build or buy is stronger when it is difficult to hire key workers in the external job market.

The model yields a firm-level measure of human capital that stems from the relation between the fraction of the wage bill that goes to a given type of workers and the contribution of these workers to the firm’s output. Empirically, we construct our measure of human capital in two steps.

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<sup>5</sup>Cisco’s acquisition strategy illustrates this trade-off. In 1997, a Cisco analyst described the strategy of the firm as follows: “in today’s economy, building work teams from scratch can be yesterday’s luxury. So, when you can’t build fast enough, you buy”. By 2017, Cisco had undertaken more than 200 M&As to “provide a capability, acceleration potential or earlier sectoral entry compared to partnering or developing in-house” (Wysocki, 1997; Romanski, 2017).

First, we use the matched employer-employee dataset from France. In the spirit of Abowd, Kramarz and Margolis (1999), we regress the (log) fraction of the wage bills of all firms in a sector that goes to a given occupation, on occupation  $\times$  sector fixed effects. We interpret the occupation  $\times$  sector fixed effects estimates as a score reflecting the sector-specific human capital of worker occupations. The higher the fixed effect of a given occupation in a sector, the larger the *average* share of the firms' wage bill that goes to the corresponding worker type in the sector. Second, we compute human capital at the firm level. Firm's internal human capital is the average of the (exponentiated) occupation  $\times$  sector fixed effects present in the firm's workforce and the sector of entry. Our measure of human capital captures the extent to which the existing workforce is adapted to the sector of entry.<sup>6</sup>

Our measure of human capital has several advantages. First, because the French matched employer-employee dataset contains a detailed occupation code at the individual level, our measure of human capital encompasses various determinants of individuals' human capital, including skills, education and experience (Becker, 1962; Gibbons and Waldman, 2004; Autor and Dorn, 2009). Second, the fixed effects strategy allows to rank occupations within sector following their contribution to firms' outputs. Third, our measure of human capital does not reflect firm-level personnel policies or influence of unions that may alter the returns to observable and unobservable dimensions of human capital.

Another empirical challenge of our paper is to identify how firms diversify. We use the firms' detailed breakdown of sales across sectors to identify entries in new sectors.<sup>7</sup> A firm enters a new sector if (i) at least one of its subsidiary starts selling in the new sector (ii) none of the other subsidiaries controlled by the same ultimate owner operates in the sector of entry. We identify buy entries by linking M&A deals retrieved from SDC Platinum and Bureau van Dijk Zephyr to

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<sup>6</sup>Thereafter, we refer to this variable as "internal human capital" without mentioning that it is specific to the sector of entry.

<sup>7</sup>The firms' detailed breakdown of sales across sectors is available in the ESA survey, also maintained by the French Bureau of Statistics (Insee). In our main analysis, we define sectors as a 5-digit code of the French SIC.

the French administrative data.<sup>8</sup> The entry is a “buy” if the subsidiary which starts selling in the new sector has been acquired by the firm. By contrast, a firm “builds” if the entry is made through an existing subsidiary. Our final data set consists of 75,000 build or buy decisions in France from 2003 to 2014.

We provide the first cross-industry statistics on firms’ decisions to build or buy. We find that 98% of entries in a new sector consisted of building firms, or 90% when weighting by entry sales. On average, firms invest a million euros at the time of entry, and about half of the firms in our sample continue to operate in the sector of entry after a year. Median (mean) entry sales are equal to 270 thousands euros (2.8 millions euros).

We test whether firms’ existing workforce composition explain to their decision to build or buy. We compare firms that operate within the same sector of origin, diversify within the same sector of entry, the same year. This specification neutralizes potential unobservable time-varying synergies between the sector of entry and that of origin. We find that firms are more likely to buy when their human capital is not adapted to the sector of entry. A one standard deviation lower human capital is associated with an increase in the likelihood of buying by 1.1 percentage points. This relationship is sizeable, equal to 50% of the unconditional probability to buy. This finding holds when controlling for a wide variety of firm characteristics such as size, profitability, capital intensity, cash holdings and other assets.

We perform a battery of robustness tests on our definition of human capital and on its explanatory power on the firms’ decision to build or buy. First, we test alternative measures of human capital. We show that our findings are robust to using alternative weights to account for the exact composition of the workforce, to focusing on key occupations (highest fixed effects), to excluding CEOs, whose wages may not only reflect productivity but also agency conflicts, and to varying the unit of observation from firms to plants. Second, we exploit heterogeneity in the workforce composition

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<sup>8</sup>We develop a web-crawler that takes acquiring and target firms’ names and addresses, to link SDC Platinum and Zephyr deals to the French administrative data.

of subsidiaries within firm and we show that the entry into the new sector is more often made through the subsidiary that has the more adapted internal human capital, certainly to minimize internal labor market reallocation costs (Cestone et al., 2016). Third, we check that building firms with a low internal human capital hire relatively more new workers on the external job market than firms with a high preexisting internal human capital. Fourth, we investigate the effects of financial constraints on the decision to build or buy. We show that our results hold irrespective of the firm's size, cash holding levels and access to public markets. Fifth, we mitigate concerns related to complementarities between human and physical capital. A firm with a poorly adapted human capital is also likely to have inadequate physical capital (equipment, machinery, etc.). To isolate the role of human capital, we compare firms that invest similar amounts at the time of entry. We still find that firms are more likely to buy when their internal human capital is not adapted to the sector of entry.

In an additional set of robustness tests, we try to mitigate concerns relative to the joint decision to diversify and how to diversify. First, we investigate how the complementarities between the sector of entry and the sector of origin (e.g., production synergies, common customers) interacts with human capital relatedness. We build on Bloom, Schankerman and Van Reenen (2013) to construct a distance between firms' initial activities and the sector of entry.<sup>9</sup> We find that firms are more likely to buy rather than to build when it enters a distant sector. However, using interacted coefficients, we show that the magnitude of the human capital coefficient increases with the distance to the sector of entry. This finding suggests that buying is a more attractive option when the cost of building is high. Second, we focus on two plausible scenarii in which firms are likely to jointly select the sector of entry as well as the type of entry.<sup>10</sup> In a first scenario, a firm that operates in a

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<sup>9</sup>In the spirit of Bloom, Schankerman and Van Reenen (2013), the distance is based on firms' breakdown of sales. It measures the correlation between the product market portfolio of a firm prior to entry and product market portfolios of firms already operating in the sector. We are not able to replicate the Hoberg and Phillips (2010)'s product market distance, as this measure uses textual analysis on 10k filings of U.S. firms that are not available for the universe of French firms.

<sup>10</sup>A classic solution to address potential selection issues is to find variables that affect the selection stage in a sector but that are plausibly orthogonal to the main dependent variable. For instance, Tate and Yang (2016b) uses

declining sector may be willing to shift operations and to reallocate workers to a better performing sector (Tate and Yang, 2016*b*; Baghai et al., 2018). Thus, the firm would pick a sector in which it can easily redeploy its workforce. This scenario would lead to a positive association between the likelihood to build and the human capital of the firm. In a second scenario, a serial acquirer may always build irrespective of human capital considerations (Golubov, Yawson and Zhang, 2015). In additional set of tests, we exclude serial acquirers and firms that shift a substantial part of their operations in another sector. Our main results remain unchanged, which suggests a limited role for selection issues.

Our second key finding is that firms are more likely to buy when it is costly to hire key workers on the external job market, i.e., when key worker occupations are in short supply. We test this prediction using occupation-level data on local labor market (LLM) tightness obtained from the French unemployment agency (Pôle Emploi). The data reports worker occupations in short supply in 350 commuting zones. We document a wide geographic heterogeneity in worker availability across local labor markets (Moretti, 2010). We define a measure of LLM tightness as the human-capital weighted average of occupations in short supply in the zip code where the expanding firm enters. Our measure of LLM tightness takes higher values if key occupations for the sector of entry are in short supply in the LLM. We test whether the LLM tightness measure explains the build or buy decision and we interact it with the measure of human capital. We find that firms are more likely to buy when labor markets are tight, and that the relationship between human capital and the choice to build or buy is driven by the highest tercile of labor market tightness.

Finally, we explore the implications in terms of performance of firms that build on their own resources. In presence of tight labor markets, hiring is costly. Therefore, firms with less adapted human capital grow relatively more slowly in the sector of entry than firms with a highly adapted

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the Tobin's Q as an instrument in a two-stage Heckman selection model. Applied to our context, we would need to find an instrument that affects the choice to diversify but not the type of entry. In addition, this instrument must be sector-specific, as we would need to instrument not only the choice of diversification but the choice to diversify in a given sector. Finding such an instrument appears to be a difficult task, hence we choose to focus on specific scenarii in which selection issues could plausibly arise.

human capital. In particular, entry sales are smaller for firms with a less adapted internal human capital. Moreover, the results show that this relationship is driven by entries in tight LLMs. Taken together, these findings suggest that labor market frictions are crucial to understand the role of human capital in the decision to build or buy.

Our paper contributes to the literature on the determinants of the decision to build or buy across sectors. Very few papers have studied together these alternatives to diversify. McCardle and Viswanathan (1994) shows that firms enter a new sector through acquisition when barriers of entry are high.<sup>11</sup> Phillips and Zhdanov (2013) shows that in equilibrium small firms invest in R&D, whereas large firms buy those small firms that have successfully innovated. Finally, Bernard, Redding and Schott (2010) document that US multi-product firms often vary their product mix but infrequently through the acquisition of a new business line (7% of the cases). We contribute to this small strand of the literature by documenting that, at the scale of the French economy, more than 90% of the corporate diversifications are made by firms that build from scratch using their preexisting resources rather than buying an incumbent in the sector of entry.

Our paper also relates to the theory of the firm. In the finance literature, the dominant view has been the “property rights” theory (Grossman and Hart, 1986; Hart and Moore, 1990; Rhodes-Kropf and Robinson, 2008). Value is created by binding together complementary assets under the control of a single firm.<sup>12</sup> However, another view, popular in early economics and strategy literature (Capron and Mitchell, 2012, see), is gaining attention in the trade and international economics literature. The “resource-based” view of the firm states that the decision to grow depends on pre-

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<sup>11</sup>In the strategy literature, Yip (1982)’s findings support McCardle and Viswanathan (1994)’s theoretical findings and show that firms are more likely to enter internally (build) a sector with low barriers to entry. Lee and Lieberman (2010) finds that firms are more likely to buy unrelated product in the telecommunication industry. In the international economics literature, Nocke and Yeaple (2007) studies the choice of entering a new country by foreign direct investment or by acquiring an already existing company.

<sup>12</sup>Rhodes-Kropf and Robinson (2008) show that the search for complementarities implies the existence of an assortative matching between acquirers and target firms, i.e., “like buys like”. An important body of empirical M&A research has found evidence supporting this prediction: Mergers are more likely to occur and more value-creating when merging firms have similar human capital (Tate and Yang, 2016*b*; Lee, Mauer and Xu, 2018), sell similar products (Hoberg and Phillips, 2010), use similar technology (Bena and Li, 2014), or share similar corporate cultures (Li et al., 2018).

existing resources and on transferable capabilities (Penrose, 1955). Recent research has documented that firms are much more likely to produce in certain pairs of industries (see e.g., Bernard et al., 2007, 2018). Boehm, Dhingra and Morrow (2019) goes a step forward and shows that firms tend to co-produce in industries that require similar intermediate inputs. Our paper focuses on another type of input: labor and we show that firms are more likely to diversify by building on existing resources when it exists complementarities between the firm's internal human capital and key skills to produce in the new sector. Thus, our results imply that firms buy when they do not have the adequate inputs in house and even more, when these inputs are scarce on the external market.

Finally, our paper adds to the rapidly growing literature on labor and corporate finance.<sup>13</sup> More specifically, our paper is related to a strand of papers that link organization of firms and labor.<sup>14</sup> Tate and Yang (2016a) predicts diversified M&As by cross-industry labor flows, since human capital is transferable between these sectors. Ouimet and Zarutskie (2016) finds that firms that are likely to invest in labor tend to retain a larger fraction of skilled employees after the merger. Lee, Mauer and Xu (2018) finds that firms are more likely to merge and have better post-merger outcomes when the target firm has a related human capital. We make three contributions to this literature. First, we propose a firm-level measure of human capital that captures complementarities between sectors. Second, we show that internal human capital resources predict how firms diversify. Third, our results emphasize the role of labor market frictions in the link between human capital and M&A decisions. Taken together, we show that employment composition shapes the boundaries of the firm.

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<sup>13</sup>A growing literature has recently explored the implications of labor adjustment costs for the cross-section of expected returns (Eiling, 2013; Donangelo, 2014; Belo, Lin and Bazdresch, 2014; Kuehn, Simutin and Wang, 2017)), corporate investment (e.g., Merz and Yashiv, 2007; Xu, 2018; Bai, Fairhurst and Serfling, 2018) and capital structure decisions such as leverage (e.g., Matsa, 2010; Agrawal and Matsa, 2013; Simintzi, Vig and Volpin, 2014; Baghai et al., 2018; Serfling, 2016) and cash holdings (Ghaly, Anh Dang and Stathopoulos, 2017).

<sup>14</sup>Other papers study the consequences of organizational changes, such as M&As, on employment and wages (e.g., Lagaras, 2017; Ma, Ouimet and Simintzi, 2018).

## 2 Theoretical framework: “Build” or “Buy”?

Why do some firms enter a new sector by acquiring an existing company (“buy”), while others do so using their existing resources (“build”)? We propose a model that predicts firms’ decision to build or buy based on the adaptability of their workforce for the new sector.

### 2.1 Basic framework

**Costs and profits.** To enter a new sector, firms must develop new productive capacities, that is, combine additional inputs to produce in the new sector. In the model, we assume labor  $L$  is the only factor of production so the production function is  $Y = \mathcal{L}$ .<sup>15</sup> Firms can select workers from three different pools of workers. First, firms can reallocate workers from their *internal* labor market and have them produce in the new sector. Second, firms can hire new workers on the *external* labor market, that is, poach workers already employed or hire unemployed workers. Third, firms can *acquire* an existing company to have workers from the acquired firm produce in the new sector. The production function combines these three sources of labor with a constant elasticity of substitution:

$$\mathcal{L} = \left( \sum_i L_i^\gamma \right)^{\frac{1}{\gamma}}, \quad (4.1)$$

where  $0 < \gamma < 1$  is the elasticity of substitution across worker pools, and  $i \in \{I, E, A\}$  denotes the different pools: internal, external, and acquired. Firms choose their mix of workers from the three pools to minimize their marginal cost of production  $c$ , defined as

$$c = \left( \sum_i c_i^{-\frac{\gamma}{1-\gamma}} \right)^{-\frac{1-\gamma}{\gamma}}, \quad (4.2)$$

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<sup>15</sup>Note that in the empirical analysis we consider the interactions between human and physical capital.



where  $c_i$  denotes workers' marginal cost of production in each pool  $i \in \{I, E, A\}$ . We provide microeconomic foundations for each labor type's marginal cost of production in section 2.3.

We assume firms compete monopolistically over product varieties and consumer preferences exhibit constant elasticity of substitution (CES) across products, so that firms' profit is proportional to their marginal cost of production  $c$ :

$$\Pi = Kc^{-(\sigma-1)}, \quad (4.3)$$

where  $\sigma$  is the elasticity of substitution between goods within a sector,  $\sigma > 1$  and  $K$  is a constant measuring firms' profitability.<sup>16</sup>

**Build.** If firms choose to enter the new sector by using their existing resources ("build"), they can choose to combine workers from their internal labor market ( $L_I$ ) as well as the external labor market ( $L_E$ ). We assume building does not have any impact on firms' existing business lines. This assumption is realistic if internal workers are reallocated away from tasks that are either completed or sufficiently routinized, so that the new production does not disrupt the existing ones. When firms build, their profit can be written as

$$\Pi^{Build} = K \left( c_I^{-\frac{\gamma}{1-\gamma}} + c_E^{-\frac{\gamma}{1-\gamma}} \right)^{\frac{(1-\gamma)(\sigma-1)}{\gamma}}. \quad (4.4)$$

Equation (4.1) implies the three pools of workers are combined according to the CES parameter  $\gamma$ . Therefore, on top of consumers' elasticity of substitution between products  $\sigma$ , firms' monopolistic profit in (4.4) depends on the marginal costs of production of the different worker pools, aggregated according to a function of  $\gamma$ .

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<sup>16</sup>In standard monopolistic competition models, this constant depends on  $\sigma$  as well as the share of consumers' income devoted to a given product. In turn, this share depends on the relative price of a given product compared to the aggregate price index. All that matters for our analysis is that this constant does not depend on the marginal cost, as is the case in standard monopolistic competition models.

**Buy.** If firms choose to enter the new sector by acquiring an existing company (“buy”), they can access the target’s pool of workers ( $L_A$ ) on top of their internal labor market ( $L_I$ ) and the external labor market ( $L_E$ ). Accessing target workers is profitable, because their human capital is likely to be more adapted to the sector of entry, as discussed in section 2.3. However, we assume integrating a target’s pool of workers to acquiring firms’ internal labor market involves post-merger restructuring costs. We model these costs as a fixed cost  $F$ .<sup>17</sup> When firms buy, their profit can be written as

$$\Pi^{Buy} = K \left( c_I^{-\frac{\gamma}{1-\gamma}} + c_E^{-\frac{\gamma}{1-\gamma}} + c_A^{-\frac{\gamma}{1-\gamma}} \right)^{\frac{(1-\gamma)(\sigma-1)}{\gamma}} - F. \quad (4.5)$$

The acquiring firms’ access to target’s worker pool increases the variable part of (4.5). When firms buy, we can show theoretically that they reallocate relatively less workers from their internal labor market, and they hire relatively less workers on the external labor market. Moreover, firms systematically lay off a positive number of their target’s workers. These findings provide a coherent interpretation of  $F$  as the post-merger restructuring costs, and relates to Lee, Mauer and Xu’s (2018) findings that removing duplicate workers is a key source of economies of scope in mergers.

## 2.2 Testable predictions: Build or Buy?

When entering a new sector, firms compare the profit from building on their existing resources (“build”) with the realized profit from acquiring an existing company (“buy”). We show in Appendix 11.1 that if the different pools of workers are sufficiently substitutable ( $\gamma > (\sigma - 1)/\sigma$ ) and  $F$  is low enough, the model implies there exists a unique threshold  $c_I^* > 0$  such that if  $c_I > c_I^*$ , we have  $\Pi^{Buy} > \Pi^{Build}$ . Otherwise, if  $c_I < c_I^*$ , we have  $\Pi^{Buy} < \Pi^{Build}$ . We obtain prediction 2.

**Proposition 2.** *Firms optimally choose to build when their marginal cost of production is low enough, that is, if their existing workforce is more adapted to operate into the sector of entry.*

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<sup>17</sup>In Appendix 11.2, we show that our model’s predictions remain the same when post-merger restructuring costs are modeled as the costs of restructuring the workforce of the acquired firm.

As shown in Appendix 11.1, our model also implies  $\frac{\partial c_I^*}{\partial c_E} < 0$ , from which prediction 3 follows.

**Proposition 3.** *Firms are more likely to buy when key workers for the sector of entry are in short supply in the external labor market.*

Prediction 3 implies that prediction 2 is stronger when key workers for the sector of entry are difficult to hire in the external labor market.

### 2.3 Micro-foundations of the labor cost

To take predictions 2 and 3 to the data, we need a micro-foundation for the labor costs  $c_i$ . In this section, we propose one, based on Cheng and Morrow (2018), in which labor costs depend on the byproduct of the availability and efficiency of workers in each pool.

**Worker occupations.** We assume there are different types of workers. Each worker type is employed in a given occupation. Each worker occupation, denoted  $o \in O = \{1, \dots, O\}$ , is available in quantity  $(a_{i1}, \dots, a_{iO})$ . Importantly, workers availability differs across worker pools  $i \in \{I, E, A\}$ : The number of workers in each occupation is different in acquiring firms' internal labor market, the external labor market, and targets' internal labor market. Worker characteristics differ across occupations: workers' wage  $(w_1, \dots, w_O)$  and efficiency  $(m_1, \dots, m_O)$  are different across occupations, but not across workers within an occupation.<sup>18</sup>

**Recruiting process.** To recruit workers, firms conduct interviews with several workers from each pool  $i \in \{I, E, A\}$ . The match between a firm and a worker is assumed to be of random quality  $h \geq 1$ , and to follow a Pareto distribution with cumulative density function  $\Psi(h) = 1 - h^{-k}$  with  $k > 1$ . This distribution is assumed equal across worker pools, that is, firms' expected match quality is the same regardless of whether workers come from inside the firm (i.e., the internal labor

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<sup>18</sup>We, therefore, drop the subscript  $i$  relative to wages and efficiency.

market) or from outside (i.e., the external labor market or the acquired firm). This assumption holds as long as workers' new tasks in the sector of entry are sufficiently different from the tasks they were previously assigned to. Indeed, in that case, there is no reason for firms to have different expected match quality with workers from different pools.<sup>19</sup> Firms observe the match quality during the interview.

We assume conducting interviews is labor-intensive and costs  $f$  per interview to the firm. This assumption implies the degree of information asymmetry between firms and workers does not vary across the three worker pools. There are two reasons why we assume this cost is the same when firms match with workers from different pools. First, this assumption simplifies the theoretical analysis and does not change its predictions. Second, in the data, we cannot observe interview and hiring costs across firms, nor differentiate those costs across worker pools.

Firms select interviewed workers by determining a match quality threshold  $\underline{h}_{io}$  under which they do not recruit the worker they interview. As a result, after all interviews, firms hire a total number  $N_i a_{io} \underline{h}_{io}^{-k}$  of workers in each occupation  $o \in \mathcal{O}$ . The labor cost of conducting interviews is then  $f N_i c_i$ .

**Costs and production function.** Firms' total labor cost  $C_i$  in each labor pool  $i$  adds up the cost of conducting interviews  $f N_i c_i$  and wages of hired employees. It is given by:

$$C_i = N_i \left( \sum_o a_{io} w_o \underline{h}_{io}^{-k} + f c_i \right). \quad (4.6)$$

For a given number of interviews  $N_i$  and quality threshold  $\underline{h}_{io}$ , firms know the expected level of human capital of their workforce: Each worker occupation  $o \in \mathcal{O}$  supplies an expected level

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<sup>19</sup>In the empirical analysis, we control for the product market distance between firms' existing business lines and the new sector of production. We find our model's predictions to continue being borne by the data. Moreover, we find stronger support for our model's predictions when the new sector is distant from firms' existing sectors of activity, that is, when it is most likely that  $k$  is the same across worker pools.

of human capital equal to  $H_{io}$ .<sup>20</sup> Within a worker pool, we assume labor supplied by employed workers in a given occupation  $o$  aggregates into an input into firms' production function (4.1) as follows:

$$L_i = \left( H_{i1}^\theta + \dots + H_{io}^\theta \right)^{1/\theta}, \quad (4.7)$$

where  $\theta < 1$  is the elasticity of substitution between the human capital supplied by workers in different occupations. We assume this elasticity is constant across worker pools  $i \in \{I, E, A\}$ , that is, the substitutability across worker occupations is the same in the internal labor market, the external labor market, and the acquired firm's labor market. This assumption can be interpreted as the fact that the substitutability across worker occupations is determined by the nature of tasks involved in the production process.

Our model imposes that both the interview cost *and* the match quality distribution are constant across worker pools. As a consequence, workers from the internal, external, and the acquired firm's labor markets, are perfectly substitutable. It follows that our model does not allow for firm-specific organizational or human capital. All the variation in labor costs across worker pools originates from the different vectors of occupation availability  $(a_{i1}, \dots, a_{io})$ .

**Cost minimization.** Firms minimize the total labor cost  $C_i$  in each worker pool, defined in (4.6), by choosing how many interviews  $N_i$  to conduct and the occupation-specific match quality threshold  $\underline{h}_{io}$ . Firms take as given the expected human capital supplied by their workers,  $H_{io}$ , and the production function (4.7).

Firms choose the optimal threshold  $\underline{h}_{io}$  and the number of interviews  $N_i$  by trading off the quality of the hired workers and the search costs associated with recruiting process. On the one hand, hiring a large number  $N_i$  of workers enables firms to select the best matches by choosing high values for  $\underline{h}_{io}$ . On the other hand, firms save on search costs  $f$  by choosing a fewer number of

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<sup>20</sup>The match quality follows a Pareto distribution, which implies a simple formula for each worker occupation's expected human capital:  $H_{io} \equiv N_i a_{io} m_o \int_{\underline{h}_{io}}^{\infty} h d\Psi(h) = \frac{N_i a_{io} m_o k \underline{h}_{io}^{1-k}}{k-1}$ .

workers  $N_i$  and low values for  $h_{io}$ .

We show in Appendix 11.3 that this constrained minimization problem results in the following marginal labor cost:

$$c_i = \left( \sum_{o \in O} \left( \frac{a_{io} m_o^k w_o^{1-k}}{f(k-1)} \right)^{\frac{\theta}{\beta}} \right)^{\frac{\beta}{\theta(1-k)}}, \quad (4.8)$$

where  $\beta \equiv \theta + \theta(1-k)$ .<sup>21</sup> Equation (4.8) implies that the marginal labor cost in worker pool  $i \in \{I, E, A\}$  increases with the interview cost  $f$ . Indeed, higher interview costs reduce the optimal number of interviews. Matches' average quality goes down, and, in turn, the human capital supplied by each worker occupation is lower.

This expression highlights that the labor cost is determined by the byproduct of workers' efficiency and availability. It is large when occupations that are efficient in the new sector (high  $m_o$ ) are in scarce supply in the worker pool (low  $a_{io}$ ).

**Wage-bill share of each occupation.** Denoting  $A_{io}$  as the total number of workers in occupation  $o$  hired to produce one unit of output, we show in Appendix 11.4 that the share of the wage bill that goes to a given worker occupation  $o$  can be expressed as

$$\frac{w_o A_{io}}{\sum_o w_o A_{io}} = \frac{(a_{io} w_o^{1-k} m_o^k)^{\frac{\theta}{\beta}}}{\sum_o (a_{io} w_o^{1-k} m_o^k)^{\frac{\theta}{\beta}}}. \quad (4.9)$$

Equation (4.9) implies that within a worker pool  $i \in \{I, E, A\}$ , the share of a firm's wage bill that goes to workers in a given occupation depends on (i) occupation-specific wages  $w_o$ , (ii) the availability  $a_{io}$  of workers in that occupation, and (iii) workers' occupation-specific efficiency  $m_o$ . The interpretation is that within a given sector, worker occupations receive relatively higher wages compared to other occupations when they are relatively more efficient at producing in this sector.

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<sup>21</sup>The assumption that  $k > 1$  implies that  $\beta > 0$ , in which case it is optimal for firms to hire workers in every occupation (Cheng and Morrow, 2018).

### 3 Empirical strategy

To take predictions 2 and 3 to the data, we need to estimate the marginal labor cost (4.8) for workers from the internal labor market, i.e.,  $c_I$ . In Section 4, we explain that neither the availability  $a_{Io}$  of workers in each occupation in the internal labor market, nor the occupation-specific efficiency  $m_o$ , are observable in the data. However, based on our model, we propose a methodology to estimate  $c_I$  using administrative worker-level occupation data.

#### 3.1 Occupation-specific human capital

Equation (4.9) allows us to estimate the average availability  $a_{Io}$  of workers in occupation  $o$ , and the occupation-specific efficiency  $m_o$ . We use the subscripts  $f$ ,  $o$ ,  $n$ , and  $t$ , for firm, worker occupation, sector of the firm, and time, respectively. At the firm-level, we denote  $\text{Share}_{f,o,n,t}$  as the share of the wage bill that goes to occupation  $o$  in firm  $f$  operating in sector  $n$ , i.e., the ratio given by Equation (4.9). Rewriting worker availability  $a_{f,o,n,t}$  as a deviation from the sectoral average  $\bar{a}_{o,n,t}$ , we have  $a_{f,o,n,t} = \bar{a}_{o,n,t} \cdot \tilde{a}_{f,o,n,t}$ . Then, taking the logarithm of Equation (4.9), we obtain

$$\log(\text{Share}_{f,o,n,t}) = \frac{\theta}{\beta} \log\left(\bar{a}_{o,n,t} m_{o,n,t}^k w_{o,n,t}^{1-k}\right) - \log\left(\sum_{o' \in O_{gt}} \left(a_{g,o',t} m_{o',n,t}^k w_{o',n,t}^{1-k}\right)^{\frac{\theta}{\beta}}\right) + \frac{\theta}{\beta} \log(\tilde{a}_{f,o,n,t}), \quad (4.10)$$

where  $O_{ft}$  is the set of worker occupations observed in firm  $f$  at time  $t$ . Equation (4.10) provides a decomposition of  $\text{Share}_{f,o,n,t}$ , which can be estimated as the following fixed-effects regression:

$$\log(\text{Share}_{f,o,n,t}) = \mu_{o,n,t} + \nu_{f,t} + \epsilon_{f,o,n,t}, \quad (4.11)$$

where  $\mu_{o,n,t}$  is an occupation  $\times$  sector  $\times$  time fixed effect capturing the average wage share that goes to occupation  $o$  at the level of sector  $n$ .  $\nu_{f,t}$  is a firm  $\times$  time fixed effect and  $\epsilon_{f,o,n,t}$  is an error term capturing the deviation of occupation  $o$ 's share in the firm's wage bill to the sectoral average.

The estimation of  $\mu_{o,n,t}$  require firms to hire more than one type of occupation each year, and every occupation to be present in more than one firm in a given sector each year.<sup>22</sup> We use the estimated values, denoted  $\hat{\mu}_{o,n,t}$ , to construct our main explanatory variable below. We interpret them as a score reflecting the (wage- and availability-adjusted) human capital of a given occupation at the sectoral level. The higher the fixed effect of a given occupation in a sector, the larger the score for this occupation in this sector.<sup>23</sup>

### 3.2 Firms' internal human capital

We rely on the occupation scores to analyze the role of human capital in the decision to build or buy. We use the subscripts  $g$ ,  $o$ ,  $n$ , and  $t$ , for the diversifying firm, worker occupation, sector of entry, and time, respectively. The marginal labor cost (4.8) can then be rewritten as  $c_{I,g,n,t} = (f(k-1))^{\frac{1}{k-1}} (\psi_{I,g,n,t})^{\frac{\theta}{\theta(1-k)}}$ , where

$$\psi_{I,g,n,t} = \sum_o \left( a_{I,g,o,n,t} w_{g,o,n,t}^{1-k} m_{g,o,n,t}^k \right)^{\frac{\theta}{\beta}}. \quad (4.12)$$

We interpret  $\psi_{I,g,n,t}$  as a proxy for the human capital of workers from firms' internal labor market. Indeed,  $c_{I,g,n,t}$  is a decreasing function of  $\psi_{I,g,n,t}$ , that is, the marginal cost of labor of operating in sector  $n$  is lower when the human capital of firms' existing workers is high for that sector.

Rewriting  $\psi_{I,g,n,t}$  in terms of occupation  $\times$  sector  $\times$  time fixed effect  $\mu_{o,n,t}$  and firm-level deviation from the sectoral average availability of worker occupation,  $\tilde{a}_{g,o,t}$ , we have

$$\psi_{I,g,n,t} = \sum_o \left( \tilde{a}_{g,o,n,t} \right)^{\frac{\theta}{\beta}} \exp(\mu_{o,n,t}). \quad (4.13)$$

<sup>22</sup>To ensure that these two conditions are met, we exclude firms that hire only one type of occupation and employ less than 20 workers from the sample. In addition, in the empirical analysis, we exclude occupation-sector-year triplets with less than 10 firms to obtain more precise estimates.

<sup>23</sup>As an illustration, table 4.13 displays the five occupations with the largest fixed effects in the sectors of pharmaceutical preparations, IT consultancy activities and manufacture of motor vehicles in 2013. The selected occupations indeed seem to play an important role in their own sectors.



Predictions 2 and 3 consist in predicting firms' choice to build or buy, based on their existing workforce composition. Therefore, we need to empirically estimate firm  $g$ 's human capital  $\psi_{I,g,n,t-1}$  one year before entering the new sector.

The key difficulty in estimating (4.13) is that we don't observe firms' internal reallocation of existing workers toward the sector of entry, that is, we don't observe  $\tilde{a}_{g,o,n,t}$ . Therefore, as soon as occupation  $o$  is present in  $g$ 's existing workforce at  $t - 1$ , we assume  $\tilde{a}_{g,o,n,t} = 1$  so that workers' availability in the internal labor market is equal to the average availability in the new sector. Otherwise, if  $a_{g,o,n,t} = 0$ , we assume  $\tilde{a}_{g,o,n,t} = 0$ .<sup>24</sup> We obtain our main independent variable, which is an empirical estimation of the value of (4.13) at  $t - 1$ :

$$\text{Internal Human Capital}_{g,n,t-1} = \frac{1}{\#O_{g,t-1}} \cdot \sum_{o \in O_{g,t-1}} \exp(\hat{\mu}_{o,n,t-1}), \quad (4.14)$$

where  $O_{g,t-1}$  is the set of worker occupations present in firm  $g$ 's internal labor market prior to entering the new sector  $n$  (i.e., occupations for which  $a_{g,o,n,t-1} > 0$ ), and the values of  $\hat{\mu}_{o,n,t-1}$  come from the estimation of equation (4.11).

Internal Human Capital $_{g,n,t-1}$  is a measure of the human capital of firm  $g$ 's existing workforce for the sector of entry  $n$ . It is defined as the average value of the (exponentiated) occupation  $\times$  sector  $\times$  year fixed effects of the occupations present in the workforce of the firm prior to entry, given by (4.11). We use the average value instead of the sum to avoid human capital being mechanically larger for firms employing more worker occupations.<sup>25</sup>

Internal Human Capital $_{g,n,t-1}$  takes a high value when occupations with a high (wage-adjusted) efficiency  $m_{o,n,t-1}$  for the sector of entry are already present in a firm's internal labor market prior to entry. We interpret it as a measure of whether a firm's workforce is adapted for a given sector

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<sup>24</sup>In the empirical analysis, we test several alternative assumptions as robustness checks (see Section 6.1). In particular, we use the fraction of each worker occupation as weights in the computation of Internal Human Capital $_{g,n,t-1}$ . Our results are robust to alternative assumptions in our estimation of equation (4.13).

<sup>25</sup>We also control for firm size using the number of employed workers. In unreported regressions, we control for the number of occupations to closely follow the definition of  $\psi_{I,g,n,t-1}$ . Our results are robust to this change.

of entry. In the rest of the paper, we refer to this measure as “human capital” or “internal human capital” without explicitly mentioning that it is specific to a given sector of entry.

### 3.3 Empirical model

Prediction 2 states that firms are more likely to “buy”, as opposed to “build”, when their existing internal human capital is not adapted to the market of entry. This pattern is more pronounced when key workers for the sector of entry are difficult to hire in the external labor market (prediction 2).

We test these predictions by analyzing the link between the type of entry and the constructed measure of internal human capital. The dependent variable is  $\mathbb{1}(\text{Buy})_{g,n,o,t}$ , a dummy equal to one if firm  $f$  enters a new sector  $n$  through an acquisition (“buy”), and zero if it enters the new sector by building on its existing resources (“build”).  $o$  indicates firm  $f$ ’s main original sector of activity, i.e. the sector in which the firm realizes the largest share of its sales prior to entry. Our baseline empirical model is:

$$\mathbb{1}(\text{Buy})_{g,n,o,t} = \lambda_{n,o,t} + \delta \text{Internal Human Capital}_{g,n,t-1} + \beta X_{g,n,o,t-1} + \eta_{g,n,o,t} \quad (4.15)$$

This presence of origin  $\times$  entry  $\times$  time fixed effects implies that the role of internal human capital is identified by comparing the diversification strategy of firms operating in the same sector of origin and entering in the same new sector. All unobservable time-varying synergies and complementarities between sectors are therefore captured by the fixed effects  $\lambda_{n,o,t}$ . In addition, this specification also controls for unobservable factors relative to the sector of entry (e.g., fixed costs of entry, barriers of entry. See McCardle and Viswanathan (1994)) or the sector of origin (e.g., ability to collateralize assets to access external finance. See Rajan and Zingales (1998)).

The vector  $X_{g,n,o,t-1}$  includes other firm’s characteristics that may influence the decision to build or buy. At the firm level such determinants are firm’s size, cash holding, tangibility, labor productivity and product market relatedness (i.e., the distance to the sector of entry based on sales

information). We also control for the variation in labor market tightness across geographical zones and sectors.

By construction, Internal Human capital $_{g,n,t-1}$  introduces a measurement error term which generate a correlation between residuals  $\eta_{g,n,o,t}$  at the level of the sector of entry. It might also be more or less precisely estimated depending on the sector of origin. We therefore double-cluster standard errors to control for correlations within the sector of entry and within the sector of origin. Finally, we standardize the Internal Human capital $_{g,n,t-1}$  variable in the rest of the analysis to interpret regression coefficients in standard deviation units.

## 4 Data and Summary Statistics

### 4.1 Data sources

#### 4.1.1 Firm data

Our primary source of data consists of French administrative data provided by the French Bureau of Statistics (Insee). We define a firm as a set of subsidiaries controlled by the same final owner. We identify the different set of subsidiaries using ownership links (*Enquête sur les Liaisons financières entre sociétés*, LIFI).<sup>26</sup>

We recover the subsidiaries' main sector of activity, balance-sheet information and income statements from the tax files (*Bénéfices Industriels et Commerciaux* and *Bénéfices Non-commerciaux*). We then consolidate the different variables to obtain firm-level measures. In addition, we exclude firms from the financial, agricultural and public sectors.<sup>27</sup>

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<sup>26</sup>LIFI is exhaustive on the set of firms that employ more than 500 employees, that generate more than 60 millions euros in revenues or that hold more than 1.2 million euros of shares. The dataset is completed by data coming from Bureau Van Dijk (Diane-Amadeus data set) to cover the universe of French firms.

<sup>27</sup>Firms in the financial and agricultural sectors use different accounting systems, which limits the comparability and relevance of standard variables across sectors. For instance, the notion of "value added" is difficult to measure in the public or the financial sector. Second, the decision to enter those sectors may be driven by other motives than in the rest of the economy.

To identify entries into new sectors, we rely on the subsidiaries' breakdown of sales by sectors (*Enquête Annuelle de Production*). This data set records the detailed amount of sales realized by subsidiaries in each sector every year. The survey is exhaustive for subsidiaries with at least 20 employees and randomly include smaller subsidiaries such that at least 85% of sales of a given sector are identified in the survey. According to the French Bureau of Statistics, subsidiaries included in the survey cover 96% of sales in the manufacturing sector. For smaller subsidiaries whose the breakdown of sales is not available, we make the assumption that these subsidiaries sell only in their main sector of activity, which is retrieved from the tax files. We exclude entries occurring during the year 2008 as the construction of the survey was deeply modified that year.<sup>28</sup>

Sectors are defined by the French Standard Industry Classification (SIC) (*Nomenclature des activités Françaises, NAF*) which is equivalent to the US SIC. We define sectors at a 5-digit French SIC code. The dataset includes 732 different sectors.

#### **4.1.2 Merger and acquisition deals**

We merge the French administrative datasets with M&A deals retrieved from SDC Platinum and Bureau van Dijk Zephyr.<sup>29</sup> We collect all deals between January 2003 and December 2014 that involve a French acquirer and a French target. We exclude Leverage Buy Out and Private Equity deals from the sample. We focus on deals in which the acquirer owns less than 50% of the target shares before the acquisition date and more than 50.1% after, to identify changes of majority ownership between operating companies.

SDC Platinum and Bureau van Dijk's Zephyr do not provide French firm standardized identifying numbers (SIREN). We proceed in several steps to retrieve the unique firm identifiers. First, we use tickers (available only for publicly traded firms) and the Bureau van Dijk identifiers (available

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<sup>28</sup>Some small internal entries might be due to changes introduced in the methodology of the survey. Our results are robust to whether we keep year 2008 or not in the analysis.

<sup>29</sup>Note that a change of ownership in the LIFI data set can not in general be used to identify M&As. Indeed, change of ownership in LIFI sometimes occur because of previously undisclosed financial links.

only for Zephyr deals) to recover a fraction of the firm identifiers. Second, we build a Python webcrawler on two websites, which takes as input firm's name and address.<sup>30</sup>: (i) [www.bodacc.fr](http://www.bodacc.fr) (Bulletin Officiel des Annonces Civiles et Commerciales), which is a governmental website that reports official notifications involving French companies since 2003, (ii) [www.societe.com](http://www.societe.com), which is a commercial website that aggregates information about French companies from various sources (mostly from Insee and Bodacc.fr). Both websites are supposed to cover the universe of French firms.

After running the web-crawler, we drop companies whose the address, city or zip code is missing, as we cannot identify with certainty the corresponding company identifier among several matches. We keep only observations for which the Jaro-Winkler string distance to the original name is below a certain threshold.<sup>31</sup> We use a conservative value of 0.8. Finally, we validate the matches manually and, when appropriate, select the best matches ourselves. Our final sample contains 7,303 deals from 2003 to 2014. To the best of our knowledge, this is the most complete M&A data set available to date for the French economy.

#### **4.1.3 Worker-level occupation worker data**

We use the French matched employer-employee administrative dataset (*Déclarations Annuelles des Données Sociales*, DADS) to construct our measure of internal human capital. Firms are required by law to report every year detailed information of their workers when filing payroll taxes.<sup>32</sup> The employer must in particular report the gross and net wages, number of hours worked and an occupation code for each worker. Note that before 2003, occupations are often missing in the dataset. This is the reason why we start the empirical analysis from this date. Occupations are reported using a 4-digit code. The French nomenclature of occupations (*Nomenclatures des*

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<sup>30</sup>The webcrawler builds on the Python packages Selenium and BeautifulSoup).

<sup>31</sup>The Jaro-Winkler distance measures the number of characters in common between strings with the idea that differences near the start of the string are more significant than differences near the end of the string.

<sup>32</sup>Note that reporting of the occupation code is required for firms that employed at least 20 employees in a given year, and optional for firms below the threshold.

*professions et catégories socio-professionnelles des emplois salariés des employeurs privés et publics*, PCS-ESE) include 414 different occupations including, for instance, 28 different types of engineers (e.g., logistic, IT, electric, mechanical).

## 4.2 Main variables

### 4.2.1 Type of entry: build or buy

Our main dependent variable  $\mathbb{1}(\text{Buy})_{g,n,t}$  is a dummy variable equal to one if the entry of firm  $f$  in sector  $n$  at time  $t$  is made through an acquisition (“buy”), and equal to zero if the entry is made internally (“build”). We consider that a firm enters a new sector if (i) at least one of its subsidiaries starts selling in that sector and (ii) none of the other subsidiaries already operates in the sector. A firm is then said to enter a sector by acquisition if the entity that sells in the new sector is added to the set of subsidiaries through a M&A. By contrast, a firm is said to buy if the subsidiary that starts selling in the new sector was already controlled by the firm, or if it is created at the time of entry.<sup>33</sup>

### 4.2.2 Distance between sector of origin and sector of entry

As an alternative to our measure of human capital, we construct a product market distance based on Bloom, Schankerman and Van Reenen (2013). The firm-level variable measures the distance between the firm’s sectoral repartition of sales (“sector portfolio”) prior to entry to the sector portfolios of firms already operating in the sector of entry. The idea of the metric is that if the sector portfolio of the entering firm is unusual compared to firms already present in the sector of entry, then the firm is “distant” to the sector of entry - otherwise it is “close”.

For a firm  $f$  entering a new sector at time  $t$ , we denote by  $S_g = (S_g^1, \dots, S_g^N)$  the vector of sales at time  $t - 1$  broken down by sectors ( $n = 1, \dots, N$ ).  $S_g^{-n}$  is the vector of sales excluding sales in

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<sup>33</sup>See appendix figure 4.5 for an illustration of the classification of entries.

sector of entry  $n$ .<sup>34</sup> For a given sector of entry  $n$ , we define the distance  $d_{g,h}^n$  between the firm and any firm  $h$  already operating in the new sector  $n$ , as (one minus) the uncentered Pearson correlation between vectors  $S_g^{-n}$  and  $S_h^{-n}$ :

$$d_{g,h}^n = 1 - \frac{(S_g^{-n} \cdot S_h^{-n})}{\sqrt{(S_g^{-n} \cdot S_g^{-n})} \sqrt{(S_h^{-n} \cdot S_h^{-n})}}$$

Finally, we define the product market distance of firm  $f$  to sector  $n$  as the weighted average of the distance  $d_{g,h}^n$  for all firms  $h$  operating in sector  $n$  at  $t - 1$ :

$$\text{Product Market Distance}_{g,n} = \frac{\sum_h \omega_h^n d_{g,h}^n}{\sum_h \omega_h^n}$$

where the weights  $\omega_h^n$  are given by the share of sales realized by firm  $h$  in sector  $n$  at  $t - 1$ :  $\omega_h^n = \frac{\text{Sales of firm } h \text{ in sector } n}{\text{Sales of firm } h}$ . The weights ensure that the distance between the diversifying firm and firm  $h$  matters more if firm  $h$  realizes a large part of its sales in sector  $n$ .

### 4.2.3 Local labor market tightness

We measure local labor market tightness using data from the French national unemployment agency (Pôle emploi). The unemployment agency lists job vacancies, helps unemployed people to find jobs and produces national and local unemployment statistics which we use in this paper. In particular, the unemployment agency tracks occupations in short supply in 350 different local labor markets market since 2010. Occupations are flagged as in short supply when (i) job offers exceed job applications (ii) surveyed employers anticipate they will not fill the posted offers.

Figure 4.3 plots the number of occupations in short supply by local labor markets (LLM) in 2013.<sup>35</sup> Darker shades of blue indicate a higher degree of tension in the local labor market.

<sup>34</sup>We exclude sales in sector  $n$  as a firm that enters sector  $n$  at time  $t$  necessarily reports zero sales in  $n$  at time  $t - 1$ .

<sup>35</sup>Appendix table 4.15 lists occupations that are in short supply in 2013.

Interestingly, we see that labor market tightness is not systematically related to geographical density as tight local labor markets can be observed both in urban and rural areas.

We define the *Local Labor Tightness* $_{n,z,t-1}$  variable as the average of the (exponentiated) occupation  $\times$  sector  $\times$  year fixed effects of the occupations in short supply in a local labor market  $z$ :

$$Local\ Labor\ Tightness_{n,z,t-1} = \frac{1}{N.L_{n,t-1}} \sum_{l \in L} \mathbb{1}(l \text{ in short supply in LLM } z) \times \exp(\hat{\mu}_{o,n,t})$$

where  $N.L_{n,t-1}$  is the number of occupations in sector  $n$  at time  $t - 1$ .<sup>36</sup> This sector-specific measure of LLM tightness takes high values if the occupations in short supply in local labor market  $z$  at time  $t - 1$  are key for firms operating in sector  $n$ . Figures 4.4a and 4.4b plot the geographical distribution of the variable for the manufacturing of pharmaceutical preparations and of motor vehicles. The graphs show that firms face on average more difficulties to find key workers in the second sector than in the first. Moreover, the measure appears to significantly vary both across LLMs and sectors.

### 4.3 Summary statistics

**Build or buy?** Panel A of Table 4.1 and Figure 4.1 present the evolution of the proportion of build and buy entries between 2004 and 2013 (excluding 2008). While at the beginning of the period about 1.8% of entries are made by acquisition, this figure increases over the sample period to reach 2.49% of total entries in 2014. However, buy entries are on average bigger than build entries. When weighted by entry sales, buy entries represent about 6-8% of total entries between 2004 and 2013.

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<sup>36</sup>In a robustness check, we directly use the percentage of jobs in tension as a proxy for local labor market tightness:

$$Local\ Labor\ Tightness_{n,z,t-1} = \frac{1}{N.L_{n,t-1}} \sum_{l \in L} \mathbb{1}(l \text{ in short supply in LLM } z).$$

Our results are robust to this alternative specification.



We then look at how these figures vary with the definition of sector in Panel B of Table 4.1. The proportion of buy entries remains stable at 1.7-1.9% whether we define a sector as a 1-digit or 5-digits code of the French SIC (our baseline). This finding suggests that firms do not tend to enter more by acquisition in sectors that are distant from their sector of origin. However, we find that build entries tend to be larger in sectors that are close to the sector of origin. Indeed, entries by acquisition represent 15% of entry sales when we use the 1-digit classification level, but only 8% when we rely on the most detailed definition of sector (5-digits code).

[Insert Table 4.1 here]

**Internal human capital.** Figure 4.2 plots the probability density functions of firms' human capital by type of entry. The variable Internal Human Capital<sub>*g,n,t-1*</sub> is normalized to have a mean of zero and a standard deviation of one. On average, the human capital of firms that enter a new sector by acquisition is less adapted to the sector of entry than that of firms that choose to build.

[Insert Figure 4.2 here]

**Other variables.** Table 4.2 Panel A reports summary statistics on the different control variables we include in our baseline specification (see section 3.3). Consistently with table 4.1, the average number in the panel of firms diversifying through an acquisition is about 2%. Firms report on average €2.82 million of sales in the sector of entry the first year, with a very large dispersion around the mean. The same year, we find that they invest on average €960,000. Firms enter industries that are vertically integrated to their original industry in 67% of the cases and usually in sectors that are close from their sector of origin. They employ about 63,000 workers, produce about €5,000 of value added per worker, own €4,000 of fixed assets per worker, and hold about €2,000 in cash per worker.

Panel B of Table 4.2 compares characteristics of firms that enter a new sector by acquisition and those which build on their preexisting internal human capital. The results show that firms that build

have significantly smaller sales in the sector of entry than firms that buy, with €9.39m less in sales on average the year of entry. They are also 13% less likely to stay in the sector of entry at a one-year horizon. They invest €9.95 millions less the year of entry and employ about 1,770 less workers on average. In addition, firms that diversify by acquisition are more profitable, more capital intensive and have higher internal funds. These significant differences on observable characteristics between firms that build and firms that buy emphasizes the importance of including control variables in the empirical analysis.

[Insert Table 4.2 here]

## 5 Human capital and corporate diversification

### 5.1 Main results

Table 4.3 presents our baseline results. The dependent variable  $1(Buy)_{g,n,t}$  is a dummy variable equal to one if firm  $f$  enters a new sector  $n$  at time  $t$  through the acquisition of an existing firm, and zero if it enters by building on its own resources. All our regressions include interacted sector of origin  $\times$  sector of entry  $\times$  year fixed effects. This specification neutralizes potential unobservable time-varying synergies between the sector of entry and that of origin. The idea is to compare firms that operate in the same sector of origin and enter the same new sector the same year, to isolate the effect of human capital on firms' decision to enter through an acquisition or by building on their own resources.

We test our model's prediction that firms are more likely to build when their human capital is more adapted to operate in the sector of entry (prediction 2). Our main independent variable *Internal Human Capital* measures to which extent the firm already employs key occupations for the sector of entry prior to diversifying. All specifications control for firms' size (log number of workers), as well as firms' total cash holdings, tangible assets, and value added that we scale by the

number of workers.

Consistent with our model's prediction and the suggestive evidence in Figure 4.2, we find that the internal human capital of the firm prior entry is negatively correlated with the probability to enter by acquisition. A one standard deviation increase in internal human capital is associated to a 1 percentage points drop in the likelihood to enter by acquisition (columns 1 and 2). This relationship is sizeable, equal to 50% of the unconditional probability to buy, and significant at the 1% level. The point estimate is unchanged when we add control variables in column 2, suggesting that control variables are uncorrelated with our key dependent variable *Internal Human Capital*. We conclude that firms whose human capital is adapted to the sector of entry are more likely to enter by building on their own resources.

The estimates in Table 4.3 also show that the likelihood of buying relative to building increases with firm size. By contrast, cash holdings, tangibility and profitability do not appear to be significantly associated with the mode of entry in a new sector.

An alternative explanation could be that firms anticipate the mode of entry by adjusting the composition of their internal human capital several years before diversifying. If this was the case, human capital would be endogenous to the mode of entry and our interpretation would be biased. To overcome this problem, we test whether lagged values of internal human capital also predict the mode of entry. We find that firms' decision to build rather than buy is still negatively correlated with the internal capital two and three years before entry (columns 3 and 4, respectively). The point estimates on each lagged measures of human capital remain unchanged, suggesting that firms do not significantly modify their workforce composition during the years preceding the entry. According to our model, one rationale for this result could be that hiring workers in key occupations is too costly because of tight local labor markets. We discuss the role of labor market tightness in section 8.1.

[Insert Table 4.3 here]

## 5.2 The role of size and financial constraints

Firms that buy tend to be larger (Table 4.2). One concern could be that only large may be able to afford the fixed costs associated with an acquisition. Under this hypothesis, small firms would always end up entering by building and human capital considerations would be irrelevant. We should expect in that case no significant relationship between human capital and the type of entry for smaller firms. In columns 1 and 2 of Table 4.4, we interact our human capital measure with firm size. We use terciles of firm size (proxied by number of workers) to allow for non-linear effects of firm size on the decision to build or buy. We find the interaction terms to be not statistically different from zero, suggesting that human capital plays a role in the decision to build or buy both for small and large firms.

One reason why larger firms tend to grow more by acquisition could be that they are less financially constrained than smaller firms, and hence can afford the acquisition costs. In columns 3 and 4, we test whether our measure of internal human capital interacts with internal financial resources as proxied for by cash holdings. The results show that the relationship between internal human capital and the probability to build or buy is not different across firms with different levels of cash earnings.

Finally, it might be that public firms have different growth strategies than private firms because they can raise new equity to fund acquisitions more easily. We test whether the relationship between internal human capital and the choice to build or buy holds differently for firms which are privately or publicly owned. We re-estimate our baseline specification with controls separately on public and private firms in columns 5 and 6 of Table 4.4. We find that the negative relationship holds both for public and private firms. Note that given the small number of public firms in France, we only perform those regressions with sector of origin  $\times$  sector of entry interacted fixed effects, and separate year fixed effects. To summarize, Table 4.4 confirms that our central findings hold across different types of firms, suggesting they may be generalized outside our sample.

[Insert Table 4.4 here]

### 5.3 Complementarities between the sector of origin and the sector of entry

Firms do not diversify in random sectors but take into account complementarities and synergies between the sector of origin and that of entry. The baseline specification includes sector of origin  $\times$  sector of entry  $\times$  year fixed effects (equation 4.15) to remove the influence of these unobservable factors on our baseline results. In this section, we explore how sectoral complementarities interact with human capital in the decision to build or buy so as to better understand when labor costs considerations matter in diversification decisions.

In the columns 1 and 2 of table 4.5, we investigate how human capital interacts with the product market distance between the sector of origin and the sector of entry.<sup>37</sup> We use to that end our firm-level distance to the sector of entry (see section 4.2.2 for more details). The variable is based on the correlation between the product market portfolio of a firm prior to entry and product market portfolios of firms already operating in the sector. A distance close to zero, for instance, means that the entering firm has very similar activities to incumbent firms.

We include terciles of our measure of distance in the baseline specification in column 1, and interact it with the measure of internal human capital in column 2. We find that firms tend to buy more frequently in the third tercile of product market distance. The point estimate for human capital is very close to that in Table 4.3, which suggests that role of the composition of the workforce is not explained by sectoral similarities. Interestingly, in column 2 we find the human capital coefficient to be significantly stronger for firms in the 2<sup>nd</sup> and 3<sup>rd</sup> terciles of distance. This suggests that high product market distance magnifies the importance of labor costs in the decision to build or buy.

In columns 3 and 4 of Table 4.5, we test the role of vertical integration in the decision to build

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<sup>37</sup>Hoberg and Phillips (2010) shows that product market distance plays an important role in determining M&A patterns. Firms that have similar products tend to merge more between each other, and this create more value. the authors develop a measure using textual analysis on 10k filings available for publicly listed firms in the US.

or buy. Labor costs considerations may indeed be less relevant in the presence of important vertical links. Firms might be willing to enter upstream sectors primarily to acquire suppliers so as to facilitate transfers of goods along the production chain. To account for the firm's position in the production chain, we measure vertical integration following Fan and Goyal (2006). Using the 1995 input-output (IO) table for France compiled by the Organization for Economic Cooperation and Development (OECD), we identify a vertical link between firms and their sector of entry whenever more than 5% of inputs used by the sector of origin comes from the sector of entry (we also use 1%, 10% and 20% as thresholds).<sup>38</sup> Since the variable is defined at the level of a sector of origin and sector of entry, we replace the interacted fixed effects by separate origin, entry and year fixed effects. We do not find any systematic relationship between the presence of vertical links and the decision to build or buy. In particular, firms that start operations in an upstream sector do not seem to enter more often by acquisition.

[Insert Table 4.5 here]

## 6 Robustness checks and alternative mechanisms

### 6.1 Alternative measures of human capital

In this section, we check the robustness of our results to alternative definitions of the measure of internal human capital. To do so, we replicate our main specification from Table 4.3 using different versions of *Internal Human Capital* and test whether firms that do not employ the key occupations for the sector of entry are more likely to enter by acquisition. Table 4.6 reports the results.

In column 1, the main independent variable is a dummy variable taking the value one if the firm does not employ any worker in the top 10 most important occupations for the sector of entry. As

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<sup>38</sup>Note that the input-output matrix from France we use is rather coarse (35 industries by 35 industries). The regression excludes observations where the industry of origin and the industry of entry are the same as the vertical link variable is not defined in that case.

explained in section 3, the ranking of occupations across sectors is based on the estimated values of the occupation  $\times$  sector  $\times$  fixed effects. We find that firms that do not hire any worker in the top 10 occupations for the sector of entry are 40% more likely to buy.

Our baseline measure of human capital is the simple average of the (exponentiated) occupation  $\times$  sector  $\times$  year fixed effects of occupations that are present in the firm's workforce one year before entering the new sector (see section 3). In column 2 of Table 4.6, we take the weighted average of the fixed effects with weights equal to the share of workers in a given occupation in the workforce of the firm. This alternative measure of internal human capital assumes that the firm allocates workers to the new sector in proportion to the existing occupational structure (see section 3.2).

In column 3, we exclude CEOs from the set of occupations used to build the measure of internal human capital. One concern with CEOs' wages is that they may be determined by other factors than their contribution to the firms' output (moral hazard, information asymmetries). Finally, in column 4, we change the unit of observation used in the estimation of the occupation  $\times$  sector  $\times$  year fixed effects. When we estimate fixed effects at the firm level, we make the assumption that every worker is involved in the production process of the firm's main activity. In contrast, plants are less diversified entities, such that estimating the fixed effects at the plant level should yield better estimates, as plants are presumably less diversified entity than firms.<sup>39</sup> Our main result is not affected by any of these alternative measures of internal human capital: The negative relationship between human capital and the probability to buy remains economically and statistically significant. Moreover, the point estimates are very similar across specifications.

[Insert Table 4.6 here]

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<sup>39</sup>A firm is defined as a set of subsidiaries, which are themselves composed of one or several plants.

## 6.2 Does selection into diversification drive our results?

A potential limit of our analysis is that we focus on the build versus buy trade-off while abstracting from the decision to diversify itself. If the entry and the type of entry in the new sector are jointly driven by unobservable factors, our OLS estimations might lead us to draw inaccurate conclusions.

Our approach to address this issue is to identify plausible self-selection narratives that could invalidate our results and directly assess their influence in our data.<sup>40</sup> We focus on two scenarios in which self-selection may pose a problem for identification. First, firms with under-performing business segments may be willing to shift their activities to sectors with better growth prospects. In order to minimize firing costs and preserve organizational capital, firms are likely to choose sectors in which they can easily redeploy their existing workforce (Tate and Yang, 2016b). In this scenario, the likelihood of an entry by acquisition would also be negatively related to internal human capital. However, if we could perfectly control for selection, there would be no role left for human capital as the decision to build or buy would be governed by the decision to enter the new sector.

We test the influence of sectoral reallocation in columns 1 to 3. We denote firms that enter internally a new sector to shift their activities as “shifting firms”. We compute for each firm the growth rate of sales between  $t - 1$  and  $t$  in each sector in which they were operating at  $t - 1$  and take the firm-level minimum of sectoral growth rates. A shifting firm is a firm (i) that enters a new sector internally and (ii) for which the minimum growth rate is negative and equal to 100% in absolute value (*i.e.*, the firm exits a sector simultaneously to entering internally a new one). We also use 50% and 25% as more conservative thresholds. Under the tested hypothesis, the negative coefficient for human capital would be driven by the sub-sample of shifting firms. Excluding them should result in non-significant coefficient for human capital. By contrast, the results show that

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<sup>40</sup>Traditional methods designed to address selection issues would involve finding an instrument that affects the choice to diversify *in a given sector* but not the type of entry. This is a difficult task as most of the variables that vary both at the level of the firm and the sector of entry (*e.g.*, compatibility or exposure to the sector of entry) are unlikely to be orthogonal to the decision to build or buy.



the point estimates for our main variable are unchanged even for fairly conservative definitions of sectoral reallocation.

Consider then the other polar case. Firms with low growth prospects may be willing to acquire firms to expand their set of investment opportunities (Levine, 2017). This mechanism could lead firms to enter unrelated sectors by acquisition irrespective of human capital considerations. Since firms are unlikely to employ the right set of workers to operate in unrelated sectors, this could translate into an observed negative relationship between internal human capital and the propensity to buy. However, if we could control for selection, we would once again find no role for human capital as the objective of the entry is actually to acquire a new firm. To address this particular issue, we focus on firms that enter multiple sectors by acquisition (“serial acquirers”) as they are more likely to be conducting such a strategy of external growth.<sup>41</sup> We still find a significant, negative coefficient for human capital. Combined together, our findings suggest a limited role for selection issues.

[Insert Table 4.7 here]

### **6.3 Complementarities between human and physical capital**

It is likely that firms that do not employ the right set of occupations to operate in the sector of entry do not possess the adequate machines either. It follows that the negative relationship between human capital and the propensity to buy could potentially reflect the role of adjustment costs for capital, and not labor.

We run two sets of tests to address this issue. First, we compare the build or buy decision of firms that realized similar entry sales in the year of entry. Given that firms should enter a new sector only if they anticipate high enough entry sales to offset entry costs, we use entry sales to proxy for entry costs. In columns 1 and 2 of Table 4.8, we rank entry sales into ten deciles and run our

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<sup>41</sup>Among firms that enter externally a sector at least once, 50% are classified as serial acquirers.

baseline regressions with interacted sector of origin  $\times$  sector of entry  $\times$  year  $\times$  sales deciles fixed effects. This specification allows us to compare firms that operate in the same sector of origin, entering the same sector, the same year, and also making similar sales when entering the new sector. Although this specification creates a lot of singletons that are dropped from the sample (the number of observations drops from 75k to 45k), our point estimates remain nearly unchanged.

Second, and similarly, we proxy for physical capital adjustments using the volume of capital expenditures made by firms when entering the new sector. To do so, we compare firms investing similar amounts the year of entry. For firms that build, we measure investment using capital expenditures the year of entry. For firms that buy, we measure investment as the amount of fixed assets in the target. We run our baseline regression with interacted sector of origin  $\times$  sector of entry  $\times$  year  $\times$  investment deciles fixed effects. The idea is to isolate the effect of human capital on the build or buy decision, irrespective of differences in capital expenditures. In columns 3 and 4 of Table 4.8, we find that the economic magnitude of the role of human capital is approximately lowered by half. It remains negative and statistically significant at the 5% level, with or without the inclusion of control variables. Based on these two tests, we conclude that firms seem to take into account internal human capital when making the decision to build or buy, irrespective of the associated costs or physical capital adjustments.

[Insert Table 4.8 here]

## **7 Evidence of labor adjustment costs**

### **7.1 Within-firm human capital and diversification choice**

Previous sections established that firms that do not employ the right set of workers tend to enter a new sector by acquisition. This finding, we argue, suggests that firms prefer to pay the costs associated to acquiring and restructuring a target when the costs of adjusting the existing workforce

are too large. In this section, we focus on firms that diversify by building on their existing resources to highlight the existence of such adjustment costs.

We define a firm as a set of subsidiaries. Therefore, the composition of the workforce may vary within a firm, with some subsidiaries better prepared to enter the new sector than others. Within firms that build, we should expect the entry to be made through subsidiaries that already employ the right set of occupations in order to minimize reallocation costs in the internal labor market. We construct our measure of internal human capital for each subsidiary and estimate the following model:

$$\mathbb{1}(\text{Build})_{f,n,t} = \lambda_{g,n,t} + \beta \cdot \text{Internal Human Capital}_{f,n,t-1} + \gamma \cdot X_{f,n,t-1} + \epsilon_{f,n,t}$$

The dependent variable is a dummy variable that takes the value one if the entry into the new sector is made through subsidiary  $f$ , and zero otherwise. We include firm  $\times$  sector of entry  $\times$  year fixed effects to compare the internal capital of the different subsidiaries of the same firm  $g$ . This specification leads mechanically to exclude stand-alone firms as we focus on the heterogeneity of human capital across subsidiaries.

In column 1 of Table 4.9, we find that within a firm, entry is more likely to be achieved through a subsidiary with the right set of occupations for the new sector. In column 2, we add control variables at the subsidiary level. The estimates show that large, productive and cash-rich subsidiaries are more likely to diversify in a new sector. In addition, in columns 3 and 4, we show that lag values of internal human capital are also positively correlated with the entry dummy. As for firms, internal human capital at the subsidiary level is sticky over time, suggesting that the composition the workforce is not adjusted in anticipation of a diversification. Overall, these findings are consistent with the presence of reallocation costs in the internal labor market.

[Insert Table 4.9 here]

## 7.2 Internal human capital and workforce adjustment

Our measure of human capital captures to which extent to the workforce of the firm is adapted to the sector of entry. Therefore, among firms that enter a new sector by developing their own resources, we should find that firms with lower human capital hire relatively more workers so as to adjust their workforce. We test this hypothesis by looking at employment growth within subsidiaries. More precisely, we focus on the subsidiaries that within diversifying firms, start selling in the new sector. This choice allows to observe more precisely the adjustment in labor associated with entry as it allows to abstract from employment variations in the other subsidiaries.

In Table 4.10, we show the existence of a negative relationship between internal human capital at  $t - 1$  and the growth rate of employment between  $t - 1$  and  $t + 1$  (with  $t$  the year of the entry into the new sector). This finding confirms that the higher the internal human capital, the less the subsidiary needs to hire additional workers to operate in the new sector. In column 2 and 3, we look at the timing of new hirings. We find that employment growth is not related to the level of internal human capital prior to entry (column 2). Instead, subsidiaries tend to adjust their workforce after having entered the new sector (column 3).

[Insert Table 4.10 here]

## 8 The role of labor market frictions

### 8.1 The effects of local labor market tightness for key occupations

Given the costs associated with an acquisition, why don't firms hire new workers instead of buying an existing firm? The model predicts that firms are more likely to buy rather than to adjust their workforce when workers in key occupations are in short supply in the external labor market (prediction 3). Specifically, the negative relationship between internal human capital and

the propensity to buy should be stronger when it is costly for the firm to hire workers on the external labor market. In this section, we empirically assess the role of labor market tightness in the decision to build or buy.

We rely to that end on data from the French unemployment agency to construct a sector-specific measure of local labor market (LLM) tightness.<sup>42</sup> According to this metric, a local labor market is viewed as tight for a given sector if the occupations in short supply in the LLM are important for operating in the sector (see section 4.2.3).

The results are reported in Table 4.11. Columns 1 and 2 show that the point estimates on the second and third terciles of LLM tightness are positive and significant, meaning that firms are significantly more likely to buy when labor markets for key occupations are tighter. Moreover, the interaction terms shows that the link between internal capital and the type of entry is stronger in presence of greater market frictions. This holds both with and without control variables (columns 1 and 2). This result is confirmed when we split the sample by tercile of labor market tightness and re-estimate the regression separately on each sub-sample: the human capital coefficient increases in absolute value and is significant at 1% only for the last tercile of labor market tightness. Overall, our results strongly confirm the prediction that human capital should play a greater role when it is more difficult to hire workers in key occupations.

[Insert Table 4.11 here]

## **8.2 Labor market tightness and the value of building**

Our model is based on the comparison of profits made when entering by acquisition and by building on existing resources. The model predicts that the value of building should be positively related to internal human capital. Moreover, this relationship should be stronger when key occu-

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<sup>42</sup>France is divided into 347 LLMs in 2013. Since 2010, the unemployment agency lists occupations in short supply in each LLM. An occupation is in short supply in a LLM if (i) the ratio of job offers exceeds job applications and (ii) surveyed employers anticipate that job offers for this occupation will be hard to fill in.

pations are in short supply in the external labor market. We have so far tested this assumption indirectly by looking at the choice to build or buy. In this last section, we directly look at the relationship between the value of building and the human capital of the firm.

The results are reported in table 4.12. Profits by sector are not observable in our data set. Instead, we proxy the value of building by the logarithm of entry sales. We find that entry sales are higher when the workforce of the firm is more adapted to the sector of entry. This finding suggests that the value of building is higher when the firm has the adequate internal resources. In columns 3 to 5, we run the analysis on subsample of LLM tightness terciles and show the positive link is entirely driven by tight labor markets (third tercile, column 5). This finding suggests that the value of building depends on firms' internal human capital when local labor market frictions are important. In other words, firms' internal resources matter only when it is costly to obtain them outside from the boundaries of the firm.

[Insert Table 4.12 here]

## 9 Conclusion

Why do some firms enter a new sector by acquiring an existing company ("buy"), while others do so using their existing resources ("build")? When a firm buys to enter a new sector, it has to incur both the costs of acquiring and restructuring the target, but gets access to its productive resources. When a firm builds on its existing resources to enter a new sector, it must pay the adjustment costs needed to acquire the adequate set of capabilities.

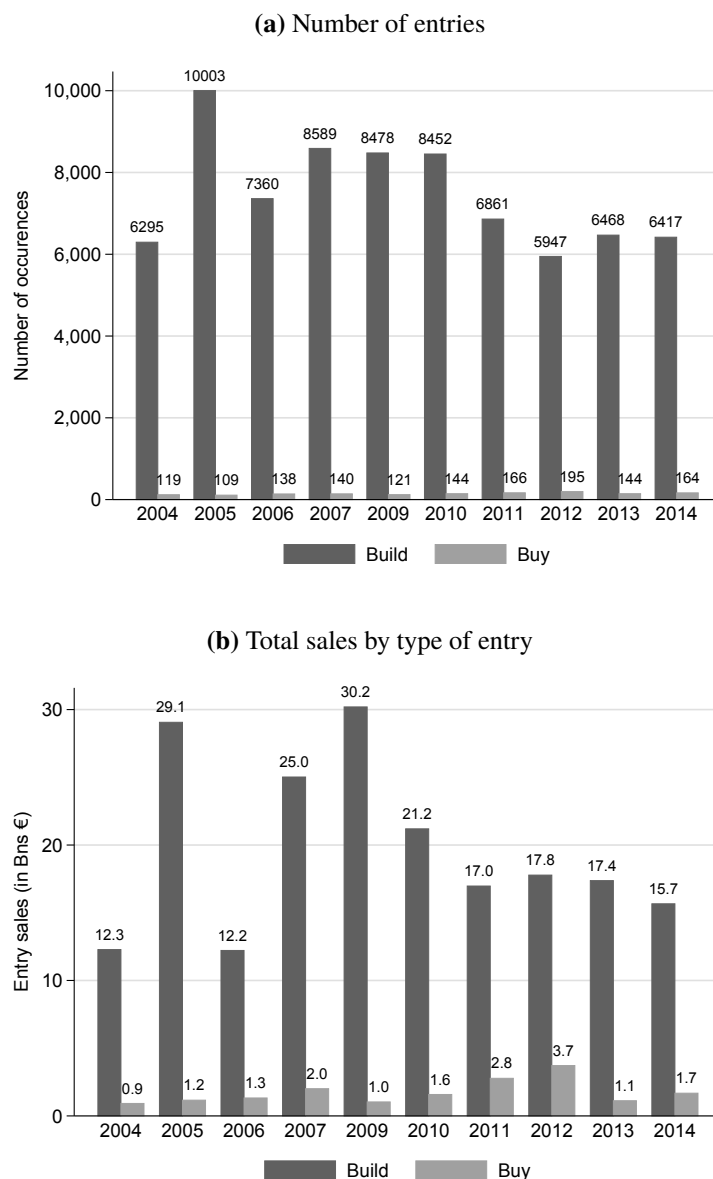
We focus on the role of labor and construct a firm-level measure of human capital based on the occupational structure of the workforce. Our main explanatory variable measures to which extent the human capital of the firm is adapted to the sector of entry. We find robust evidence that firms choose to build (buy) when their human capital is (not) adapted to the sector of entry. In addition,

using occupation-level data on local labor market tightness, we show that firms are more likely to buy when it is more costly to hire new workers, *i.e.* when labor markets for key occupations are in short supply. This paper contributes to the literature on corporate diversification by showing that both the set of internal resources and the cost of accessing external resources play a role in explaining how firms diversify, which contributes to a better understanding of the determinants of firms' boundaries.

## 10 Figures and Tables

**Figure 4.1. Number and size of build and buy entries.**

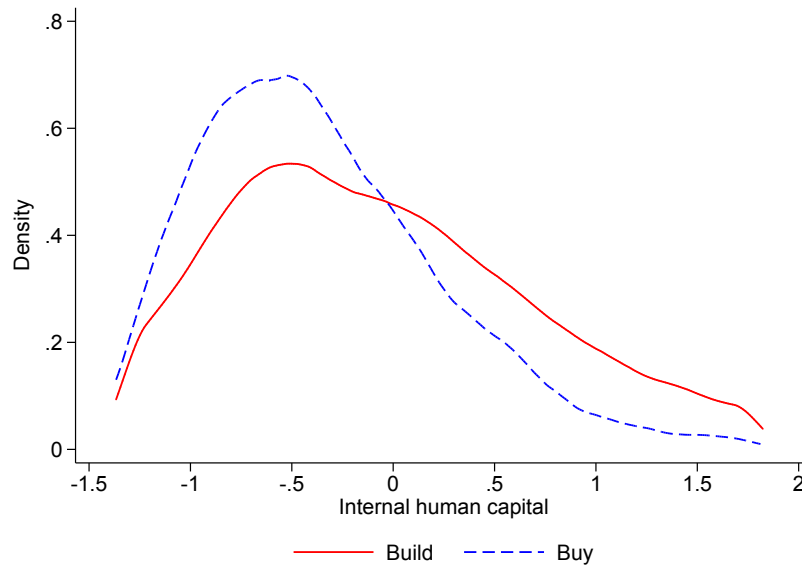
*Source:* SDC Platinum, BvD Zephyr, ESA survey. *Sample:* Firms that enter a new sector during the periods 2003-2007 and 2009-2014. This figure displays the number of external (Buy) and internal (Build) entries by year and the total sales by type of type. Acquisitions are identified with SDC Platinum and Bureau van Dijk Zephyr databases. Entries are identified with sales reported at the 5-digit level of the French SIC.





**Figure 4.2. Human capital by type of entry.**

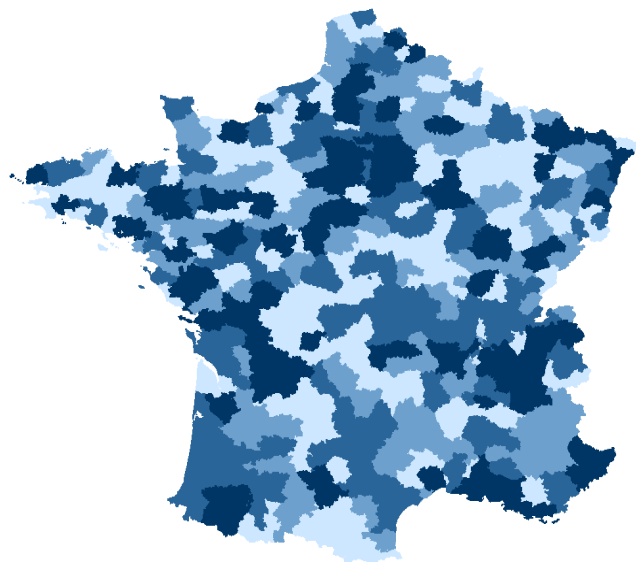
The figure displays the probability distribution function of *Internal Human capital* by mode of entry. *Source:* SDC Platinum, BvD Zephyr, EAE survey, matched employer-employee dataset. *Sample:* Firms that enter a new sector either internally (build) or externally (buy) during the periods 2003-2007 and 2009-2014. Acquisitions are identified with SDC Platinum and Bureau van Dijk Zephyr databases. Build entries are identified using reported sales from the ESA survey at the 5-digits level of the French SIC. *Internal Human Capital*<sub>g,n,t-1</sub> measures to which extent the workforce of the firm is adapted to the sector of entry (see section 3.2). *Internal Human Capital*<sub>g,n,t-1</sub> is trimmed at the 5% level (for this graph only).



### Figure 4.3. Occupations in short supply.

*Source:* French national unemployment agency. Figure 4.3 plots the distribution of the tightness of labor markets in 2013. Labor market tightness is measured by the number of occupations in short supply in a given local labor market. Darker shades of blue indicate a higher degree of tension in the local labor market. Occupations in short supply are identified by the French national employment agency as occupations for which (i) the ratio of job offers over job applications is high (ii) surveyed employers forecast that it will be difficult to fill posted offers. There are 348 different local labor markets.

(a) Number of occupations in short supply by local labor market.



**Table 4.1. Evolution of the number of build and buy entries.**

*Source:* SDC Platinum, BvD Zephyr, EAE survey, tax files, ownership links dataset. *Sample:* Firms that enter a new sector during the periods 2003-2007 and 2009-2014. This table reports the ratio of Buy entries to Build entries. A firm is said to "buy" when it enters a new sector through a M&A (source: SDC Platinum and Bureau van Dijk Zephyr). A firm is said to "build" when it enters a new sector by one its existing subsidiaries (source: ESA survey).

Panel A. Buy and Build entries by year

	2004	2005	2006	2007	2009	2010	2011	2012	2013	2014
Build (number)	6295	10003	7360	8589	8478	8452	6861	5947	6468	6417
Buy (number)	119	109	138	140	121	144	166	195	144	164
Buy (% , frequency)	1.85	1.08	1.84	1.60	1.4	1.67	2.36	3.17	2.18	2.49
Buy (% , sales)	6.98	3.85	9.79	7.44	3.31	6.95	14.07	17.30	6.06	9.68

Panel B. Buy and Build entries by industry level

Industry level:	5 digits	4 digits	3 digits	2 digits	1 digit
Build (number)	74,870	72,250	63,176	49,570	32,431
Buy (number)	1,440	1,363	1,163	941	584
Buy (% , frequency)	1.89	1.85	1.81	1.86	1.77
Buy (% , sales)	8.05	8.55	8.31	10.57	15.72

**Table 4.2. Summary statistics.**

Source: SDC Platinum, BvD Zephyr, EAE survey, tax files, ownership links dataset, matched employer-employee dataset. Sample: Firms that enter a new sector during the periods 2003-2007 and 2009-2014. This table reports descriptive statistics for firms that are identified to enter a new sector, either internally or externally, during the periods 2003-2007 and 2009-2014. Panel A reports the distribution of the main firm characteristics. Panel B compares the means firms' characteristics that enter a new sector internally and those that enter by acquisition. A firm is said to "buy" when it enters a new sector through a M&A (source: SDC Platinum and Bureau van Dijk Zephyr). A firm is said to "build" when it enters a new sector by one its existing subsidiaries (source: ESA survey). Sectors refer to an industry at the 5-digits level of the French SIC. Description of the variables are reported in Appendix C.

Panel A. Distribution of firms characteristics

	N	Mean	St.Dev.	Percentiles				
				5 <sup>th</sup>	25 <sup>th</sup>	50 <sup>th</sup>	75 <sup>th</sup>	95 <sup>th</sup>
$\mathbb{1}(\text{Buy})_{g,n,t}$	76310	0.02	0.14	0.00	0.00	0.00	0.00	0.00
Entry sales $_{g,n,t}$ (M euros)	76310	2.82	21.32	0.00	0.05	0.27	1.21	8.95
$\mathbb{1}(\text{1-year survival})_{g,n,t+1}$	76310	0.47	0.50	0.00	0.00	0.00	1.00	1.00
Investment $_{g,n,t}$ (M euros)	76310	0.96	16.24	0.00	0.03	0.10	0.35	2.44
Internal Human Capital $_{g,n,t-1}$	76310	0.14	1.04	-1.29	-0.59	-0.00	0.69	2.05
N.workers $_{g,t-1}$ (in thousands)	76310	0.63	5.16	0.02	0.04	0.07	0.19	1.29
Value added/N.workers $_{g,t-1}$	76310	0.05	0.03	0.02	0.03	0.04	0.06	0.11
Fixed assets/N.workers $_{g,t-1}$	76310	0.04	0.05	0.00	0.01	0.03	0.06	0.14
Cash holdings/N.workers $_{g,t-1}$	76310	0.02	0.02	0.00	0.00	0.01	0.02	0.06
Product market distance $_{g,n,t-1}$	76310	0.87	0.15	0.53	0.81	0.94	0.98	1.00
Vertical integration $_{g,n,t-1}$	44947	0.67	0.47	0.00	0.00	1.00	1.00	1.00

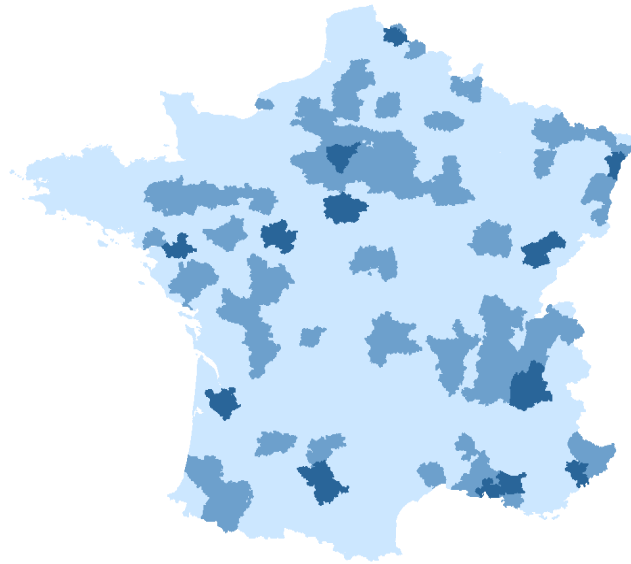
Panel B. Comparison of build and buy entries

	Build		Buy		Difference	
	Mean	St.Dev.	Mean	St.Dev.	Mean	p-value
Entry sales $_{g,n,t}$ (M euros)	2.64	20.52	12.04	45.85	-9.39 * **	(0.00)
$\mathbb{1}(\text{1-year survival})_{g,n,t+1}$	0.47	0.50	0.59	0.49	-0.13 * **	(0.00)
Investment $_{g,n,t}$ (M euros)	0.78	15.35	10.72	40.43	-9.95 * **	(0.00)
Internal Human Capital $_{g,n,t-1}$	0.15	1.04	-0.21	0.77	0.36 * **	(0.00)
N.workers $_{g,t-1}$ (in thousands)	0.59	4.82	2.37	14.33	-1.77 * **	(0.00)
Value added/N.workers $_{g,t-1}$	0.05	0.03	0.07	0.04	-0.01 * **	(0.00)
Fixed assets/N.workers $_{g,t-1}$	0.04	0.05	0.05	0.06	-0.00	(0.16)
Cash holdings/N.workers $_{g,t-1}$	0.02	0.02	0.02	0.02	-0.01 * **	(0.00)
Product market distance $_{g,n,t-1}$	0.87	0.16	0.92	0.10	-0.05 * **	(0.00)
Vertical integration $_{g,n,t-1}$	0.68	0.47	0.59	0.49	0.08 * **	(0.00)
N	74,870		1,440		76,310	

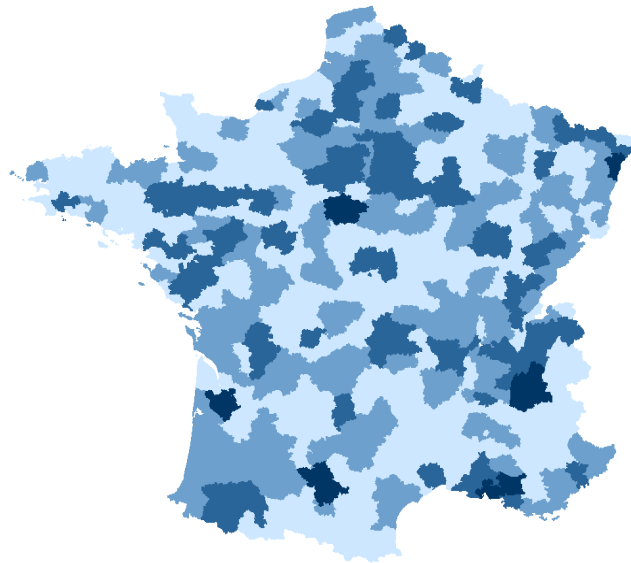
#### Figure 4.4. Local labor market tightness.

Source: French national unemployment agency. The figures plot the value of  $LLM\ Tightness_{n,z,t}$  of each local labor market  $z$  in  $t = 2013$  for different sectors  $n$ . Figure 4.4a focuses on the manufacture of pharmaceutical preparations and figure 4.4b focuses on the manufacture of motor vehicles. Darker shades of blue indicate local labor markets with a larger number of occupations in short supply. Occupations in short supply are identified by the French national employment agency as occupations for which (i) the ratio of job offers over job applications is high (ii) surveyed employers forecast that it will be difficult to fill posted offers. France is divided into 348 different local labor markets  $z$ .

(a) Manufacture of pharmaceutical preparations



(b) Manufacture of motor vehicles



**Table 4.3. Human capital and corporate diversification.**

*Source:* SDC Platinum, BvD Zephyr, EAE survey, tax files, ownership links dataset, matched employer-employee dataset. *Sample:* Firms that enter a new sector during the periods 2003-2007 and 2009-2014. The table reports OLS estimates and analyses the role of human capital on the type of diversification strategy. The dependent variable  $\mathbb{1}(\text{Buy})_{g,n,t}$  is a dummy variable that takes the value one if the entry of firm  $g$  in sector  $n$  at time  $t$  is made through an acquisition, zero if the entry is made internally. Entries are identified with sales reported at the 5-digit level of the French SIC. The main independent variable is a firm-level measure of human capital  $\text{Internal Human Capital}_{g,n,t-1}$ . The variable measures to which extent the workforce of the firm is adapted to the sector of entry (see section 3.2). Control variables include the number of workers in logarithm as well total cash holdings, tangible assets and value added, all three scaled by the number of workers in the firm. All models include Sector Origin  $\times$  Entry  $\times$  Year fixed effects. Standard errors are double clustered at sector of origin and sector of entry levels and reported in parentheses. \*, \*\*, and \*\*\* mean significantly different from zero at 10, 5 and 1% levels, respectively.

Dependent variable:	$\mathbb{1}(\text{Buy})_{g,n,t}$			
	(1)	(2)	(3)	(4)
Internal Human Capital $_{g,n,t-1}$	-0.015*** (0.004)	-0.010*** (0.003)		
log(N.workers) $_{g,t-1}$		0.010*** (0.002)	0.010*** (0.002)	0.011*** (0.002)
Cash holdings/N.workers $_{g,t-1}$		0.044 (0.045)	0.043 (0.050)	0.054 (0.058)
Fixed assets/N.workers $_{g,t-1}$		-0.021 (0.028)	-0.024 (0.031)	-0.023 (0.034)
Value added/N.workers $_{g,t-1}$		0.049 (0.035)	0.046 (0.038)	0.038 (0.043)
Internal Human Capital $_{g,n,t-2}$			-0.011*** (0.003)	
Internal Human Capital $_{g,n,t-3}$				-0.014*** (0.004)
Sector origin $\times$ entry $\times$ year FE	Yes	Yes	Yes	Yes
$R^2$	0.199	0.206	0.208	0.207
N	76,354	76,296	66,145	54,230

**Table 4.4. The role of size and financial constraints.**

Source: SDC Platinum, BvD Zephyr, EAE survey, tax files, ownership links dataset, matched employer-employee dataset. Sample: Firms that enter a new sector during the periods 2003-2007 and 2009-2014. The table reports OLS estimates and tests the effect of firms' financial constraints on the relationship between human capital and the type of diversification strategy. Three proxy of financial constraints are considered: size, cash holding and public ownership status. Columns (1) and (2) include the second and third terciles of size (number of workers) interacted with *Internal Human Capital*<sub>g,n,t-1</sub>. Columns (3) and (4) include the second and third terciles of cash holdings over workers (*Cash holdings/N. workers*) interacted with *Internal Human Capital*<sub>g,n,t-1</sub>. In columns (5) and (6), we split firms between publicly and privately owned firms. Public firms are those that include at least one publicly listed firm within the firm. The dependent variable  $\mathbb{1}(Buy)_{g,n,t}$  is a dummy variable that takes the value one if the entry of firm *g* in sector *n* at time *t* is made through an acquisition, zero if the entry is made internally. Entries are identified at the 5-digit level of the French SIC. The main independent variable is a firm-level measure of human capital *Internal Human Capital*<sub>g,n,t-1</sub>. The variable measures to which extent the workforce of the firm is adapted to the sector of entry (see section 3.2). Control variables include the number of workers in logarithm as well total cash holdings, tangible assets and value added, all three scaled by the number of workers in the firm. Standard errors are double clustered at sector of origin and sector of entry levels and reported in parentheses. \*, \*\*, and \*\*\* mean significantly different from zero at 10, 5 and 1% levels, respectively.

Dependent variable:	$\mathbb{1}(Buy)_{g,n,t}$					
	Size		Cash/N. workers		Type of firm	
	(1)	(2)	(3)	(4)	Public (5)	Private (6)
Internal Human Capital <sub>g,n,t-1</sub>	-0.011*** (0.003)	-0.011*** (0.003)	-0.014*** (0.003)	-0.010*** (0.003)	-0.123** (0.051)	-0.007*** (0.002)
2nd tercile of N.workers <sub>g,t-1</sub>	0.005** (0.002)	0.005** (0.002)				
3rd tercile of N.workers <sub>g,t-1</sub>	0.025*** (0.005)	0.025*** (0.006)				
2nd N.workers <sub>g,t-1</sub> × Internal HC <sub>g,n,t-1</sub>	-0.001 (0.001)	-0.001 (0.001)				
3rd t. N.workers <sub>g,t-1</sub> × Internal HC <sub>g,n,t-1</sub>	-0.004 (0.003)	-0.004 (0.003)				
2nd tercile of Cash <sub>g,t-1</sub>			0.002 (0.002)	0.001 (0.001)		
3rd tercile of Cash <sub>g,t-1</sub>			0.004** (0.002)	0.003 (0.002)		
2nd t. Cash <sub>g,t-1</sub> × Internal HC <sub>g,n,t-1</sub>			-0.000 (0.001)	0.000 (0.001)		
3rd t. Cash <sub>g,t-1</sub> × Internal HC <sub>g,n,t-1</sub>			-0.003* (0.002)	-0.002 (0.002)		
Controls	No	Yes	No	No	Yes	Yes
Sector origin × entry × year FE	Yes	Yes	Yes	Yes	No	No
Sector Origin × entry FE	No	No	No	No	Yes	Yes
Year FE	No	No	No	No	Yes	Yes
R <sup>2</sup>	0.204	0.205	0.199	0.206	0.107	0.123
N	76,354	76,296	76,354	76,354	1,198	74,204

**Table 4.5. The role of sectoral complementarities.**

*Source:* SDC Platinum, BvD Zephyr, EAE survey, tax files, ownership links dataset, matched employer-employee dataset. *Sample:* Firms that enter a new sector during the periods 2003-2007 and 2009-2014. The table reports OLS estimates and tests the effect of complementarities between the sector of origin and sector of entry on the relationship between human capital and the type of diversification strategy. The dependent variable is a dummy variable that takes the value one if the entry of firm  $g$  in sector  $n$  at time  $t$  is made through an acquisition, zero if the entry is made internally. The main independent variable is a firm-level measure of human capital  $Internal\ Human\ Capital_{g,n,t-1}$ . The variable measures to which extent the workforce of the firm is adapted to the sector of entry (see section 3.2). In addition, columns (1) and (2) include a product market distance adapted from Bloom, Schankerman and Van Reenen (2013). It measures the distance between the sectors in which firm  $g$  operates at  $t - 1$  and the sector of entry  $n$ . The distance ranges from 0 to 1 (1 being the maximum). Columns (3) and (4) include the Fan and Goyal (2006)'s measure of vertical relatedness. It measures the intensity of vertical links between the main sector of activity of firm  $g$  at time  $t - 1$  and the sector in which  $g$  enters at time  $t$ . "Vertical" is a dummy variable that takes the value 1 if the vertical relatedness exceed 5%. Sector of origin  $\times$  sector of entry  $\times$  year fixed effects are included in columns (1) and (2). Models include sector of origin, sector of entry, year fixed effects separately. Control variables include the number of workers in logarithm as well total cash holdings, tangible assets and value added, all three scaled by the number of workers in the firm. Standard errors are double clustered at sector of origin and sector of entry levels and reported in parentheses. \*, \*\*, and \*\*\* mean significantly different from zero at 10, 5 and 1% levels, respectively.

Dependent variable:	$\mathbb{1}(\text{Buy})_{g,n,t}$			
	Product market distance		Vertical Integration	
	(1)	(2)	(3)	(4)
Internal Human Capital $_{g,n,t-1}$	-0.010*** (0.003)	-0.006*** (0.002)	-0.019*** (0.005)	-0.018*** (0.005)
2nd t. Product Market Distance $_{g,n,t-1}$	0.003 (0.003)	0.007** (0.003)		
3rd t. Product Market Distance $_{g,n,t-1}$	0.009** (0.004)	0.012*** (0.004)		
2nd t. Distance $_{g,n,t-1} \times$ Internal HC $_{g,n,t-1}$		-0.007*** (0.002)		
3rd t. Distance $_{g,n,t-1} \times$ Internal HC $_{g,n,t-1}$		-0.008*** (0.002)		
Vertical integration $_{g,n,t-1}$			0.001 (0.006)	0.000 (0.006)
Vertical integration $_{g,n,t-1} \times$ Internal HC $_{g,n,t-1}$				-0.002 (0.005)
Controls	Yes	Yes	Yes	Yes
Sector origin $\times$ entry $\times$ year FE	Yes	Yes	No	No
Sector of origin FE	No	No	Yes	Yes
Sector of entry FE	No	No	Yes	Yes
Year FE	No	No	Yes	Yes
$R^2$	0.208	0.208	0.102	0.102
N	76,226	76,226	68,531	68,531



**Table 4.6. Alternative measures of human capital.**

*Source:* SDC Platinum, BvD Zephyr, EAE survey, tax files, ownership links dataset, matched employer-employee dataset. *Sample:* Firms that enter a new sector during the periods 2003-2007 and 2009-2014. The table reports OLS estimates and assess how our results are robust to the definition of human capital. The dependent variable  $\mathbb{1}(\text{Buy})_{g,n,t}$  is a dummy variable that takes the value one if the entry of firm  $g$  in sector  $n$  at time  $t$  is made through an acquisition, zero if the entry is made internally. Entries are identified at the 5-digit level of the French SIC. We test several alternative definition of our main independent variable *Internal Human Capital* $_{g,n,t-1}$ . In the baseline definition, the measure is computed as the sum of occupation  $\times$  sector  $\times$  year fixed effects present in the workforce of firm  $g$  at time  $t - 1$ . The measure is scaled by the number of occupations in firm  $g$ . The variable measures to which extent the workforce of the firm is adapted to the sector of entry (see section 3.2). In column (1), the dependent variable is a dummy equal to one if for a sector of entry  $n$  and a time of entry  $t$ , firm  $g$  has no occupation in the top 10 of occupation-sector-year fixed effects. In column (2), the sum of occupation  $\times$  sector  $\times$  year fixed effects is weighted by the number of employees by occupation in the firm. In column (3), CEO occupations are excluded from the sum of occupations. In column (4), occupation  $\times$  sector  $\times$  year fixed effects are estimated at the plant-level instead of the firm level in the baseline model. Control variables include the number of workers in logarithm as well total cash holdings, tangible assets and value added, all three scaled by the number of workers in the firm. All models include sector of origin  $\times$  entry  $\times$  year fixed effects. Standard errors are double clustered at sector of origin and sector of entry levels and reported in parentheses. \*, \*\*, and \*\*\* mean significantly different from zero at 10, 5 and 1% levels, respectively.

Dependent variable:	$\mathbb{1}(\text{Buy})_{g,n,t}$			
	(1)	(2)	(3)	(4)
$\mathbb{1}(\text{No Top 10})_{g,n,t-1}$	0.008*** (0.003)			
Internal Human Capital $_{g,n,t-1}$ (weighted)		-0.009*** (0.002)		
Internal Human Capital $_{g,n,t-1}$ (no CEO)			-0.010*** (0.003)	
Internal Human Capital $_{g,n,t-1}$ (plant-level)				-0.009*** (0.003)
Sector origin $\times$ entry $\times$ year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
$R^2$	0.205	0.206	0.205	0.206
N	76,296	75,614	76,270	76,094

**Table 4.7. Selection into diversification.**

*Source:* SDC Platinum, BvD Zephyr, EAE survey, tax files, ownership links dataset, matched employer-employee dataset. *Sample:* Firms that enter a new sector during the periods 2003-2007 and 2009-2014. The table reports OLS estimates and tests two potential self-selection stories that could drive the main results. The dependent variable  $\mathbb{1}(\text{Buy})_{g,n,t}$  is a dummy variable that takes the value one if the entry of firm  $g$  in sector  $n$  at time  $t$  is made through an acquisition, zero if the entry is made internally. The main independent variable is a firm-level measure of human capital  $\text{Internal Human Capital}_{g,n,t-1}$ . The variable measures to which extent the workforce of the firm is adapted to the sector of entry (see section 3.2). In columns (1) to (3), firms that decrease their activity in a preexisting sector while entering sector  $n$  (*Shifting firms*) are excluded. *Shifting firms* are firms for which the minimum growth rate of sales is negative and greater than 100%, 50% and 25% in absolute value. We compute the growth rate of sales between  $t - 1$  and  $t$  in each sector in which firms were operating at  $t - 1$  and take the firm-level minimum of sectoral growth rates. In column (4), *Serial acquirers* are excluded. Serial acquirers are firms that enter more than one sector by acquisition during the time period. Control variables include the number of workers in logarithm as well total cash holdings, tangible assets and value added, all three scaled by the number of workers in the firm. All models include sector of origin  $\times$  entry  $\times$  year fixed effects. Standard errors are double clustered at sector of origin and sector of entry levels and reported in parentheses. \*, \*\*, and \*\*\* mean significantly different from zero at 10, 5 and 1% levels, respectively.

Dependent variable: Excluding:	$\mathbb{1}(\text{Buy})_{g,n,t}$			
	100% (1)	Shifting firms 50% (2)	25% (3)	Serial acquirers (4)
Internal Human Capital $_{g,n,t-1}$	-0.010*** (0.003)	-0.012*** (0.003)	-0.012*** (0.004)	-0.003*** (0.001)
log(N.workers) $_{g,t-1}$	0.010*** (0.002)	0.010*** (0.002)	0.011*** (0.003)	0.003*** (0.001)
Cash holdings/N.workers $_{g,t-1}$	0.056 (0.046)	0.072 (0.058)	0.073 (0.057)	0.001 (0.014)
Fixed assets/N.workers $_{g,t-1}$	-0.010 (0.029)	0.007 (0.032)	0.041 (0.036)	-0.011 (0.010)
Value added/N.workers $_{g,t-1}$	0.043 (0.033)	0.039 (0.043)	0.024 (0.050)	0.016 (0.016)
Controls	Yes	Yes	Yes	Yes
Sector origin $\times$ entry $\times$ year FE	Yes	Yes	Yes	Yes
$R^2$	0.205	0.222	0.243	0.157
N	74,510	54,072	38,847	72,681

**Table 4.8. Complementarities between human and physical capital.**

*Source:* SDC Platinum, BvD Zephyr, EAE survey, tax files, ownership links dataset, matched employer-employee dataset. *Sample:* Firms that enter a new sector during the periods 2003-2007 and 2009-2014. The table reports OLS estimates and tests the effect of labor and capital complementarities on the relationship between human capital and the type of diversification strategy. The relationship between human capital and the type of diversification strategy is compared between firms that realized similar entry sales or capital expenditures during the year of entry. In columns (1) and (2), we rank entry sales into ten deciles and run our baseline regressions with interacted sector of origin  $\times$  sector of entry  $\times$  year  $\times$  sales decile fixed effects. Sales are defined as the total amount of sales realized in the sector of entry  $n$  by firm  $g$  at time  $t$ . In columns (3) and (4), we consider replace sales with investment deciles. In the case of build entries, investment is measured as the total amount of capital expenditures realized by firm's firms that entered in sector  $n$  at time  $t$ . In the case of Buy entries, investment is the amount of acquired fixed physical assets. The dependent variable is a dummy variable that takes the value one if the entry of firm  $g$  in sector  $n$  at time  $t$  is made through an acquisition, zero if the entry is made internally. The main independent variable is a firm-level measure of human capital *Internal Human Capital* $_{g,n,t-1}$ . The variable measures to which extent the workforce of the firm is adapted to the sector of entry (see section 3.2). Control variables include the number of workers in logarithm as well total cash holdings of the firm, the total amount of tangible assets held by the firm and the total value added generated by the firm, all scaled by the number of workers in the firm. Standard errors are double clustered at sector of origin and sector of entry levels and reported in parentheses. \*, \*\*, and \*\*\* mean significantly different from zero at 10, 5 and 1% levels, respectively.

Dependent variable:	$\mathbb{1}(\text{Buy})_{g,n,t}$			
	Sales		Investment	
	(1)	(2)	(3)	(4)
Internal Human Capital $_{g,n,t-1}$	-0.009*** (0.003)	-0.007** (0.003)	-0.004* (0.002)	-0.003* (0.002)
Controls	No	Yes	No	Yes
Sector origin $\times$ entry $\times$ year FE $\times$ Sales bucket	Yes	Yes	No	No
Sector origin $\times$ entry $\times$ year FE $\times$ Investment bucket	No	No	Yes	Yes
$R^2$	0.232	0.235	0.267	0.267
N	45,959	45,959	31,735	31,735

**Table 4.9. Reallocation costs in the internal labor market.**

*Source:* EAE survey, tax files, ownership links dataset, matched employer-employee dataset. *Sample:* Subsidiaries of firms that enter a new sector internally during the periods 2003-2007 and 2009-2014. The table reports OLS estimates and tests whether subsidiaries that enter the new sector have high human capital compared to the other subsidiaries of the same firm. The dependent variable is a dummy variable that takes the value one if the entry in sector  $n$  at time  $t$  is made through subsidiary  $f$ , zero if the entry is not made through subsidiary  $f$  within firm  $g$ . Entries are identified with sales reported at the 5-digit level of the French SIC. The main independent variable is a subsidiary-level measure of human capital  $Internal\ Human\ Capital_{g,n,t-1}$ . The variable measures to which extent the workforce of the subsidiary is adapted to the sector of entry (see section 3.2). Column (1) and (2) are the baseline specifications. In columns (3) and (4), the measure of Internal Human Capital is calculated at  $t - 2$  and  $t - 3$  respectively. Columns (2) to (4) include the following set of control variables: the number of workers, the subsidiary's cash holdings, amount of tangible assets and value added, the last three variables being scaled by the number of workers in the subsidiary. All models are estimated with firm  $\times$  sector of entry  $\times$  year fixed effects. Standard errors are double clustered at sector of origin and sector of entry levels and reported in parentheses. \*, \*\*, and \*\*\* mean significantly different from zero at 10, 5 and 1% levels, respectively.

Dependent variable:	(1)	(2)	$\mathbb{1}(\text{Build})_{f,n,t}$ (3)	(4)
Internal Human Capital $_{f,n,t-1}$	0.021*** (0.004)	0.024*** (0.004)		
$\log(\text{N. workers})_{f,t-1}$		0.018*** (0.003)	0.017*** (0.003)	0.017*** (0.003)
Cash holdings/N.workers $_{f,t-1}$		0.312** (0.153)	0.325** (0.161)	0.314* (0.160)
Fixed assets/N.workers $_{f,t-1}$		0.078*** (0.026)	0.080*** (0.026)	0.086*** (0.029)
Value added/N.workers $_{f,t-1}$		0.080** (0.032)	0.070** (0.034)	0.062* (0.035)
Internal Human Capital $_{f,n,t-2}$			0.024*** (0.004)	
Internal Human Capital $_{f,n,t-3}$				0.023*** (0.004)
Firm $\times$ sector of entry $\times$ year FE	Yes	Yes	Yes	Yes
Controls	No	Yes	No	No
$R^2$	0.229	0.234	0.236	0.233
N	362,089	362,089	316,760	267,060

**Table 4.10. Internal human capital and employment growth.**

*Source:* matched employer-employee dataset, ownership links dataset, EAE survey. *Sample:* Subsidiaries through which internal entries are realized during the periods 2003-2007 and 2009-2014. The table reports OLS estimates and tests the link between internal human capital and the variation of the number of workers. The main variable is the growth rate of the number of workers (computed as in Davis and Haltiwanger (1992)). The variation is computed between  $[t-1;t+1]$ ,  $[t-1;t]$ , and  $[t;t+1]$  with  $t$  the year of entry in the new sector. The main independent variable is a subsidiary-level measure of human capital  $Internal\ Human\ Capital_{g,n,t-1}$ . The variable measures to which extent the workforce of the subsidiary is adapted to the sector of entry (see section 3.2). Control variable include the following set of control variables: the number of workers, the subsidiary's cash holdings, amount of tangible assets and value added, the last three variables being scaled by the number of workers in the subsidiary. All models include sector of origin  $\times$  entry  $\times$  year fixed effects. Standard errors are double clustered at sector of origin and sector of entry levels and reported in parentheses. \*, \*\*, and \*\*\* mean significantly different from zero at 10, 5 and 1% levels, respectively.

Dependent variable:	$\Delta$ number of workers		
	$[t-1 ; t+1]$ (1)	$[t-1 ; t]$ (2)	$[t ; t+1]$ (3)
Internal Human Capital $_{f,n,t-1}$	-0.013* (0.007)	0.002 (0.001)	-0.016** (0.008)
Controls	Yes	Yes	Yes
Sector origin $\times$ entry $\times$ year FE	Yes	Yes	Yes
$R^2$	0.639	0.102	0.659
N	19,205	26,003	19,205

**Table 4.11. Diversification, human capital and local labor market tightness.**

*Source:* SDC Platinum, BvD Zephyr, EAE survey, tax files, ownership links dataset, matched employer-employee dataset. *Sample:* Firms that enter a new sector during the periods 2003-2007 and 2009-2014. The table reports OLS estimates and tests the effect of tight local labor markets for key occupations on the relationship between human capital and the type of diversification strategy. The dependent variable is a dummy variable that takes the value one if the entry of firm  $g$  in sector  $n$  at time  $t$  is made through an acquisition, zero if the entry is made internally. The main independent variable is a firm-level measure of human capital  $Internal\ Human\ Capital_{g,n,t-1}$ . The variable measures to which extent the workforce of the firm is adapted to the sector of entry (see section 3.2).  $LLM\ Tightness_{n,z,t}$  is the sum of occupations in short supply in the local labor market  $z$  at time  $t - 1$ , weighted by the occupation  $\times$  sector  $\times$  year fixed effects, scaled by the number of occupations present in sector  $n$  at (see equation (4.2.3)). Terciles of LLM tightness are included in columns (1) and (2). Models in columns (3) to (5) are estimated on subsamples of the dataset split by terciles of LLM tightness. France is divided into 348 local labor markets. Control variables include the number of workers in logarithm as well total cash holdings of the firm, the total amount of tangible assets held by the firm and the total value added generated by the firm, all scaled by the number of workers in the firm. All models include sector origin  $\times$  sector of entry  $\times$  year fixed effects, as well as labor market fixed effects. Standard errors are double clustered at sector of origin and sector of entry levels and reported in parentheses. \*, \*\*, and \*\*\* mean significantly different from zero at 10, 5 and 1% levels, respectively.

Dependent variable:	$\mathbb{1}(\text{Buy})_{g,n,t}$				
	All (1)	All (2)	$\leq P33$ (3)	$\geq P33$ and $\leq P66$ (4)	$\geq P66$ (5)
Internal Human Capital $_{g,n,t-1}$	-0.016*** (0.005)	-0.008** (0.004)	-0.003 (0.004)	-0.013** (0.006)	-0.016*** (0.004)
2nd tercile of LLM Tightness $_{n,z,t-1}$	0.007** (0.003)	0.006** (0.003)			
3rd tercile of LLM Tightness $_{n,z,t-1}$	0.014*** (0.005)	0.012*** (0.004)			
2nd t. LLM Tightness $_{n,z,t-1} \times$ Internal HC $_{g,n,t-1}$	-0.005** (0.002)	-0.004** (0.002)			
3rd t. LLM Tightness $_{n,z,t-1} \times$ Internal HC $_{g,n,t-1}$	-0.005** (0.002)	-0.004* (0.002)			
Controls	No	Yes	Yes	Yes	Yes
Sector origin $\times$ entry $\times$ year FE	Yes	Yes	Yes	Yes	Yes
Local Labor Market FE	Yes	Yes	Yes	Yes	Yes
$R^2$	0.418	0.424	0.525	0.501	0.377
N	28,598	28,957	7,953	7,796	8,067

**Table 4.12. Local labor market tightness and the value of building.**

*Source:* SDC Platinum, BvD Zephyr, EAE survey, tax files, ownership links dataset, matched employer-employee dataset. *Sample:* Firms that enter a new sector by building during the periods 2003-2007 and 2009-2014. The table reports OLS estimates and tests the effect of tight local labor markets for key occupations on the relationship between human capital and performance on the sector of entry. The dependent variable  $\log(\text{Sales})_{g,n,z,t}$  is the logarithm of sales realized by firm  $g$  in sector  $n$  the year of entry  $t$ . The variable is defined only for Build entries, i.e., when  $1(\text{Buy})_{g,n,z,t} = 0$ . The main independent variable is a firm-level measure of human capital  $\text{Internal Human Capital}_{g,n,t-1}$ . The variable measures to which extent the workforce of the firm is adapted to the sector of entry (see section 3.2).  $\text{LLM Tightness}_{n,z,t}$  is the sum of occupations in short supply in the local labor market  $z$  at time  $t - 1$ , weighted by the occupation  $\times$  sector  $\times$  year fixed effects, scaled by the number of occupations present in sector  $n$  at (see equation (4.2.3)). Terciles of LLM tightness are included in columns (1) and (2). Models in columns (3) to (5) are estimated on subsamples of the dataset split by terciles of LLM tightness. France is divided into 348 local labor markets. Control variables include the number of workers in logarithm as well total cash holdings of the firm, the total amount of tangible assets held by the firm and the total value added generated by the firm, all scaled by the number of workers in the firm. All models include sector origin  $\times$  sector of entry  $\times$  year fixed effects, as well as labor market fixed effects. Standard errors are double clustered at sector of origin and sector of entry levels and reported in parentheses. \*, \*\*, and \*\*\* mean significantly different from zero at 10, 5 and 1% levels, respectively.

Dependent variable:	$\log(\text{Sales})_{g,n,t}$				
Tercile of LLM Tightness $_{n,z,t-1}$ :	All	All	$\leq$ P33	$\geq$ P33 and $\leq$ P66	$\geq$ P66
	(1)	(2)	(3)	(4)	(5)
Internal Human Capital $_{g,n,t-1}$	0.105*** (0.021)	0.099*** (0.028)	0.083 (0.051)	0.038 (0.056)	0.139** (0.061)
2nd tercile of LLM tightness $_{n,z,t-1}$		-0.014 (0.036)			
3rd tercile of LLM tightness $_{n,z,t-1}$		-0.012 (0.049)			
2nd t. LLM tightness $_{n,z,t-1} \times$ Internal HC $_{g,n,t-1}$		0.003 (0.029)			
3rd t. LLM tightness $_{n,z,t-1} \times$ Internal HC $_{g,n,t-1}$		0.012 (0.030)			
Controls	Yes	Yes	Yes	Yes	Yes
Sector origin $\times$ entry $\times$ year FE	Yes	Yes	Yes	Yes	Yes
Local Labor Market FE	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.498	0.498	0.571	0.502	0.491
N	27,747	27,747	7,634	7,500	7,772

# 11 Theoretical appendix

## 11.1 Predictions 2 and 3

When  $\gamma > (\sigma - 1)/\sigma$ , the difference  $\Delta(c_I, c_E, c_A) = \Pi^{Build}(c_I, c_E) - \Pi^{Buy}(c_I, c_E, c_A)$  is a decreasing function of  $c_I$ . Moreover,  $\lim_{c_I \rightarrow 0} \Delta(\cdot) = F > 0$ , and

$$\lim_{c_I \rightarrow \infty} \Delta(c_I) = F + K \left( c_E^{-\frac{\gamma}{\gamma-1}} \right)^{\frac{(\gamma-1)(\sigma-1)}{\gamma}} - K \left( c_E^{-\frac{\gamma}{\gamma-1}} + c_A^{-\frac{\gamma}{\gamma-1}} \right)^{\frac{(\gamma-1)(\sigma-1)}{\gamma}}, \quad (4.16)$$

which is negative if  $F$  is small enough relative to the marginal labor costs of workers in the target firm. This ensures the unique existence of  $c_I^* > 0$  such that for any  $c_E$  and  $c_A$ ,  $c_I > c_I^*$  implies  $\Delta(\cdot) = 0$ . This proves prediction 2. Moreover,  $\Delta(\cdot)$  is a decreasing function of  $c_E$ , thus  $\Delta(\cdot) = 0$  for a lower threshold  $c_I^*$  when  $c_E$  is large, implying prediction 3.

## 11.2 Endogenous restructuring costs

We propose a micro-foundation for  $F$ , based on the cost of laying off some workers in the acquired firm. We denote  $\phi$  as the marginal cost of layoff,  $L_A^{before}$  as the labor input of the acquired firm *before* the acquisition, and  $L_A^{after}$  as the labor input *after* the merger has occurred. We assume the layoff cost is proportional to the distance between  $L_A^{before}$  and  $L_A^{after}$ :

$$F(L_A^{before}, L_A^{after}) = \phi(L_A^{before} - L_A^{after}). \quad (4.17)$$

Given the standard monopolistic competition framework, output  $Y$  is equal to  $K(\sigma - 1)c^{-\sigma}$ . Since  $Y = \mathcal{L}$ , we can write the labor input of the acquired firm before the acquisition as

$$L_A^{before} = c_A^{-\frac{1}{\sigma}} \cdot (K(\sigma - 1))^{\frac{1}{\sigma}}. \quad (4.18)$$



The acquiring firm minimizes the marginal labor cost across the three worker pools  $i \in \{I, E, A\}$  (equation (4.8)), subject to the production function (4.1). This implies

$$L_i = \frac{c_i^{-\frac{1}{1-\gamma}}}{\sum_i c_i^{-\frac{\gamma}{1-\gamma}}} \cdot cL, \quad (4.19)$$

so that after the acquisition, the labor input coming from the acquired firm is

$$L_A^{after} = c_A^{-\frac{1}{\sigma}} \cdot (K(\sigma - 1))^{\frac{1}{\sigma}} \cdot \left( 1 + \left( \frac{c_E}{c_A} \right)^{-\frac{\gamma}{1-\gamma}} + \left( \frac{c_I}{c_A} \right)^{-\frac{\gamma}{1-\gamma}} \right)^{-\frac{1}{\gamma} + \frac{1}{\sigma} \left( \frac{1-\gamma}{\gamma} \right)}. \quad (4.20)$$

Comparing (4.18) and (4.20), we have  $L_A^{after} \leq L_A^{before}$ . It is clear from (4.20) that  $F(L_A^{before}, L_A^{after})$  is decreasing in  $c_I$  and  $c_E$ . Recall that  $\Delta(c_I, c_E, c_A)$  is also a decreasing function of  $c_I$  and  $c_E$ . We now have  $\lim_{c_I \rightarrow 0} \Delta(c_I) = \phi L_A^{before} > 0$ , and

$$\begin{aligned} \lim_{c_I \rightarrow \infty} \Delta(c_I) = & K \left( c_E^{-\frac{\gamma}{\gamma-1}} \right)^{\frac{(\gamma-1)(\sigma-1)}{\gamma}} - K \left( c_E^{-\frac{\gamma}{\gamma-1}} + c_A^{-\frac{\gamma}{\gamma-1}} \right)^{\frac{(\gamma-1)(\sigma-1)}{\gamma}} \\ & + \phi c_A^{-\frac{1}{\sigma}} \cdot (K(\sigma - 1))^{\frac{1}{\sigma}} \left( 1 - \left( 1 + \left( \frac{c_E}{c_A} \right)^{-\frac{\gamma}{1-\gamma}} \right)^{-\frac{1}{\gamma} + \frac{1}{\sigma} \left( \frac{1-\gamma}{\gamma} \right)} \right), \end{aligned} \quad (4.21)$$

which is negative if  $\phi$  is not too large. Given  $\Delta(\cdot)$  keeps the same properties as before, the testable predictions stated in the main text remain valid.

### 11.3 Optimal marginal costs (Equation (4.8))

Given a minimum threshold  $\underline{h}_{io}$  and the random match quality  $h \geq 1$  following a Pareto distribution with cf  $\Psi(h)$ , each worker occupation  $o \in O$  supplies the following amount of human capital:

$$H_{io} \equiv N_i a_{io} m_o \int_{\underline{h}_{io}}^{\infty} h d\Psi(h) = \frac{N a_{io} m_o k \underline{h}_{io}^{1-k}}{k-1}, \quad (4.22)$$

with  $i \in \{I, E, A\}$ .

We write the Lagrangian of the minimization of (4.6) subject to (4.7) and (4.22):

$$\begin{aligned} \mathcal{L} = & N_i \left[ \sum_{o \in \mathcal{O}} a_{io} w_o \underline{h}_{io}^{-k} + f c_i \right] \\ & + \sum_{o \in \mathcal{O}} \mu_o \left[ H_{io} - \frac{N_i a_{io} m_o k \underline{h}_{io}^{1-k}}{k-1} \right] \\ & + \lambda_{io} \left[ L_i - \left( \sum_{o \in \mathcal{O}} H_{io}^\theta \right)^{1/\theta} \right]. \end{aligned}$$

We obtain the first-order conditions

$$\mu_o = \frac{w_o}{m_o \underline{h}_{io}} \quad (\text{wrt } \underline{h}_{io}) \quad (4.23)$$

$$C_i = \sum_{o \in \mathcal{O}} \mu_o H_{io} \quad (\text{wrt } N_i) \quad (4.24)$$

$$\frac{w_o}{m_o \underline{h}_{io}} = \lambda H_{io}^{\theta-1} \left( \sum_{o \in \mathcal{O}} H_{io}^\theta \right)^{\frac{1}{\theta}-1} \quad (\text{wrt } H_{io}). \quad (4.25)$$

Plugging (4.23) into (4.25), then rearranging and summing over  $o$ , we obtain

$$C_i = \left[ \sum_{o \in \mathcal{O}} \left( \frac{a_{io} m_o^k w_o^{1-k}}{L_i^k (N_i k)^{-1} (k-1)} \right)^{\frac{\theta}{\beta}} \right]^{\frac{\beta}{\theta(1-k)}}. \quad (4.26)$$

We guess that  $C_i = c_i L_i$ . Using the definition of total costs  $C_i$  given by (4.6) we have that

$$\begin{aligned}
c_i L_i &= N_i \left( \sum_{o \in \mathcal{O}} a_{io} w_o \underline{h}_{io}^{-k} + f c_i \right) \\
&= \sum_{o \in \mathcal{O}} \left( \frac{k-1}{k} \right) \frac{m_o}{w_o \underline{h}_{io}} H_{io} + N_i f c_i \\
&= \left( \frac{k-1}{k} \right) c_i L_i + N_i f c_i,
\end{aligned} \tag{4.27}$$

where we use of Equation (4.22) on the second row and Equation (4.25) on the third row. It follows naturally from (4.27) that  $N_i = \frac{L_i}{fk}$ . Now, plugging  $C_i = c_i L_i$  into (4.26) and using  $N_i = \frac{L_i}{fk}$ , we find that the optimal unit labor cost function for each labor market  $i \in \{I, E, A\}$  is:

$$c_i = \left[ \sum_{o \in \mathcal{O}} \left( \frac{a_{io} m_o^k w_o^{1-k}}{f(k-1)} \right)^{\frac{\theta}{\beta}} \right]^{\frac{\beta}{\theta(1-k)}}. \tag{4.28}$$

#### 11.4 The relative wage share for each worker occupation (Equation (4.9))

Putting together the first-order conditions (4.24) and (4.25) and taking the sum over  $o \in \mathcal{O}$ , we obtain

$$\frac{\frac{w_o}{m_o \underline{h}_{io}} H_{io}}{C_i} = \frac{H_{io}^\theta}{\sum_{o \in \mathcal{O}} H_{io}^\theta}, \tag{4.29}$$

so that the share of each worker occupation in total costs is equal to the share of human capital supplied by that worker occupation.

We normalize input from each labor market at  $L_i = 1$ , which implies  $\sum_{o \in \mathcal{O}} H_{io}^\theta = 1$ . Plugging (4.22) into (4.29) and using  $N_i = \frac{1}{fk}$ , we obtain

$$\underline{h}_{io} = \left( \frac{a_{io}}{f(k-1)} \right)^{\frac{1-\theta}{\beta}} w_o^{\frac{1}{\beta}} m_o^{-\frac{\theta}{\beta}} C_i^{-\frac{1}{\beta}}, \tag{4.30}$$

where  $\beta \equiv \theta + \theta(1-k)$ .

From Equation (4.27), we have that the costs of conducting interviews, expressed in labor units, are equal to  $N_i f c_i = \frac{c_i}{k}$ . This implies that for any number of workers  $\tilde{A}_{io}$  to work in an occupation, firms must hire a larger number of workers  $A_{io} = \frac{k}{k-1} \tilde{A}_{io}$  because some workers will be conducting interviews. By assumption, the number of workers in occupation  $o \in \mathcal{O}$  hired writes  $\tilde{A}_{io} = N_i a_{io} (1 - \Psi(\underline{h}_{io})) = N_i a_{io} \underline{h}_{io}^{-k}$ . Finally, using (4.30) and  $N_i = \frac{1}{fk}$ , we find that the total number of workers in occupation  $o$  hired to produce one unit of output is

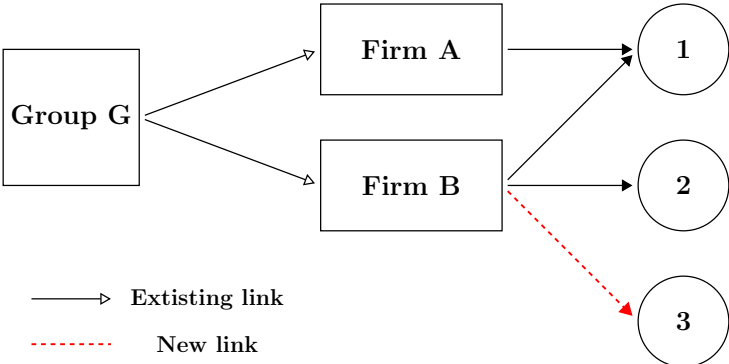
$$A_{io} = \left( \frac{a_{io}}{f(k-1)} \right)^{\frac{\theta}{\beta}} w_o^{\frac{-k}{\beta}} m_0^{\frac{k\theta}{\beta}} C_i^{\frac{k}{\beta}}. \quad (4.31)$$

It follows that relative share of the wage bill that goes to a given occupation  $o$  can be expressed as in Equation (4.9).

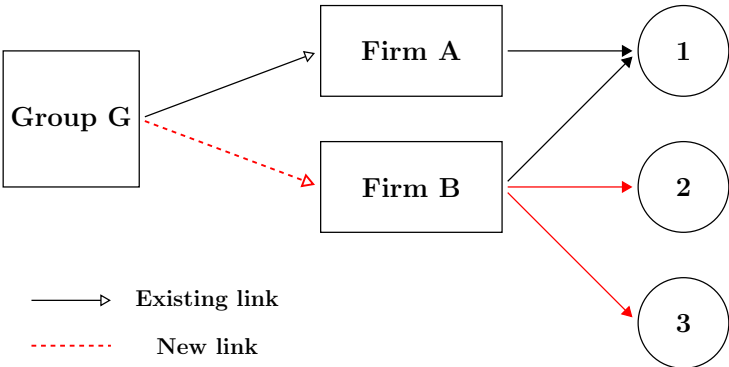
# 12 Additional tables and figures for internet appendix

**Figure 4.5. Identification of build and buy entries.**

(a) "Build" entry in sector 3 through entity B



(b) "Buy" entry in sector 2 and 3 through the acquisition of B



**Table 4.13. Top 5 occupations within sector.**

*Source:* matched employer-employee dataset for the period 2003-2014. *Sample:* Universe of full-time French workers who earn at least 1,000 euros a year. This table reports the top five occupation  $\times$  sector  $\times$  year fixed effects estimated following equation (4.10). Occupation  $\times$  sector  $\times$  year fixed effects capture the average share of the wage bill that goes to an occupation within a sector a given year. The higher the fixed effects the more important the occupation for the production process of a given sector.

Panel A. Pharmaceutical preparations (2013)	
Occupation	Estimated fixed effects
Technicians in production and control quality	0.99
Chemists, operators and skilled workers	0.96
R&D engineers and executives	0.61
Sales managers in SMEs	0.31
Sales representatives and technicians	0.29

Panel B. IT consultancy activities (2013)	
Occupation	Estimated fixed effects
Computer science R&D engineers and executives	2.34
IT project manager	1.63
CEOs of service companies (1-49 workers)	0.99
CEOs of commercial companies (1-49 workers)	0.92
IT support engineers and executives	0.82

Panel C. Manufacture of motor vehicles (2013)	
Occupation	Estimated fixed effects
Mechanical qualified assemblers in series	0.99
Technicians specialized in mechanics and metal work manufacturing and quality control	0.85
CEOs of companies (50-499 workers)	0.40
R&D engineers specialized in mechanics and metal work	0.40
Unskilled workers in assembly lines of metal work	0.14

**Table 4.14. Top 10 sectors of entry in 2013.**

The table reports the number of entries for sectors with the largest number of entries, by entry type in 2013. Build entries (Panel A) are identified as sales reported into a new sector (source: ESA survey). Buy entries (Panel B) are identified when firms realize diversifying acquisitions (source: SDC Platinum and Bureau van Dijk Zephyr). Sectors refer to an industry at the 4-digit level of the French SIC.

Panel A. Build entries

Sector of origin	Sector of entry	N. Pairs origin × entry
Retail sale in stores with food or tobacco	Manufacture of bread, pastry and cakes	880
Retail sale in stores with food or tobacco	Renting and leasing of cars and light motor vehicles	565
Retail sale in stores with food or tobacco	Agents involved in the sale of food	488
Retail sale in stores with food or tobacco	Retail sale of automotive fuel in specialized stores	395
Retail sale in stores with food or tobacco	Retail sale via mail order or Internet	338
Sale of cars and light motor vehicles	Maintenance and repair of motor vehicles	332
Retail sale in stores with food or tobacco	Renting or leased real estate	296
Freight transport by road	Other transportation support activities	295
Freight transport by road	Warehousing and storage	278
Freight transport by road	Maintenance and repair of motor vehicles	272

Panel B. Buy entries

Sector of origin	Sector of entry	N. Pairs origin × entry
Computer consultancy activities	Computer programming activities	14
Activities of head offices	Wholesale of machinery and equipment	8
Software publishing	Computer programming activities	8
Computer consultancy activities	Software publishing	7
Computer consultancy activities	Business and other management consultancy activities	6
Activities of head offices	Wholesale of other household goods	6
Engineering activities	Programming activities	6
Wholesale of machinery and equipment	Manufacture of lifting and handling equipment	5
Computer consultancy activities	Wholesale of computers, peripheral equipment and software	5
Computer consultancy activities	Other business support service activities	5

**Table 4.15. Top 10 occupations in short supply.**

*Source:* French unemployment agency. *Sample:* Occupations' supply and demand of 348 local labor markets in 2013. This table reports the top 10 occupations that are the reported as being in short supply the most often among local labor markets. The last column gives the percentage of local labor markets in which the occupation is reported as being in short supply. Occupations in short supply are identified by the French national employment agency as occupations for which (i) the ratio of job offers over job applications is high (ii) surveyed employers forecast that it will be difficult to fill posted offers.

Rank	Occupation	% of local labor markets
1	Kitchen staff	77.0
2	Machining equipment operators	58.3
3	Butchers	51.7
4	Metal workers	50.0
5	Nurses	48.9
6	Technical and commercial relation managers	48.3
7	Bakers	48.0
8	Car mechanics	48.0
9	Catering staff	48.0
10	Machining equipment maintenance workers	46.2



**Table 4.16. Alternative measure of local labor market tightness.**

*Source:* SDC Platinum, BvD Zephyr, EAE survey, tax files, ownership links dataset, matched employer-employee dataset. *Sample:* Firms that enter a new sector during the periods 2003-2007 and 2009-2014. The table reports OLS estimates and tests the effect of tight local labor markets on the relationship between human capital and the type of diversification strategy. The dependent variable is a dummy variable that takes the value one if the entry of firm  $g$  in sector  $n$  at time  $t$  is made through an acquisition, zero if the entry is made internally. The main independent variable is a firm-level measure of human capital  $Internal\ Human\ Capital_{g,n,t-1}$  that is the sum of occupation  $\times$  sector  $\times$  year fixed effects present both in the workforce of firm  $g$  at time  $t - 1$  and in the sector of entry  $n$ .  $Internal\ Human\ Capital_{g,n,t-1}$  can be interpreted as the fit quality of a firm workforce to a sector prior to diversification.  $LLM\ Tightness_{n,z,t}$  is the sum of occupations in short supply in the local labor market  $z$  at time  $t - 1$ , scaled by the number of occupations present in sector  $n$  (see equation (36)). Terciles of LLM tightness are included in columns (1) and (2). Models in columns (3) to (5) are estimated on subsamples of the dataset split by terciles of LLM tightness. France is divided into 348 local labor markets. The set of control variables include the number of workers, total cash holdings of the firm, the total amount of tangible assets held by the firm and the total value added generated by the firm, all scaled by the number of workers in the firm. All models include sector origin  $\times$  sector of entry  $\times$  year fixed effects, as well as labor market fixed effects. Standard errors are double clustered at sector of origin and sector of entry levels and reported in parentheses. \*, \*\*, and \*\*\* mean significantly different from zero at 10, 5 and 1% levels, respectively.

Dependent variable: Level of LLM Tightness $_{n,z,t-1}$ :	All		$\mathbb{1}(\text{Buy})_{g,n,t}$		
	(1)	(2)	$\leq P33$ (3)	$\geq P33$ and $\leq P66$ (4)	$\geq P66$ (5)
Internal Human Capital $_{g,n,t-1}$	-0.015*** (0.004)	-0.009** (0.004)	-0.000 (0.002)	-0.011** (0.005)	-0.019*** (0.007)
2nd tercile of LLM Tightness $_{n,z,t-1}$	0.007* (0.004)	0.006* (0.004)			
3rd tercile of LLM Tightness $_{n,z,t-1}$	0.012** (0.005)	0.012** (0.005)			
2nd t. LLM Tightness $_{n,z,t-1} \times$ Internal HC $_{g,n,t-1}$	-0.003** (0.002)	-0.003 (0.002)			
3rd t. LLM Tightness $_{n,z,t-1} \times$ Internal HC $_{g,n,t-1}$	-0.007** (0.003)	-0.005* (0.003)			
Controls	No	Yes	Yes	Yes	Yes
Sector origin $\times$ entry $\times$ year FE	Yes	Yes	Yes	Yes	Yes
Local Labor Market FE	Yes	Yes	Yes	Yes	Yes
$R^2$	0.418	0.424	0.498	0.543	0.400
N	28,957	28,957	7,897	7,778	7,882

## 13 Description of variables

**Table 4.17 – Description of the data set (1/3).**

<u>Dependent variables</u>	
$\mathbb{1}(\text{Buy})_{g,n,t}$	Dummy variable that takes the value one if a firm $g$ enters a sector $n$ at year $t$ through an acquisition, and zero if the entry is made internally by building on preexisting resources. Acquisitions are identified with SDC Platinum and Bureau van Dijk Zephyr databases. Build entries are identified using reported sales from the ESA survey at the 4-digit of the French SIC. <i>Source:</i> SDC Platinum, BvD Zephyr, Tax files, Ownership links dataset, ESA survey.
$\mathbb{1}(\text{Build})_{f,n,t}$	Dummy variable that takes the entry into sector $n$ is made through a firm $f$ within the firm $g$ , and zero if the entry is <i>not</i> made through the firm $f$ . This variable is constructed only for the subsample of Build entries for which we can identify precisely the entity responsible for the entry. <i>Source:</i> ownership links dataset, ESA survey.
Build entries	Number of occurrences in which new sales are reported in a new sector. <i>Source:</i> ESA survey.
Buy entries	Number of occurrences in which firms realize diversifying acquisitions. <i>Source:</i> SDC Platinum and Bureau van Dijk Zephyr.
$\Delta$ workers $[t-i;t+j]$	Growth rate of the number of workers computed following Davis and Haltiwanger (1992): $\Delta \text{workers}_{t-i,t+j} = \frac{\# \text{Workers}_{t-i,t+j} - \# \text{Workers}_{t-i,t+j-1}}{0.5 * (\# \text{Workers}_{t-i,t+j} + \# \text{Workers}_{t-i,t+j-1})}$ <p>. The growth rate ranges between -2 and 2. The variation is computed between <math>[t-1;t+1]</math>, <math>[t-1;t]</math> and <math>[t;t+1]</math> with <math>t</math> the year of entry in the new sector. <i>Source:</i> Matched employer-employee dataset.</p>
$\log(\text{Sales})_{g,n,t}$	logarithm of sales realized by firm $g$ in sector $n$ the year of entry $t$ . <i>Source:</i> Tax files.
<u>Independent variables</u>	
Internal Human Capital $_{g,n,t-1}$	Sum of (exponentiated) occupation $\times$ sector $\times$ year fixed effects present both in the workforce of firm $g$ at time $t - 1$ and in the sector of entry $n$ . The measure is scaled by the number of occupations in firm $g$ . Fixed effects are estimated on the full French matched employer-employee dataset and are retrieved from a regression that takes the share of the wage bill that goes to a given occupation within a given sector as dependent variable. It can be interpreted as the fit quality of a firm workforce to a sector prior to diversification. <i>Source:</i> Matched employer-employee dataset.
Internal Human Capital $_{g,n,t-i}$	Lagged measure of <i>Internal Human Capital</i> at time $t - 2$ or $t - 3$ . The variable is constructed using the same methodology as Internal Human Capital $_{g,n,t-1}$ <i>Source:</i> Matched employer-employee dataset.

**Table 4.18 – Description of the data set (2/3).**

$\mathbb{1}(\text{No Top 10})_{g,n,t-1}$	Dummy variable that takes the value 1 if none of the 10 most important occupation for the sector $n$ of entry are present in the workforce of firm $g$ at time $t - 1$ , and zero if there are. <i>Source:</i> Matched employer-employee dataset.
Internal Human Capital (weighted)	Variable constructed using the same methodology as Internal Human Capital $_{g,n,t-1}$ , except the sum of occupation $\times$ sector $\times$ year fixed effects is weighted by the number of employees by occupation in the firm. <i>Source:</i> Matched employer-employee dataset.
Internal Human Capital (without CEO)	Variable constructed using the same methodology as Internal Human Capital $_{g,n,t-1}$ , except the CEO occupations are excluded from the sum of occupations. <i>Source:</i> Matched employer-employee dataset.
Internal Human Capital (plant-level)	Variable constructed using the same methodology as Internal Human Capital $_{g,n,t-1}$ , except the fixed effects are estimated at the plant-level instead of the firm level. <i>Source:</i> Matched employer-employee dataset.
Internal Human Capital $_{g,n,t-i}$	Lagged measure of <i>Internal Human Capital</i> at time $t - 2$ or $t - 3$ . The variable is constructed using the same methodology as Internal Human Capital $_{g,n,t-1}$ . <i>Source:</i> Matched employer-employee dataset.
$\mathbb{1}(\text{No Top 10})_{g,n,t-1}$	Dummy variable that takes the value 1 if none of the 10 most important occupation for the sector $n$ of entry are present in the workforce of firm $g$ at time $t - 1$ , and zero if there are. <i>Source:</i> Matched employer-employee dataset.
Internal Human Capital (weighted)	Variable constructed using the same methodology as Internal Human Capital $_{g,n,t-1}$ , except the sum of occupation $\times$ sector $\times$ year fixed effects is weighted by the number of employees by occupation in the firm. <i>Source:</i> Matched employer-employee dataset.
Internal Human Capital (without CEO)	Variable constructed using the same methodology as Internal Human Capital $_{g,n,t-1}$ , except the CEO occupations are excluded from the sum of occupations. <i>Source:</i> Matched employer-employee dataset.
Internal Human Capital (plant-level)	Variable constructed using the same methodology as Internal Human Capital $_{g,n,t-1}$ , except the fixed effects are estimated at the plant-level instead of the firm level. <i>Source:</i> Matched employer-employee dataset.
<u>Control variables</u>	
$\log(\text{N.workers})_{g,t-1}$	Logarithm of the number of workers in firm $g$ at time $t - 1$ . <i>Source:</i> Matched employer-employee dataset, Ownership links dataset.
Value added/ $\text{N.workers}_{g,t-1}$	Total value added generated by firm $g$ at time $t - 1$ , scaled by the number of workers in the firm. <i>Source:</i> Tax files, Ownership links dataset, Matched employer-employee dataset.
Fixed assets/ $\text{N.workers}_{g,t-1}$	Total value of fixed assets held by firm $g$ at time $t - 1$ , scaled by the number of workers in the firm. <i>Source:</i> Tax files, Ownership links dataset, Matched employer-employee dataset.

**Table 4.19 – Description of the data set (3/3).**

Cash holdings/ $N$ .workers $_{g,t-1}$	Total cash holdings of firm $g$ at time $t - 1$ , scaled by the number of workers in the firm. <i>Source:</i> Tax files, Ownership links dataset, Matched employer-employee dataset.
Product market distance $_{g,n,t-1}$	Distance between the sectors in which firm $g$ operates at $t - 1$ and the sector of entry $n$ . The distance ranges from 0 to 1. A value of 0 (resp. 1) indicates that the sales of firm $g$ are perfectly correlated (resp not correlated) at time $t - 1$ to the sales of the firms operating in the sector of entry $n$ . The product market distance is adapted from Bloom, Schankerman and Van Reenen (2013). See section 4.2.2 for more details. <i>Source:</i> Ownership links dataset, Tax files, ESA survey.
Vertical integration $_{g,n,t-1}$	Dummy variable that is equal to one if the sector of origin of the firm (as measured in the I-O OECD classification) sources more than 5% of its inputs from the sector of entry (as measured in the I-O OECD classification). The variable is not defined when the sector of origin and the sector of entry belongs to the same item of the I-O OECD classification. The methodology follows Fan and Goyal (2006)'s measure of vertical relatedness. <i>Source:</i> Ownership links dataset, Tax files, OECD 1999 French Input-Output table.
LLM tightness $_{n,z,t-1}$	Sum over all occupations in short supply in the local labor market $z$ at time $t$ of the exponentiated occupation $\times$ sector $\times$ year fixed effects for sector $n$ , scaled by the number of occupations observed in sector $n$ at time $t$ (see equation 4.2.3). Occupations in short supply in a LLM are identified by the French national employment agency Pole Emploi as occupations for which (i) the ratio of job offers over job applications is high (ii) surveyed employers forecast that it will be difficult to fill posted offers. France is divided into 348 different local labor markets. <i>Source:</i> Matched employer-employee dataset, Pole Emploi.
<u>Other variables</u>	
Type of firm	Dummy variable that is equal to one if at least one entity within the firm is a publicly listed company, and zero otherwise. <i>Source:</i> Bureau van Dijk Amadeus
Shifting firms	Shifting firms are firms that decrease their activity in a preexisting sector while entering sector $n$ . They are identified with the growth rate of sales between $t - 1$ and $t$ in each sector in which firms were operating at $t - 1$ that is negative and greater than 100%, 50% and 25% in absolute value. We take the firm-level minimum of sectoral growth rates. <i>Source:</i> ESA survey, Ownership links dataset.
Serial acquirers	Serial acquirers are firms that enter more than one sector by acquisition during the time period. <i>Source:</i> SDC Platinum, BvD Zephyr, Ownership links dataset, ESA survey
Entry sales $_{g,n,t}$	Total sales reported by firm $g$ in sector $n$ at time $t$ . <i>Source:</i> Tax files
$\mathbb{1}(1\text{-year survival})_{g,n,t+1}$	Dummy equal to one if firm $g$ reports sales in sector of entry $n$ one year after the entry $n$ at time $t$ . <i>Source:</i> Tax files
Sales bucket	Deciles of realized sales by the firm $g$ in sector $n$ at time $t$ . The sales buckets are used as fixed effects to compare firms within the same entry sale bucket. <i>Source:</i> Tax files
Investment bucket	Decile of total capital expenditures realized by firm $g$ to enter sector $n$ . Investment is measured in the case of build entry as the total amount of investment realized by the firm(s) of the firm that entered in sector $n$ at time $t$ . In the case of acquisitions, investment is set equal to the amount of fixed assets of the firm that has been acquired. The investment buckets are used as fixed effects to compare firms within the same investment bucket. <i>Source:</i> Tax files

## 14 Bibliography

- Abowd, John M, and Francis Kramarz.** 2003. “The costs of hiring and separations.” *Labour Economics*, 10(5): 499–530.
- Abowd, John M, Francis Kramarz, and David N Margolis.** 1999. “High wage workers and high wage firms.” *Econometrica*, 67(2): 251–333.
- Agrawal, Ashwini K, and David A Matsa.** 2013. “Labor unemployment risk and corporate financing decisions.” *Journal of Financial Economics*, 108(2): 449–470.
- Autor, David, and David Dorn.** 2009. “This job is “getting old”: measuring changes in job opportunities using occupational age structure.” *American Economic Review*, 99(2): 45–51.
- Baghai, Ramin, Rui Silva, Viktor Thell, and Vikrant Vig.** 2018. “Talent in distressed firms: Investigating the labor costs of financial distress.” *Working paper*.
- Bai, John Jianqiu, Douglas J Fairhurst, and Matthew Serfling.** 2018. “Employment protection, investment, and firm growth.” *Working paper*.
- Becker, Gary S.** 1962. “Investment in human capital: A theoretical analysis.” *Journal of political economy*, 70(5, Part 2): 9–49.
- Belo, Frederico, Xiaoji Lin, and Santiago Bzdresch.** 2014. “Labor hiring, investment, and stock return predictability in the cross section.” *Journal of Political Economy*, 122(1): 129–177.
- Bena, Jan, and Kai Li.** 2014. “Corporate innovations and mergers and acquisitions.” *Journal of Finance*, 69(5): 1923–1960.
- Bernard, Andrew B, Emily J Blanchard, Ilke Van Beveren, and Hylke Vandenbussche.** 2018. “Carry-along trade.” *The Review of Economic Studies*, 86(2): 526–563.
- Bernard, Andrew B, J Bradford Jensen, Stephen J Redding, and Peter K Schott.** 2007. “Firms in international trade.” *Journal of Economic perspectives*, 21(3): 105–130.
- Bernard, Andrew B, Stephen J Redding, and Peter K Schott.** 2010. “Multiple-product firms and product switching.” *American Economic Review*, 100(1): 70–97.
- Blatter, Marc, Samuel Muehlemann, and Samuel Schenker.** 2012. “The costs of hiring skilled workers.” *European Economic Review*, 56(1): 20–35.
- Bloom, Nicholas, Mark Schankerman, and John Van Reenen.** 2013. “Identifying technology spillovers and product market rivalry.” *Econometrica*, 81(4): 1347–1393.
- Boehm, Johannes, Swati Dhingra, and John Morrow.** 2019. “The comparative advantage of firms.” *Working paper*.
- Capron, Laurence, and Will Mitchell.** 2012. *Build, borrow, or buy: Solving the growth dilemma*. Harvard Business Press.
- Cestone, Giacinta, Chiara Fumagalli, Francis Kramarz, and Giovanni Pica.** 2016. “Insurance between firms: the role of internal labor markets.” *working paper*.
- Cheng, Wenya, and John Morrow.** 2018. “Firm productivity differences from factor markets.” *Journal of Industrial Economics*, 66(1): 126–171.
- Davis, Steven J, and John Haltiwanger.** 1992. “Gross job creation, gross job destruction, and employment reallocation.” *Quarterly Journal of Economics*, 107(3): 819–863.
- Donangelo, Andres.** 2014. “Labor mobility: Implications for asset pricing.” *Journal of Finance*, 69(3): 1321–1346.

- Eckbo, Espen.** 1983. “Horizontal mergers, collusion, and stockholder wealth.” *Journal of financial Economics*, 11(1-4): 241–273.
- Eiling, Esther.** 2013. “Industry-specific human capital, idiosyncratic risk, and the cross-section of expected stock returns.” *The Journal of Finance*, 68(1): 43–84.
- Fan, Joseph P. H., and Vidhan Goyal.** 2006. “On the patterns and wealth effects of vertical mergers.” *Journal of Business*, 79(2): 877–902.
- Farrell, Joseph, and Carl Shapiro.** 1990. “Horizontal mergers: an equilibrium analysis.” *American Economic Review*, 107–126.
- Ghaly, Mohamed, Viet Anh Dang, and Konstantinos Stathopoulos.** 2017. “Cash holdings and labor heterogeneity: the role of skilled labor.” *Review of Financial Studies*, 30(10): 3636–3668.
- Gibbons, Robert, and Michael Waldman.** 2004. “Task-specific human capital.” *American Economic Review*, 94(2): 203–207.
- Golubov, Andrey, Alfred Yawson, and Huizhong Zhang.** 2015. “Extraordinary acquirers.” *Journal of Financial Economics*, 116(2): 314–330.
- Grossman, Sanford J, and Oliver D Hart.** 1986. “The costs and benefits of ownership: a theory of vertical and lateral integration.” *Journal of Political economy*, 94(4): 691–719.
- Hart, Oliver, and John Moore.** 1990. “Property rights and the nature of the firm.” *Journal of Political Economy*, 98(6): 1119–1158.
- Hoberg, Gerard, and Gordon Phillips.** 2010. “Product market synergies and competition in mergers and acquisitions: A text-based analysis.” *Review of Financial Studies*, 23(10): 3773–3811.
- Kuehn, Lars-Alexander, Mikhail Simutin, and Jessie Jiaxu Wang.** 2017. “A labor capital asset pricing model.” *Journal of Finance*, 72(5): 2131–2178.
- Lagaras, Spyridon.** 2017. “Corporate takeovers and labor restructuring.”
- Lee, Gwendolyn K, and Marvin B Lieberman.** 2010. “Acquisition vs. internal development as modes of market entry.” *Strategic Management Journal*, 31(2): 140–158.
- Lee, Kyeong Hun, David C. Mauer, and Emma Qianying Xu.** 2018. “Human capital relatedness and mergers and acquisitions.” *Journal of Financial Economics*, 129(1): 111–135.
- Levine, Oliver.** 2017. “Acquiring growth.” *Journal of Financial Economics*, 126(2): 300–319.
- Li, Kai, Feng Mai, Rui Shen, and Xinyan Yan.** 2018. “Measuring corporate culture using machine learning.” Working paper.
- Maksimovic, Vojislav, Gordon Phillips, and Nagpurnanand R Prabhala.** 2011. “Post-merger restructuring and the boundaries of the firm.” *Journal of Financial Economics*, 102(2): 317–343.
- Matsa, David A.** 2010. “Capital structure as a strategic variable: evidence from collective bargaining.” *Journal of Finance*, 65(3): 1197–1232.
- Ma, Wenting, Paige Ouimet, and Elena Simintzi.** 2018. “Technological change and inequality.”
- McCardle, Kevin F, and S Viswanathan.** 1994. “The direct entry versus takeover decision and stock price performance around takeovers.” *Journal of Business*, 1–43.
- Merz, Monika, and Eran Yashiv.** 2007. “Labor and the market value of the firm.” *American Economic Review*, 97(4): 1419–1431.
- Moretti, Enrico.** 2010. “Local labor markets.” *National Bureau of Economic Research*.

- Nocke, Volker, and Stephen Yeaple.** 2007. “Cross-border mergers and acquisitions vs. greenfield foreign direct investment: The role of firm heterogeneity.” *Journal of International Economics*, 72(2): 336–365.
- Ouimet, Paige Parker, and Rebecca Zarutskie.** 2016. “Acquiring labor.” working paper.
- Penrose, Edith.** 1955. “Limits to the growth and size of firms.” *American Economic Review*, 45(2): 531–543.
- Phillips, Gordon M, and Alexei Zhdanov.** 2013. “R&D and the Incentives from Merger and Acquisition Activity.” *The Review of Financial Studies*, 26(1): 34–78.
- Rajan, Raghuram, and Luigi Zingales.** 1998. “Financial Dependence and Growth.” *American Economic Review*, 88(3): 559–86.
- Rhodes-Kropf, Matthew, and David T. Robinson.** 2008. “The market for mergers and the boundaries of the firm.” *Journal of Finance*, 63(3): 1169–1211.
- Romanski, Hilton.** 2017. “Cisco’s 200th Acquisition - A Tradition of Advancement, Disruption and Growth.” *Cisco Blog*.
- Serfling, Matthew.** 2016. “Firing costs and capital structure decisions.” *Journal of Finance*, 71(5): 2239–2286.
- Simintzi, Elena, Vikrant Vig, and Paolo Volpin.** 2014. “Labor protection and leverage.” *Review of Financial Studies*, 28(2): 561–591.
- Tate, Geoffrey A, and Liu Yang.** 2016a. “The human factor in acquisitions: cross-industry labor mobility and corporate diversification.” *Working paper*.
- Tate, Geoffrey, and Liu Yang.** 2016b. “The bright side of corporate diversification: evidence from internal labor markets.” *Review of Financial Studies*, 28(8): 2203–2249.
- Wysocki, Bernard Jr.** 1997. “Many mergers driven by search for fresh talent.” *Wall Street Journal*.
- Xu, Sheng-Jun.** 2018. “Skilled labor supply and corporate investment: Evidence from the H-1B visa program.” *Working paper*.
- Yip, George S.** 1982. “Diversification entry: Internal development versus acquisition.” *Strategic Management Journal*, 3(4): 331–345.





# Chapitre 5

## Résumé de la thèse

### 1 Contraintes de liquidité et capital client

Quelles sont les raisons qui amènent certaines entreprises se développer davantage que d'autres ? La capacité d'une entreprise à construire et à entretenir une demande pour ses produits (ou « capital client ») est un déterminant important de sa capacité à croître, survivre, et générer des profits. Pour autant, peu de travaux de recherches ont été menés pour étudier les déterminants au niveau de l'entreprise du capital client. Ce papier vise à explorer le rôle des contraintes de liquidité dans la formation d'un réseau de clients.

On peut distinguer deux principales manières d'investir dans le capital client. Premièrement, les entreprises consacrent des ressources considérables en marketing chaque année pour développer leur base de clients. Les entreprises américaines dépensent environ autant en frais de marketing et publicité qu'en recherche et développement. On estime ainsi que les frais de marketing représentent entre 2 et 8% de PIB (Arkolakis, 2010). Deuxièmement, les entreprises peuvent proposer des prix plus bas pour attirer de nouveaux clients et garder les clients existants. Dans les deux cas, les entreprises doivent renoncer à une fraction de leurs profits immédiats pour investir dans de futures relations commerciales. Les entreprises contraintes en liquidité sont susceptibles d'accorder plus

de valeur aux profits immédiats et ainsi d'investir moins dans leur capital client.

Nous utilisons une base de données unique pour montrer dans un cadre quasi-expérimental que les contraintes de liquidité limitent la croissance de la demande adressée à l'entreprise. Spécifiquement, nos résultats indiquent qu'en réponse à un choc de liquidité positif, les entreprises augmentent leurs bases de clients et par suite leurs chiffres de vente. Par opposition, nous ne pouvons pas mettre en évidence d'effet de ce choc sur les ventes aux clients existants.

Pour expliciter le mécanisme économique, nous avons ensuite étudié l'effet de ce choc de liquidité sur le niveau des prix et pu mettre en évidence aucune baisse de prix. L'effet sur l'expansion de la base de consommateur semble en revanche plus prononcé quand les frictions sur les marchés de produit sont plus élevées. Ces résultats nous permettent de conclure que (i) les entreprises contraintes en liquidité sous-investissent dans leur capital client (ii) les frictions sur les marchés de produits constituent le principal obstacle au développement des bases de consommateur des entreprises.

Nous développons un modèle pour permettre d'expliquer le lien entre les contraintes de liquidité et les frictions sur les marchés de produit. Les entreprises doivent payer des coûts de marketing pour créer une demande pour leurs produits. Quand les marchés de produits sont très frictionnels, il est plus coûteux pour les clients de changer de fournisseurs. Ces derniers se concentrent par conséquent plus sur l'acquisition que sur la rétention de clients. A la différence des coûts de rétention, les coûts d'acquisition de consommateur doivent être payés avant que les transactions commerciales n'aient lieu. Nous introduisons des contraintes de liquidités en faisant l'hypothèse que seule une fraction exogène des futures ventes peut être utilisée pour financer les coûts d'acquisition de consommateurs. Les frictions de financement et celles sur les marchés de produits se renforcent mutuellement dans la mesure où accéder à un financement interne devient plus important quand les clients sont plus difficiles à acquérir.

Nous exploitons pour l'analyse un choc de liquidité exogène généré par la mise en application

d'une loi française en 2009 (dite la réforme). La réforme a introduit dans le droit commercial français une limite aux conditions de paiement. Spécifiquement, suite à cette réforme, les délais de paiement contractuels ne peuvent plus dépasser 60 jours et les pénalités associées aux retards de paiement ont été augmentées. La réforme a ainsi entraîné une forte baisse des délais de paiement. De manière cohérente avec Barrot (2016), nous trouvons que suite à la mise en place de la loi, les entreprises les plus exposées à la réforme ex ante ont bénéficié d'une baisse des besoins en fonds de roulement et d'une augmentation des ratios de trésorerie.

La restriction des délais de paiement a également pu affecter la capacité des fournisseurs à initier et maintenir des relations commerciales (Breza and Liberman, 2017). Pour identifier précisément le rôle du choc de liquidité, nous nous concentrons sur les effets de la réforme sur les transactions internationales qui n'ont pas été assujetties à la limite des 60 jours. Le mécanisme central de cette étude est donc l'effet de la baisse des délais de paiement avec les clients domestiques sur l'accumulation du capital client international.<sup>1</sup> Nous utilisons dans ce cadre une base de données administratives couvrant l'ensemble des transactions entre les exportateurs français et leurs clients de l'Union Européenne.

Notre stratégie d'identification part de l'hypothèse selon laquelle les entreprises payées en 90 jours, par exemple, étaient plus susceptibles d'être affectées par la réforme que celles déjà payées en moins de 60 jours. La distance à la limite des soixante jours, toutefois, est susceptible d'être corrélée avec des variables inobservables qui pourraient affecter la capacité à acquérir de nouveaux clients (comme son pouvoir de marché, par exemple). Pour tenir compte de cette difficulté, nous avons introduit une mesure d'exposition à la réforme basée sur l'hétérogénéité des délais de paiement sectoriels. Nos estimations comparent par conséquent l'évolution des bases clients d'entreprises

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<sup>1</sup>Un autre intérêt de ce choix est que les contraintes de financement et les frictions sur les marchés de produit sont davantage susceptibles de jouer un rôle sur l'accumulation du capital client dans les transactions internationales ; celles-ci nécessitent en effet davantage de fonds de roulement que les transactions domestiques du fait des temps de transport accrus (Schmidt-Eisenlohr, 2013; Feenstra, Li and Yu, 2014). La littérature en commerce international suggère également que la recherche de nouveaux clients est plus coûteuse dans un cadre international du fait d'asymétries d'information plus importantes (Rauch, 1999; Eaton et al., 2014).

présentes dans des secteurs avec de long délais de paiement à celles d'entreprises bénéficiant de courts délais de paiement sectoriels. Nous introduisons de plus des effets fixes entreprise et pays-temps. Nos estimations sont donc basées sur la comparaison d'entreprises différenciellement affectées par la réforme dans un même marché (Paravisini et al., 2014; Eaton et al., 2016).

Nos résultats montrent qu'être payé trois jours plus tôt par les clients français (une déviation standard) augmente la croissance à l'exportation de 1.2 points de pourcentage. De manière frappante, la vaste majorité de l'effet provient d'une expansion des bases clients. Celle-ci provient à deux tiers d'une acquisition de nouveaux clients, le dernier tiers venant d'une meilleure rétention de clients. Nous montrons aussi que le choc de liquidité positif a également augmenté l'entrée dans de nouvelles destinations et limité le taux de sortie.

Nous nous penchons ensuite plus en profondeur sur le mécanisme économique. Nous testons premièrement si les entreprises ont baissé leurs prix suite à la mise en place de la réforme. Nous ne trouvons pas d'effet de la baisse des périodes de paiement sur les prix même en étudiant séparément les nouveaux clients et les clients existants. .

Nous testons ensuite le rôle des frictions sur les marchés de produit en utilisant deux mesures différentes. Premièrement, nous utilisons la classification des produits établies par Rauch (1999) qui indique si les produits sont vendus sur des marchés organisés ou non, l'absence de plateforme centralisée pour les échanges impliquant pour les fournisseurs de participer à un processus coûteux de recherche de clients. Deuxièmement, nous utilisons une mesure de la durée moyenne des relations commerciales pour un produit introduite par Martin, Mejean and Parenti (2018), la présence de longues durées commerciales suggérant des coûts importants pour changer de fournisseurs. Dans les deux cas, nous trouvons que les effets sur l'accumulation de capital client ne sont significatifs que lorsque les frictions sur les marchés de produits sont importantes. Nos résultats montrent donc que les contraintes de liquidité freinent l'accumulation de capital client en limitant la capacité des entreprises à identifier de nouveaux clients ou à les attirer par du marketing ou par une amélioration

de la qualité des produits.

L'effet de la réforme sur les délais nets de paiement aux fournisseurs a également été analysé pour tenir compte du fait que les entreprises soient à la fois clients et fournisseurs. Dans la mesure où les délais de paiement des clients et des fournisseurs doivent s'approcher de soixante jours, la réforme doit mécaniquement réduire les délais de paiement nets. Nos résultats sont quantitativement inchangés par cette mesure alternative des périodes de paiement, ce qui confirme nos résultats.

L'augmentation observée des ventes domestiques en réponse à la réforme montre qu'il n'y a pas eu de substitution entre marché domestique et marchés internationaux mais bien un effet positif de la réforme. La réforme n'a en particulier pas eu pour effet d'inciter les entreprises à se tourner vers des entreprises étrangères pour ne pas avoir à réduire les délais de paiement ou pour compenser des réductions de vente sur le marché domestique.

Notre travail contribue à la littérature sur le rôle de la structure de capital sur les choix de marchés de produit (Phillips, 1995; Chevalier, 1995; Frésard, 2010; Boutin et al., 2013). Dans une étude fondatrice, Chevalier and Scharfstein (1996) montrent théoriquement que les entreprises contraintes en liquidité sous-investissent dans l'acquisition de clients car elles valorisent moins les profits futurs. Les auteurs confirment cette idée en montrant que les supermarchés financièrement contraints baissent moins leurs prix pendant les récessions.

A la différence de la littérature existante, nous pouvons suivre de manière conjointe les prix, les nombre de clients ainsi que leur identité. De plus, nos résultats soulignent le rôle des coûts de recherche dans la formation du capital client. Ce résultat est cohérent avec des études récentes du rôle du marketing dans l'acquisition de nouveaux clients. Notre papier suggère par conséquent qu'en présence de coûts de recherche de clients, les entreprises financièrement contraintes ne proposent pas nécessairement des coûts plus élevés mais diminuent à la place les dépenses en marketing.

En mettant à jour un lien causal entre la capacité de financement et l'accumulation de consommateurs, nos résultats font écho à la littérature récente soulignant le rôle des facteurs de demande

dans la détermination de la taille des entreprises. Hottman, Redding and Weinstein (2016) utilisent des données granulaires de produits pour montrer que 50 à 75% de l'hétérogénéité de la taille des entreprises peut être expliquée par des variations de demande, contre 20% par des différences d'efficacité technique. De manière similaire, Bernard et al. (2019) montrent que 81% des variations de ventes entre entreprises belges provient de facteurs ayant trait au nombre et à l'identité des clients. Nos résultats suggèrent que l'hétérogénéité de la demande à laquelle les entreprises font face provient de la présence de frictions financières.

Enfin, cette étude est en lien avec la littérature sur le rôle des facteurs financiers sur le comportement des entreprises à l'exportation. Manova (2013) et Chaney (2016) avancent qu'en présence de contraintes financières, l'activité à l'exportation n'est pas seulement déterminée par des considérations de profit comme dans Mélitz (2003) mais également par la capacité des entreprises à soutenir les besoins de liquidité générés par les transactions internationales. Utilisant la crise de 2008 comme un baisse exogène de l'offre de crédit bancaire, Paravisini et al. (2014) montrent que l'accès au crédit affecte la marge intensive à l'export, mais ne trouvent pas d'effet sur la probabilité d'entrer ou de sortir d'une destination. Les auteurs concluent que les contraintes de crédit agissent comme une augmentation du coût variable des exportations. Par opposition, nos résultats indiquent que les contraintes de liquidité limitent la capacité des entreprises à investir dans le capital client.

## **2 Etude de la granularité des emprunteurs**

Le concept de granularité introduit par Gabaix (2011) a placé la distribution de taille des entreprises (et en particulier la présence récurrente de queues épaisses) au premier plan de la recherche empirique en macroéconomie. Comme la loi des grands nombres n'est pas valable en présence de très grands acteurs, les chocs idiosyncratiques ne se compensent pas en moyenne, et au contraire, peuvent devenir d'importants déterminants des fluctuations agrégées. Cette approche avance que l'analyse du comportement microéconomique des très grands acteurs peut permettre de

donner de nouvelles réponses à des problèmes posés de longue date en macroéconomie.<sup>2</sup> En finance, la prévalence de grandes banques a incité les économistes à explorer le rôle de la distribution de la taille des banques pour la propagation des chocs bancaires à l'économie réelle.<sup>3</sup> Par opposition, la présence de queues épaisses dans la distribution des emprunteurs n'a pas été étudiée dans la littérature. Nous utilisons dans cette optique une base de données couvrant le quasi-univers des relations banques-entreprises en France entre début 1999 et fin 2016. Notre analyse révèle que le top 100 des entreprises emprunteuses représente 18% du montant agrégé du crédit de long-terme et 64% des lignes de crédits non tirées.

La présence dans l'économie d'entreprises empruntant des fractions non triviales du crédit agrégé (« emprunteurs granulaires ») a deux principaux faisceaux d'implications. Premièrement, les propriétés agrégées du crédit sont susceptibles d'être déterminées par les caractéristiques et le comportement des emprunteurs granulaires. Il s'ensuit qu'un modèle d'agent représentatif calibré en utilisant des moments du crédit agrégé reproduira dans les faits le comportement économique d'un échantillon restreint de très grands emprunteurs. Deuxièmement, la capacité des banques à diversifier le risque est limitée dans la mesure où le portefeuille des emprunteurs sera très concentré. Cette observation vient en particulier remettre en cause l'idée que les banques parviennent à fournir de la liquidité au secteur privé en lissant les retraits de fond sur un portefeuille diversifié d'emprunteurs (Holmström and Tirole, 1998; Kashyap, Rajan and Stein, 2002). Dans une économie granulaire, l'octroi de lignes de crédit expose les banques à un risque de liquidité non-diversifiable et potentiellement non-négligeable. Ce papier fournit une étude approfondie de la validité empirique de ces deux propositions.

La principale difficulté empirique à laquelle nous faisons face est de pouvoir identifier sépa-

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<sup>2</sup>Ces derniers incluent l'origine des cycles macroéconomiques (Di Giovanni, Levchenko and Mejean, 2014; Carvalho and Grassi, 2019), des avantages comparatifs des pays (Gaubert and Itkhoki, 2018), ou de la synchronisation des cycles économiques entre pays (Di Giovanni, Levchenko and Mejean, 2017, 2018).

<sup>3</sup>Voir Buch and Neugebauer (2011); Bremus and Buch (2017); Bremus et al. (2018) pour une analyse internationale des banques granulaires et Amiti and Weinstein (2018); Alfaro, García-Santana and Moral-Benito (2019) pour des études de la transmission des chocs bancaires à travers les relations de crédit et les liens producteurs-fournisseurs.

rément les variations de crédit provenant des emprunteurs individuels (« composants entreprises ») des chocs au niveau banque impactant les différents emprunteurs (« composants banques »). En se basant sur Amiti and Weinstein (2018), nous procédons à une régression pondérée du taux de croissance du crédit au niveau entreprise-banque sur un ensemble d'effets fixes banque-temps et entreprise-temps. Les deux types d'effets fixes identifient respectivement (à une constante additive près) des facteurs qui affectent l'évolution du crédit dans toutes les relations entreprise d'une même banque et toutes les relations banque d'une même entreprise. Un choc idiosyncratique est défini comme la déviation d'un effet fixe estimé par rapport à une tendance commune. Les variations de crédit peuvent ainsi être décomposées comme la somme de chocs idiosyncratiques entreprises, banques, et d'une composante commune à toutes les relations bancaires de l'économie (« composante macroéconomique »).

Nous proposons une simple modification de la procédure mise au point par Amiti and Weinstein (2018). Nous montrons que l'utilisation du taux de croissance défini par Davis, Haltiwanger and Schuh (1996) simplifie non seulement considérablement l'estimation mais permet également de prendre en compte l'entrée et la sortie des entreprises et des banques de la base de données. Avec cette procédure, la moyenne pondérée de manière appropriée des composantes firmes et entreprises au temps  $t$  correspond exactement au taux de croissance au niveau de la banque, de l'entreprise et de l'économie pour toutes les relations de crédit actives à  $t - 1$  ou à  $t$ .

A l'aide de cette décomposition, nous étudions dans un premier temps les implications de la présence d'emprunteurs granulaires sur les propriétés du crédit agrégé. Nous nous concentrons sur un moment clé dans la littérature en macro-finance, à savoir la corrélation du crédit aux entreprises non-financières avec le cycle économique. La présence d'une relation positive entre les deux séries temporelles est largement considérée comme la manifestation de frictions financières affectant les entreprises.<sup>4</sup> Partant de cette idée, de nombreuses études ont utilisé l'analyse de l'évolution

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<sup>4</sup>L'interprétation sous-jacente est qu'en présence de frictions financières, la capacité des entreprises à emprunter est liée à leur richesse nette, laquelle évolue mécaniquement de concert avec le cycle économique. La cyclicité du crédit agrégé est par conséquent généralement considérée comme une manifestation de l'accélérateur financier (Bernanke,



du crédit agrégé le long du cycle économique pour estimer l'importance macroéconomique des frictions financières.<sup>5</sup>

Notre méthodologie nous permet d'estimer les contributions respectives à la cyclicité du crédit agrégé des chocs idiosyncratiques provenant des emprunteurs et provenant des banques. Dans l'hypothèse d'une distribution des entreprises et des banques sans queues épaisses, ces contributions seraient négligeables et la large majorité de la corrélation du crédit et du PIB serait expliquée par la composante macroéconomique.

A l'inverse, nous trouvons que les chocs idiosyncratiques au niveau entreprise expliquent entre 60 et 80% de la corrélation du crédit agrégé avec le cycle. Les chocs idiosyncratiques au niveau banque, en revanche, ne semblent pas contribuer significativement à la corrélation avec les fluctuations de PIB. L'asymétrie de la distribution de crédit confère de plus une importance disproportionnée aux grands emprunteurs par comparaison avec le volume de prêts qu'ils représentent. Deux tiers de la contribution des chocs idiosyncratiques à la cyclicité proviennent ainsi du top 100 des emprunteurs. Il s'ensuit que les propriétés du crédit agrégé sont très largement déterminées par le comportement des emprunteurs granulaires.

Nos résultats impliquent que l'analyse de la cyclicité du crédit agrégé est peu susceptible de donner des enseignements utiles sur l'intensité ou la nature des frictions financières s'appliquant à la majorité des entreprises non financières. Au lieu d'un resserrement des conditions d'accès aux crédits, la baisse du crédit bancaire agrégé pendant les périodes de récession pourrait en réalité refléter un différentiel de cyclicité des opportunités d'investissement pour les entreprises granulaires ou bien la présence de phénomènes de substitution entre crédit bancaire et autres modalités de financement.<sup>6</sup> Les conclusions de notre étude nous amènent ainsi à recommander l'exclusion des

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Gertler and Gilchrist, 1996; Kiyotaki and Moore, 1997), ie le rôle amplificateur du secteur financier dans la propagation des chocs négatifs provenant du secteur non financier.

<sup>5</sup>Voir par exemple Chari, Kehoe and McGrattan (2007), Smets and Wouters (2007), Justiniano, Primiceri and Tambalotti (2010) ou Jermann and Quadrini (2012).

<sup>6</sup>Voir Covas and Den Haan (2011) et Begenau and Salomao (2018) pour une étude des phénomènes de substitution entre financement par dette et par émission d'actions en période d'expansion et de récession économique.

emprunteurs granulaires pour l'étude des déterminants du financement des entreprises le long du cycle économique.<sup>7</sup>

Nous étudions ensuite les implications de la présence d'emprunteurs granulaires pour les banques. Quand les emprunteurs font face à des chocs de liquidité idiosyncratiques et diversifiables, Holmström and Tirole (1998) montrent que l'octroi de lignes de crédit permet aux banques de réallouer la liquidité entre les entreprises pauvres en liquidité et les entreprises avec de la liquidité en excès. En présence de chocs agrégés, toutefois, ce processus de réallocation n'est plus possible et les banques doivent garder des réserves de liquidité pour pouvoir se prémunir face à des retraits massifs.<sup>8</sup> Notre papier documente une autre limite à la capacité des banques à agir comme des pools de liquidités. Quand la distribution des emprunteurs a une queue épaisse, les banques ne peuvent pas diversifier le risque de liquidité idiosyncratique même quand le nombre d'emprunteurs devient arbitrairement grand. Garder des actifs liquides devient nécessaire non seulement pour se protéger contre une synchronisation des retraits sur les lignes de crédit mais également contre des chocs idiosyncratiques négatifs affectant les emprunteurs granulaires. Nos résultats mettent en valeur la présence d'une relation positive entre la concentration du portefeuille d'emprunteurs et la variance du montant des lignes de crédit. Cette observation suggère que les bases d'emprunteurs sont effectivement sous-diversifiées. En utilisant notre décomposition des variations de crédit, nous estimons qu'en l'absence des chocs idiosyncratiques sur les emprunteurs, la variance du montant des lignes de crédit baisserait en moyenne de 18 à 31%. Le rôle des chocs emprunteurs sur les variations de lignes de crédit au niveau banque est donc considérable et comparable en magnitude à la contribution des chocs agrégés.

Au niveau de l'économie, les chocs spécifiques aux emprunteurs contribuent substantiellement

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<sup>7</sup>Covas and Den Haan (2011) avait déjà noté que l'influence disproportionnée des emprunteurs granulaires tend à masquer le comportement des plus petites entreprises. Eisfeldt and Muir (2016) et Begenau and Salomao (2018) excluent les plus grandes entreprises de l'échantillon d'étude. Ce travail, toutefois, est le premier à fournir une étude quantitative de l'influence des emprunteurs granulaires sur les fluctuations du crédit agrégé.

<sup>8</sup>Voir Ivashina and Scharfstein (2010); Cornett et al. (2011); Bord and Santos (2014); Ippolito et al. (2016) pour une description de retraits massifs sur les lignes de crédit pendant la crise financière.

aux fluctuations des lignes de crédit. La variance de la composante emprunteur représente 84% de la variance totale des lignes de crédit agrégées. Il y a deux raisons pour expliquer une telle importance des chocs emprunteurs. Premièrement, la concentration élevée des portefeuilles d'emprunteurs augmente la variance des lignes de crédit au niveau banque. Deuxièmement, comme les grands emprunteurs ont plusieurs relations bancaires, les chocs idiosyncratiques banques peuvent également augmenter la variance totale en rendant les banques plus corrélées entre elles. Nous trouvons que la majorité de la variance de la composante emprunteur agrégée provient des liens entre banques. Ce résultat suggère que la présence d'emprunteurs granulaires peut représenter une source de risque systémique pour le secteur bancaire car elle tend à rendre les retraits sur les lignes de crédit moins diversifiables et plus coordonnés entre banque.

Ce travail s'appuie sur et contribue à trois différents thèmes de recherche. Le premier axe a été initié par Covas and Den Haan (2011) et explore l'hétérogénéité des choix de décisions de financement des entreprises le long du cycle économique pour étudier la distribution des frictions financières dans l'économie (Begenau and Salomao, 2018; Crouzet and Mehrotra, 2019).<sup>9</sup> L'objectif de cette littérature est de mieux comprendre la distribution des frictions financières entre entreprises. Par opposition, notre travail vise à quantifier la contribution des grands emprunteurs aux fluctuations du crédit agrégé au cours du cycle économique.

Notre papier contribue ensuite à la littérature étudiant le rôle des banques sur l'offre de liquidité aux entreprises (Kashyap, Rajan and Stein, 2002). Acharya, Almeida and Campello (2013) montrent en particulier que les lignes de crédit des entreprises plus systémiques (béta élevé) sont plus chères car le risque de liquidité qu'elles font peser aux banques n'est pas diversifiable. Nous documentons une autre limite à la diversification du risque, à savoir la grande concentration du portefeuille des lignes de crédit. De manière générale, notre étude suggère que la composition du portefeuille des

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<sup>9</sup>L'utilisation de la taille comme proxy pour la magnitude des contraintes financières afin d'étudier les différences de sensibilité des entreprises aux chocs macroéconomiques remonte au moins à Gertler and Gilchrist (1994). Récemment, Chodorow-Reich (2014) et Mian and Sufi (2014) ont utilisé la taille des entreprises pour analyser les effets des contraintes de financement pendant la crise financière de 2008.

emprunteurs est un objet d'étude central pour quantifier le risque de liquidité des banques.<sup>10</sup>

Le dernier thème de recherche vise à explorer les implications en macro-finance de l'existence d'agents économiques granulaires. Les travaux précédents se sont concentrés sur le rôle des banques sur la transmission des chocs financiers dans l'économie (Buch and Neugebauer, 2011; Amiti and Weinstein, 2018; Alfaro, García-Santana and Moral-Benito, 2019) et sur la formation de taux d'intérêts souverains (Gabaix and Koijen, 2019), sur les effets de grands investisseurs institutionnels sur les prix des actions et des CDS (Greenwood and Thesmar, 2011; Ben-David et al., 2019; Siriwardane, forthcoming) ainsi que les conséquences d'un réseau de production granulaire sur l'évaluation du prix des actifs (Herskovic, 2018). Cette étude est à notre connaissance la première à fournir une évaluation détaillée de l'importance des emprunteurs granulaires sur la formation des variations de crédit au niveau des banques et de l'économie.

### 3 Capital humain et diversification des entreprises

En 2017, plus de 12000 fusions-acquisitions intersectorielles ont eu lieu dans le monde, représentant au total une valeur de plus de 900 mille milliards de dollars.<sup>11</sup> Les fusions-acquisitions intersectorielles permettent aux entreprises de se diversifier, d'obtenir des actifs spécifiques et d'accéder à de nouveaux marchés.<sup>12</sup> Toutefois, la magnitude de ces phénomènes peut être trompeuse dans la mesure où la vaste majorité des diversifications d'entreprises se font sans passer par des fusions acquisitions. Pourquoi certaines entreprises rentrent elles dans un nouveau secteur en passant par une fusion-acquisition (entrée externe), quand d'autres le font en développant leurs ressources

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<sup>10</sup>A la suite de Kashyap, Rajan and Stein (2002), la littérature s'est concentrée majoritairement sur la corrélation entre les retraits sur les dépôts et les retrait sur les lignes de crédit pour évaluer la capacité des banques à pourvoir de la liquidité sur demande. Voir Gatev and Strahan (2006); Ivashina and Scharfstein (2010); Acharya and Mora (2015); Ippolito et al. (2016).

<sup>11</sup>Les fusions-acquisitions intersectorielles représentent environ 30% des transactions en fréquence et en volume. Voir Rapport annuel 2018 KPMG M&A Predictor.

<sup>12</sup>Les motivations derrière les fusions-acquisitions horizontales sont différentes et ont trait majoritairement à la consolidation des parts de marché dans un secteur (see e.g., Eckbo, 1983; Farrell and Shapiro, 1990).

existantes (entrée interne)? Cette question à des implications majeures pour la compréhension du rôle des fusions-acquisitions dans la réallocation des ressources dans l'économie.

Dans cette étude, nous comparons des entreprises qui rentrent dans un nouveau secteur en développant leurs ressources existantes à celles qui acquièrent une nouvelle entreprise déjà présente dans le secteur d'entrée. Bien que notre analyse puisse s'appliquer à d'autres types d'actifs, la présence de frictions spécifiques sur le marché du travail suggère un rôle important du capital humain dans le choix de type de diversification des entreprises. Nous étudions les coûts et les bénéfices associés aux différents types d'entrée. Quand une entreprise entre de manière externe dans un nouveau secteur, elle doit payer les coûts d'acquisition et de restructuration de l'entreprise cible mais gagne accès à de nouvelles ressources de production.<sup>13</sup> Quand une entreprise entre de manière interne, elle fait face à des coûts d'embauche pour ajuster sa main d'œuvre au secteur d'entrée.<sup>14</sup> Ainsi, plus la main d'œuvre de l'entreprise est adaptée au secteur d'entreprise, plus les coûts d'ajustement seront faibles et plus il sera préférable pour l'entreprise de choisir une entrée interne.

Nous trouvons que les entreprises qui ont une main d'œuvre plus adaptée au secteur d'entrée sont plus susceptibles d'entrer de manière interne. La relation entre le capital humain interne et le mode d'entrée est plus prononcée quand il est plus difficile d'obtenir le capital humain nécessaire sur marché du travail externe, ie quand les travailleurs dans les occupations clé sont en quantité limitée. Les entreprises qui entrent de manière interne ont des ventes plus faibles quand leur main d'œuvre n'est pas adaptée au secteur d'entrée, et ce plus particulièrement quand les occupations clé sont en quantité limité sur le marché du travail externe. Ces résultats sont cohérents avec l'idée que les entreprises doivent chercher de nouveaux actifs clés pour croître dans un nouveau secteur. Quand les coûts de recherche augmentent, acheter une entreprise existante devient moins coûteux

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<sup>13</sup>Maksimovic, Phillips and Prabhala (2011) montrent que les entreprises acquéreuses procèdent à une restructuration extensive des entreprises cibles et vendent ou ferment 46% des établissements qu'elles achètent.

<sup>14</sup>Les coûts d'embauche représentent entre un et deux trimestres de salaires et augmentent avec la spécificité des compétences (Abowd and Kramarz, 2003; Blatter, Muehlemann and Schenker, 2012).

que de développer des ressources à partir de zéro et d'embaucher de nouveaux travailleurs.<sup>15</sup>

Une difficulté clé pour tester cette hypothèse consiste à définir et à mesurer le capital humain d'une entreprise. Nous développons un modèle de diversification avec choix endogène de type de travailleurs pour fournir une définition du capital humain adaptée à notre problème. Dans le modèle, une entreprise qui vise à se diversifier embauche des travailleurs appartenant à plusieurs occupations plus ou moins utiles selon le secteur d'entrée. Si l'entreprise décide d'entrer de manière interne, elle peut choisir d'utiliser des travailleurs dans sa propre main d'œuvre (marché du travail interne) ou sur le marché du travail externe. Si l'entreprise décide de rentrer de manière externe, elle peut choisir des travailleurs dans la main d'œuvre de l'entreprise cible mais elle doit payer des coûts fixes d'acquisition. Le modèle génère deux prédictions principales. Premièrement, à l'équilibre, l'entreprise choisit d'entrer de manière interne quand son capital humain interne est adapté au secteur d'entrée. L'entreprise décide d'entrer de manière externe quand sa main d'œuvre ne comprend pas les occupations nécessaires pour opérer dans le secteur d'entrée, et ce en dépit des coûts liés à l'acquisition. Deuxièmement, la relation entre le capital humain interne et le choix du type d'entrée est plus prononcée quand il est difficile d'embaucher des travailleurs clé sur le marché du travail externe.

Le modèle génère une mesure du capital humain basée sur la relation d'équilibre entre la fraction de la masse salariale qui revient à un type d'occupation et la contribution de cette occupation à la production de l'entreprise. Nous construisons notre mesure de capital humain en deux étapes en utilisant une base établie à partir des déclarations individuelles de salaires des employés français (DADS). Dans l'esprit d'Abowd, Kramarz and Margolis (1999), nous régressons la fraction des salaires qui reviennent à une occupation pour les entreprises appartenant à un secteur donné sur

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<sup>15</sup>La stratégie d'acquisition de Cisco illustre ce mécanisme. En 1997, un analyste de Cisco décrivait la stratégie de l'entreprise comme suit : « dans l'économie d'aujourd'hui, construire des équipes de travail de zéro est un luxe d'antan. Maintenant, quand on ne peut pas entrer de manière interne, on achète. En 2017, Cisco a entrepris plus de 200 fusions-acquisitions pour « fournir des capacités, des potentiels d'accélération ou une entrée plus rapide dans un secteur que d'autres modalités d'entrées comme le partenariat ou le développement de ressources en interne (Wysocki, 1997; Romanski, 2017).

des effets fixes occupation-secteur. Nous interprétons les effets fixes occupation-secteur comme un score reflétant le capital humain d'une occupation dans un secteur donné. Dans une deuxième étape, nous calculons le capital humain au niveau de l'entreprise comme la moyenne des effets fixes pris pour le secteur d'entrée des occupations présentes dans la main d'œuvre de l'entreprise. Notre définition du capital humain traduit dans quelle mesure la main d'œuvre est adaptée au secteur d'entrée.<sup>16</sup>

Notre mesure de capital humain a plusieurs avantages. Premièrement, comme les données que nous utilisons contiennent un code d'occupation pour chaque travailleur, notre mesure de capital humain est basée sur plusieurs dimensions du capital humain individuel comme les compétences, l'éducation et l'expérience (Becker, 1962; Gibbons and Waldman, 2004; Autor and Dorn, 2009). Deuxièmement, la stratégie d'effets fixes nous permet d'ordonner les occupations dans chaque secteur selon leur contribution à la production des entreprises. Troisièmement, notre mesure du capital humain ne reflète pas les stratégies de rémunération propres à l'entreprise. Notre variable dépendante n'est donc pas affectée par des dimensions inobservables (cycle de vie, préférences du dirigeant) qui pourraient elles-mêmes être reliées aux choix de diversification de l'entreprise.

Une autre difficulté empirique pour notre papier est de savoir comment les entreprises entrent dans un nouveau secteur. Nous utilisons pour ce faire une enquête renseignant la ventilation des ventes par secteurs.<sup>17</sup> Une firme entre dans un nouveau secteur si (i) au moins une de ses filiales commencent à vendre dans un nouveau secteur (ii) aucune des autres filiales contrôlées par le même propriétaire final opère déjà dans le secteur. Nous identifions les entrées externes en appariant des données de fusions-acquisitions issues de SDC Platinum et du Bureau Van Dijk aux données administratives françaises. Une entrée est dite externe si la filiale qui vend dans le nouveau secteur a été achetée par l'entreprise. Par opposition, une entrée est dite interne si elle est faite via une

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<sup>16</sup>Dans la suite, nous nommons cette variable « capital humain interne » sans mentionner qu'elle est spécifique au secteur d'entrée.

<sup>17</sup>Ces données sont rendues disponibles par l'enquête ESA qui est établie par l'Insee. Dans notre analyse, nous définissons un secteur comme un code à cinq chiffres de la nomenclature d'activités française.

filiale préexistante de l'entreprise. Notre base de données finales comprend 75000 entrées internes et externes entre 2003 et 2014.

Nous établissons les premières statistiques descriptives sur les entrées internes et externes. Nous trouvons que 98% des entrées dans un nouveau secteur sont internes, ou 90% quand les entrées sont pondérées par les ventes. En moyenne, les entreprises investissent un million d'euros au moment de l'entrée, et environ la moitié des entreprises de notre échantillon continuent à opérer dans le secteur d'entrée après un an. Les ventes médianes (moyennes) dans le nouveau secteur sont égales à 270 Keuros (2.8 Meuros).

Nous regardons si la composition de la main d'œuvre des entreprises explique leurs choix de diversification. Nous comparons des entreprises qui opèrent dans le même secteur d'origine et qui entrent dans le même secteur la même année. Cette spécification neutralise de potentielles synergies inobservables entre le secteur d'entrée et le secteur d'origine. Nous trouvons que les entreprises sont plus susceptibles d'entrer de manière interne quand leur capital humain n'est pas adapté au secteur d'entrée. Baisser le capital humain d'une déviation standard augmente la probabilité d'achat de 1.1 points de pourcentage. Cela équivaut à une augmentation de 50% par rapport à la probabilité inconditionnelle d'une entrée interne. Ce résultat reste valide même en contrôlant pour une grande variété de caractéristiques de l'entreprise comme la taille, la profitabilité, l'intensité capitalistique et le niveau de trésorerie.

Nous procédons à une large variété de tests de robustesse pour nous assurer de la validité de nos résultats. Premièrement, nous montrons que nos résultats sont robustes à l'utilisation de mesures alternatives du capital humain (moyenne pondérée par le poids des occupations dans la main d'œuvre, moyenne sans prendre en compte le management. . . ). Deuxièmement, nous exploitons l'hétérogénéité dans la composition de la main d'œuvre entre filiales d'une même entreprise. Nous trouvons que les entreprises qui se diversifient de manière interne choisissent la filiale avec la main d'œuvre la plus adaptée pour entrer dans le nouveau secteur. Troisièmement, nous vérifions que



les entreprises qui rentrent de manière interne avec un faible capital humain embauchent plus de travailleurs que celles qui ont déjà les compétences clés en interne avant l'entrée. Quatrièmement, nous étudions le rôle des contraintes financières sur le choix de la modalité de diversification. Nous montrons que nos résultats sont valables quels que soient le niveau de cash, la taille ou bien le niveau d'accès au financement sur les marchés. Cinquièmement, nous vérifions que nos résultats ne sont pas expliqués par des complémentarités entre capital humain et capital physique.

Dans une série supplémentaire de tests, nous nous intéressons simultanément au choix de la modalité d'entrée et au choix d'entrer dans un nouveau secteur. Premièrement, nous regardons comment les complémentarités entre le secteur d'entrée et le secteur d'origine (synergies de productions, clients communs) interagissent avec le capital humain interne. Nous adaptons la mesure de Bloom, Schankerman and Van Reenen (2013) pour construire une distance entre un secteur et une entreprise basée sur le portefeuille d'activités de cette dernière. Nous trouvons que les entreprises sont plus susceptibles d'entrer de manière interne quand l'entreprise est distante du secteur d'entrée. Le capital humain interne a par ailleurs un rôle plus important pour le choix de type d'entrée quand la distance entre le secteur d'entrée et l'entreprise est grande. Deuxièmement, nous étudions le rôle de deux scénarios plausibles de sélection dans un secteur qui pourraient potentiellement expliquer nos résultats principaux. Les entreprises qui opèrent dans des secteurs peu dynamiques pourraient premièrement vouloir réallouer leurs activités et leurs travailleurs dans un nouveau secteur (Tate and Yang, 2016*b*; Baghai et al., 2018). Les entreprises choisiraient dans ce scénario toujours un secteur dans lequel elles peuvent facilement réallouer leur main d'œuvre. Ce mécanisme alternatif pourrait également générer une corrélation positive entre la probabilité d'entrée interne et le capital humain des entreprises. Dans un second scénario, des entreprises opérant dans des secteurs en déclin pourraient vouloir acheter des entreprises dans des secteurs en croissance pour lesquels elles n'auraient pas le capital humain adéquat. Ce mécanisme pourrait également conduire à des résultats similaires à ceux observés. Nos résultats indiquent toutefois que ces deux scénarios ne permettent

pas d'expliquer nos résultats.

Notre second résultat principal est que les entreprises sont plus susceptibles de réaliser une entrée externe quand les occupations clés sont en quantité limitée sur le marché du travail externe. Nous testons cette prédiction en utilisant des données fournies par l'agence Pôle Emploi indiquant quelles occupations sont en quantité limitée dans les différentes zones d'emploi. Nous documentons une large hétérogénéité de la disponibilité des occupations entre zones d'emploi. Nous créons une mesure des tensions sur le marché de l'emploi. La variable indique la présence de fortes tensions sur le marché de l'emploi pour une entreprise et un secteur d'entrée donnés quand les occupations clés pour rentrer dans un secteur sont en tension dans la zone d'emploi de l'entreprise. Nous trouvons que les entreprises sont plus susceptibles d'entrer de manière externe quand les tensions sur le marché de l'emploi sont fortes. De plus, nos résultats montrent que nos résultats sont tirés par les observations dans le dernier tercile de tensions sur le marché de l'emploi.

Notre papier contribue à la littérature sur les déterminants des entrées internes et externes entre secteurs. Très peu de papiers ont étudié de manière jointe le choix entre ces deux modalités de diversification. McCardle and Viswanathan (1994) montrent que les entreprises entrent dans un nouveau secteur par acquisition quand les barrières d'entrée sont hautes, ce que l'analyse empirique de Yip (1982) tend à corroborer. Phillips and Zhdanov (2013) proposent un cadre théorique dans lequel les petites entreprises investissent à l'équilibre dans la recherche et développement et les grandes entreprises achètent les firmes qui ont réussi à innover. Enfin, Bernard, Redding and Schott (2010) documentent que les entreprises américaines varient fréquemment leurs portefeuilles de produit mais que les entrées externes restent relativement rares (7 % des cas). Nous contribuons à cette littérature relativement restreinte en montrant que plus de 90% des diversifications d'entreprises se font par des entrées internes et en reliant le choix de type d'entrée aux ressources internes de l'entreprise.

Notre papier a aussi trait à la théorie de la firme. Dans la littérature de finance, la vue dominante a

longtemps été la théorie des droits de propriété (Grossman and Hart, 1986; Hart and Moore, 1990). La théorie prédit que placer des actifs complémentaires sous le contrôle d'une seule entreprise est source de profits.<sup>18</sup> Toutefois, une autre conception de la théorie de la firme plus populaire dans les années soixante et dans la littérature de stratégie (Capron and Mitchell, 2012) a récemment connu un regain d'intérêt dans la littérature en commerce international. La vision de la firme « basée sur les ressources » indique que les frontières de l'entreprise dépendent de ses ressources internes et des capacités qu'elle peut transférer. Nocke and Yeaple (2007) montrent ainsi que le choix d'entrer dans un nouveau pays via un investissement direct à l'étranger ou en acquérant une entreprise déjà existante dépend de la mesure dans laquelle les capacités d'une entreprise sont transférables d'un pays à un autre. Boehm, Dhingra and Morrow (2019) montrent que les entreprises tendent à produire dans des industries qui requièrent des intrants économiques similaires. Notre papier étudie un autre facteur de production : le travail salarié. Notre étude montre que l'accès à des capacités spécifiques détermine non seulement les choix de diversification, mais comment les entreprises diversifient ; et que le travail spécialisé est un déterminant important de la capacité d'une entreprise à croître dans un nouveau marché.

Enfin, notre papier contribue à la littérature florissante à l'interface de l'économie du travail et de la finance d'entreprise.<sup>19</sup> Plus spécifiquement, notre papier est relié à une branche de la littérature qui relie la théorie des organisations à l'économie du travail. <sup>20</sup> Tate and Yang (2016a) montrent

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<sup>18</sup>Rhodes-Kropf and Robinson (2008) montrent que la recherche de complémentarités génère un appariement assortatif entre entreprises acquéreuses et entreprises acquises. La littérature empirique en fusions-acquisitions fournit des éléments corroborant ces prédictions : les fusions sont plus susceptibles de survenir et génèrent plus de valeur quand les entreprises ont un capital humain similaire (Tate and Yang, 2016b; Lee, Mauer and Xu, 2018), vendent des produits similaires (Hoberg and Phillips, 2010), utilisent des technologies similaires (Bena and Li, 2014), ou partagent des cultures d'entreprise similaires (Li et al., 2018).

<sup>19</sup>La littérature a récemment exploré les implications de la présence de coûts d'ajustement de la main d'œuvre pour les distribution des retours espérés sur les actifs (Eiling, 2013; Donangelo, 2014; Belo, Lin and Bazdresch, 2014; Kuehn, Simutin and Wang, 2017)), pour l'investissement des entreprises (e.g., Merz and Yashiv, 2007; Xu, 2018; Bai, Fairhurst and Serfling, 2018) ainsi que pour la structure de capital des entreprises (e.g., Matsa, 2010; Agrawal and Matsa, 2013; Simintzi, Vig and Volpin, 2014; Baghai et al., 2018; Serfling, 2016; Ghaly, Anh Dang and Stathopoulos, 2017).

<sup>20</sup>Une série de papiers moins reliés à notre étude étudie également les conséquences des fusions-acquisitions sur les salaires ou l'emploi (e.g., Lagaras, 2017; Ma, Ouimet and Simintzi, 2018).

que le nombre de fusions-acquisitions intersectorielles peut être prédit par le flux de travailleurs entre industries. Les auteurs concluent que ce résultat reflète la présence de complémentarités de capital humain entre certains secteurs. Ouimet and Zarutskie (2016) trouvent que les entreprises qui cherchent à obtenir du capital humain retiennent une plus grande part des employés qualifiés après l'achat d'une entreprise. Lee, Mauer and Xu (2018) montrent que les entreprises sont plus susceptibles de fusionner et génèrent de plus grands profits après la fusion quand elles ont un capital humain similaire. Nous contribuons à cette littérature sur trois points. Premièrement, nous proposons une mesure du capital humain au niveau de l'entreprise qui permet d'illustrer d'une nouvelle manière les complémentarités entre secteur. Deuxièmement, nous montrons que le capital humain interne permet de prédire la manière dont les entreprises se diversifient. Enfin, nos résultats soulignent le rôle des tensions sur le marché de l'emploi pour comprendre la relation entre capital humain et fusions-acquisitions. De manière générale, nous montrons que la composition de la main d'œuvre affecte les frontières de la firme.

## 4 Bibliographie

- Abowd, John M, and Francis Kramarz.** 2003. “The costs of hiring and separations.” *Labour Economics*, 10(5) : 499–530.
- Abowd, John M, Francis Kramarz, and David N Margolis.** 1999. “High wage workers and high wage firms.” *Econometrica*, 67(2) : 251–333.
- Acharya, Viral V, and Nada Mora.** 2015. “A crisis of banks as liquidity providers.” *The Journal of Finance*, 70(1) : 1–43.
- Acharya, Viral V, Heitor Almeida, and Murillo Campello.** 2013. “Aggregate risk and the choice between cash and lines of credit.” *The Journal of Finance*, 68(5) : 2059–2116.
- Agrawal, Ashwini K, and David A Matsa.** 2013. “Labor unemployment risk and corporate financing decisions.” *Journal of Financial Economics*, 108(2) : 449–470.
- Alfaro, Laura, Manuel García-Santana, and Enrique Moral-Benito.** 2019. “On the direct and indirect real effects of credit supply shocks.” NBER Working Paper.
- Amiti, Mary, and David E Weinstein.** 2018. “How much do idiosyncratic bank shocks affect investment? Evidence from matched bank-firm loan data.” *Journal of Political Economy*, 126(2) : 525–587.
- Arkolakis, Costas.** 2010. “Market Penetration Costs and the New Consumers Margin in International Trade.” *Journal of Political Economy*, 118(6) : 1151–1199.
- Autor, David, and David Dorn.** 2009. “This job is “getting old” : measuring changes in job opportunities using occupational age structure.” *American Economic Review*, 99(2) : 45–51.
- Baghai, Ramin, Rui Silva, Viktor Thell, and Vikrant Vig.** 2018. “Talent in distressed firms : Investigating the labor costs of financial distress.” *Working paper*.
- Bai, John Jianqiu, Douglas J Fairhurst, and Matthew Serfling.** 2018. “Employment protection, investment, and firm growth.” Working paper.
- Barrot, Jean-Noël.** 2016. “Trade Credit and Industry Dynamics : Evidence from Trucking Firms.” *The Journal of Finance*, 71(5) : 1975–2016.
- Becker, Gary S.** 1962. “Investment in human capital : A theoretical analysis.” *Journal of political economy*, 70(5, Part 2) : 9–49.
- Begenau, Juliane, and Juliana Salomao.** 2018. “Firm Financing over the Business Cycle.” *The Review of Financial Studies*.
- Belo, Frederico, Xiaoji Lin, and Santiago Bazdresch.** 2014. “Labor hiring, investment, and stock return predictability in the cross section.” *Journal of Political Economy*, 122(1) : 129–177.
- Bena, Jan, and Kai Li.** 2014. “Corporate innovations and mergers and acquisitions.” *Journal of Finance*, 69(5) : 1923–1960.
- Ben-David, Itzhak, Francesco Franzoni, Rabih Moussawi, John Sedunov, et al.** 2019. “The Granular Nature of Large Institutional Investors.” CEPR Discussion Papers.
- Bernanke, Ben, Mark Gertler, and Simon Gilchrist.** 1996. “The financial accelerator and the flight to quality.” *Review of Economics and Statistics*, 78(1) : 1–15.
- Bernard, Andrew B, Emmanuel Dhyne, Glenn Magerman, Kalina Manova, and Andreas Moxnes.** 2019. “The origins of firm heterogeneity : a production network approach.” National Bureau of Economic Research.

- Bernard, Andrew B, Stephen J Redding, and Peter K Schott.** 2010. “Multiple-product firms and product switching.” *American Economic Review*, 100(1) : 70–97.
- Blatter, Marc, Samuel Muehlemann, and Samuel Schenker.** 2012. “The costs of hiring skilled workers.” *European Economic Review*, 56(1) : 20–35.
- Bloom, Nicholas, Mark Schankerman, and John Van Reenen.** 2013. “Identifying technology spillovers and product market rivalry.” *Econometrica*, 81(4) : 1347–1393.
- Boehm, Johannes, Swati Dhingra, and John Morrow.** 2019. “The comparative advantage of firms.” *Working paper*.
- Bord, Vitaly M, and João AC Santos.** 2014. “Banks’ liquidity and the cost of liquidity to corporations.” *Journal of Money, Credit and Banking*, 46(s1) : 13–45.
- Boutin, Xavier, Giacinta Cestone, Chiara Fumagalli, Giovanni Pica, and Nicolas Serrano-Velarde.** 2013. “The deep-pocket effect of internal capital markets.” *Journal of Financial Economics*, 109 : 122–145.
- Bremus, Franziska, and Claudia M Buch.** 2017. “Granularity in banking and growth : Does financial openness matter ?” *Journal of Banking & Finance*, 77 : 300–316.
- Bremus, Franziska, Claudia M Buch, Katheryn N Russ, and Monika Schnitzer.** 2018. “Big Banks and Macroeconomic Outcomes : Theory and Cross-Country Evidence of Granularity.” *Journal of Money, Credit and Banking*, 50(8) : 1785–1825.
- Breza, Emily, and Andres Liberman.** 2017. “Financial contracting and organizational form : Evidence from the regulation of trade credit.” *Journal of Finance*.
- Buch, Claudia M, and Katja Neugebauer.** 2011. “Bank-specific shocks and the real economy.” *Journal of Banking & Finance*, 35(8) : 2179–2187.
- Capron, Laurence, and Will Mitchell.** 2012. *Build, borrow, or buy : Solving the growth dilemma*. Harvard Business Press.
- Carvalho, Vasco M, and Basile Grassi.** 2019. “Large Firm Dynamics and the Business Cycle.” *American Economic Review*.
- Chaney, Thomas.** 2016. “Liquidity constrained exporters.” *Journal of Economic Dynamics and Control*, 72 : 141 – 154.
- Chari, Varadarajan V, Patrick J Kehoe, and Ellen R McGrattan.** 2007. “Business cycle accounting.” *Econometrica*, 75(3) : 781–836.
- Chevalier, Judith A.** 1995. “Do LBO supermarkets charge more ? An empirical analysis of the effects of LBOs on supermarket pricing.” *The Journal of Finance*, 50(4) : 1095–1112.
- Chevalier, Judith A, and David S Scharfstein.** 1996. “Capital-market imperfections and counter-cyclical markups : Theory and evidence.” *American Economic Review*, 86(4) : 703.
- Chodorow-Reich, Gabriel.** 2014. “The employment effects of credit market disruptions : Firm-level evidence from the 2008–9 financial crisis.” *The Quarterly Journal of Economics*, 129(1) : 1–59.
- Cornett, Marcia Millon, Jamie John McNutt, Philip E Strahan, and Hassan Tehranian.** 2011. “Liquidity risk management and credit supply in the financial crisis.” *Journal of Financial Economics*, 101(2) : 297–312.
- Covas, Francisco, and Wouter J Den Haan.** 2011. “The cyclical behavior of debt and equity finance.” *American Economic Review*, 101(2) : 877–99.

- Crouzet, Nicolas, and Neil R Mehrotra.** 2019. “Small and Large Firms over the Business Cycle.” NBER Working Paper.
- Davis, Steven J, John Haltiwanger, and Scott Schuh.** 1996. “Small business and job creation : Dissecting the myth and reassessing the facts.” *Small Business Economics*, 8(4) : 297–315.
- Di Giovanni, Julian, Andrei A Levchenko, and Isabelle Mejean.** 2014. “Firms, destinations, and aggregate fluctuations.” *Econometrica*, 82(4) : 1303–1340.
- Di Giovanni, Julian, Andrei A Levchenko, and Isabelle Mejean.** 2017. “Large firms and international business cycle comovement.” *American Economic Review*, 107(5) : 598–602.
- Di Giovanni, Julian, Andrei A Levchenko, and Isabelle Mejean.** 2018. “The micro origins of international business-cycle comovement.” *American Economic Review*, 108(1) : 82–108.
- Donangelo, Andres.** 2014. “Labor mobility : Implications for asset pricing.” *Journal of Finance*, 69(3) : 1321–1346.
- Eaton, Jonathan, Marcela Eslava, Cornell J Krizan, Maurice Kugler, and James Tybout.** 2014. “A search and learning model of export dynamics.” Working Paper.
- Eaton, Jonathan, Samuel Kortum, Brent Neiman, and John Romalis.** 2016. “Trade and the global recession.” *American Economic Review*, 106(11) : 3401–38.
- Eckbo, Espen.** 1983. “Horizontal mergers, collusion, and stockholder wealth.” *Journal of financial Economics*, 11(1-4) : 241–273.
- Eiling, Esther.** 2013. “Industry-specific human capital, idiosyncratic risk, and the cross-section of expected stock returns.” *The Journal of Finance*, 68(1) : 43–84.
- Eisfeldt, Andrea L, and Tyler Muir.** 2016. “Aggregate external financing and savings waves.” *Journal of Monetary Economics*, 84 : 116–133.
- Farrell, Joseph, and Carl Shapiro.** 1990. “Horizontal mergers : an equilibrium analysis.” *American Economic Review*, 107–126.
- Feenstra, Robert C., Zhiyuan Li, and Miaojie Yu.** 2014. “Exports and Credit Constraints under Incomplete Information : Theory and Evidence from China.” *The Review of Economics and Statistics*, 96(4) : 729–744.
- Frésard, Laurent.** 2010. “Financial Strength and Product Market Behavior : The Real Effects of Corporate Cash Holdings.” *Journal of Finance*, 65 : 1097–1122.
- Gabaix, Xavier.** 2011. “The granular origins of aggregate fluctuations.” *Econometrica*, 79(3) : 733–772.
- Gabaix, Xavier, and Ralph SJ Koijen.** 2019. “Granular Instrumental Variables.” NBER Working Paper.
- Gatev, Evan, and Philip E Strahan.** 2006. “Banks’ advantage in hedging liquidity risk : Theory and evidence from the commercial paper market.” *The Journal of Finance*, 61(2) : 867–892.
- Gaubert, Cecile, and Oleg Itskhoki.** 2018. “Granular comparative advantage.” NBER Working Paper.
- Gertler, Mark, and Simon Gilchrist.** 1994. “Monetary policy, business cycles, and the behavior of small manufacturing firms.” *The Quarterly Journal of Economics*, 109(2) : 309–340.
- Ghaly, Mohamed, Viet Anh Dang, and Konstantinos Stathopoulos.** 2017. “Cash holdings and labor heterogeneity : the role of skilled labor.” *Review of Financial Studies*, 30(10) : 3636–3668.

- Gibbons, Robert, and Michael Waldman.** 2004. “Task-specific human capital.” *American Economic Review*, 94(2) : 203–207.
- Greenwood, Robin, and David Thesmar.** 2011. “Stock price fragility.” *Journal of Financial Economics*, 102(3) : 471–490.
- Grossman, Sanford J, and Oliver D Hart.** 1986. “The costs and benefits of ownership : a theory of vertical and lateral integration.” *Journal of Political economy*, 94(4) : 691–719.
- Hart, Oliver, and John Moore.** 1990. “Property rights and the nature of the firm.” *Journal of Political Economy*, 98(6) : 1119–1158.
- Herskovic, Bernard.** 2018. “Networks in production : Asset pricing implications.” *The Journal of Finance*, 73(4) : 1785–1818.
- Hoberg, Gerard, and Gordon Phillips.** 2010. “Product market synergies and competition in mergers and acquisitions : A text-based analysis.” *Review of Financial Studies*, 23(10) : 3773–3811.
- Holmström, Bengt, and Jean Tirole.** 1998. “Private and public supply of liquidity.” *Journal of Political Economy*, 106(1) : 1–40.
- Hottman, Colin J, Stephen J Redding, and David E Weinstein.** 2016. “Quantifying the sources of firm heterogeneity.” *The Quarterly Journal of Economics*, 131(3) : 1291–1364.
- Ippolito, Filippo, José-Luis Peydró, Andrea Polo, and Enrico Sette.** 2016. “Double bank runs and liquidity risk management.” *Journal of Financial Economics*, 122(1) : 135–154.
- Ivashina, Victoria, and David Scharfstein.** 2010. “Bank lending during the financial crisis of 2008.” *Journal of Financial Economics*, 97(3) : 319–338.
- Jermann, Urban, and Vincenzo Quadrini.** 2012. “Macroeconomic effects of financial shocks.” *American Economic Review*, 102(1) : 238–71.
- Justiniano, Alejandro, Giorgio E Primiceri, and Andrea Tambalotti.** 2010. “Investment shocks and business cycles.” *Journal of Monetary Economics*, 57(2) : 132–145.
- Kashyap, Anil K, Raghuram Rajan, and Jeremy C Stein.** 2002. “Banks as liquidity providers : An explanation for the coexistence of lending and deposit-taking.” *The Journal of Finance*, 57(1) : 33–73.
- Kiyotaki, Nobuhiro, and John Moore.** 1997. “Credit cycles.” *Journal of Political Economy*, 105(2) : 211–248.
- Kuehn, Lars-Alexander, Mikhail Simutin, and Jessie Jiayu Wang.** 2017. “A labor capital asset pricing model.” *Journal of Finance*, 72(5) : 2131–2178.
- Lagaras, Spyridon.** 2017. “Corporate takeovers and labor restructuring.”
- Lee, Kyeong Hun, David C. Mauer, and Emma Qianying Xu.** 2018. “Human capital relatedness and mergers and acquisitions.” *Journal of Financial Economics*, 129(1) : 111–135.
- Li, Kai, Feng Mai, Rui Shen, and Xinyan Yan.** 2018. “Measuring corporate culture using machine learning.” Working paper.
- Maksimovic, Vojislav, Gordon Phillips, and Nagpurnanand R Prabhala.** 2011. “Post-merger restructuring and the boundaries of the firm.” *Journal of Financial Economics*, 102(2) : 317–343.
- Manova, Kalina.** 2013. “Credit Constraints, Heterogeneous Firms and International Trade.” *The Review of Economic Studies*, 80 : 711–744.



- Martin, Julien, Isabelle Mejean, and Mathieu Parenti.** 2018. “Relationship Stickiness : Measurement and Applications to International Economics.” Working Paper.
- Matsa, David A.** 2010. “Capital structure as a strategic variable : evidence from collective bargaining.” *Journal of Finance*, 65(3) : 1197–1232.
- Ma, Wenting, Paige Ouimet, and Elena Simintzi.** 2018. “Technological change and inequality.”
- McCardle, Kevin F, and S Viswanathan.** 1994. “The direct entry versus takeover decision and stock price performance around takeovers.” *Journal of Business*, 1–43.
- Mélicit, Marc.** 2003. “The impact of trade on intra-industry reallocations and aggregate industry productivity.” *Econometrica*, 71(6) : 1695–1725.
- Merz, Monika, and Eran Yashiv.** 2007. “Labor and the market value of the firm.” *American Economic Review*, 97(4) : 1419–1431.
- Mian, Atif, and Amir Sufi.** 2014. “What explains the 2007–2009 drop in employment ?” *Econometrica*, 82(6) : 2197–2223.
- Nocke, Volker, and Stephen Yeaple.** 2007. “Cross-border mergers and acquisitions vs. greenfield foreign direct investment : The role of firm heterogeneity.” *Journal of International Economics*, 72(2) : 336–365.
- Ouimet, Paige Parker, and Rebecca Zarutskie.** 2016. “Acquiring labor.” working paper.
- Paravisini, Daniel, Veronica Rappoport, Philipp Schnabl, and Daniel Wolfenzon.** 2014. “Dissecting the Effect of Credit Supply on Trade : Evidence from Matched Credit-Export Data.” *Review of Economic Studies*, 1–26.
- Phillips, Gordon M.** 1995. “Increased debt and industry product markets : an empirical analysis.” *Journal of Financial Economics*, 37(2) : 189–238.
- Phillips, Gordon M, and Alexei Zhdanov.** 2013. “R&D and the Incentives from Merger and Acquisition Activity.” *The Review of Financial Studies*, 26(1) : 34–78.
- Rauch, James E.** 1999. “Networks versus markets in international trade.” *Journal of International Economics*, 48(1) : 7–35.
- Rhodes-Kropf, Matthew, and David T. Robinson.** 2008. “The market for mergers and the boundaries of the firm.” *Journal of Finance*, 63(3) : 1169–1211.
- Romanski, Hilton.** 2017. “Cisco’s 200th Acquisition - A Tradition of Advancement, Disruption and Growth.” *Cisco Blog*.
- Schmidt-Eisenlohr, Tim.** 2013. “Towards a Theory of Trade Finance.” *Journal of International Economics*, 91(1) : 96–112.
- Serfling, Matthew.** 2016. “Firing costs and capital structure decisions.” *Journal of Finance*, 71(5) : 2239–2286.
- Simintzi, Elena, Vikrant Vig, and Paolo Volpin.** 2014. “Labor protection and leverage.” *Review of Financial Studies*, 28(2) : 561–591.
- Siriwardane, Emil.** forthcoming. “Limited investment capital and credit spreads.” *The Journal of Finance*.
- Smets, Frank, and Rafael Wouters.** 2007. “Shocks and frictions in US business cycles : A Bayesian DSGE approach.” *American Economic Review*, 97(3) : 586–606.
- Tate, Geoffrey A, and Liu Yang.** 2016a. “The human factor in acquisitions : cross-industry labor mobility and corporate diversification.” *Working paper*.

- Tate, Geoffrey, and Liu Yang.** 2016b. “The bright side of corporate diversification : evidence from internal labor markets.” *Review of Financial Studies*, 28(8) : 2203–2249.
- Wysocki, Bernard Jr.** 1997. “Many mergers driven by search for fresh talent.” *Wall Street Journal*.
- Xu, Sheng-Jun.** 2018. “Skilled labor supply and corporate investment : Evidence from the H-1B visa program.” *Working paper*.
- Yip, George S.** 1982. “Diversification entry : Internal development versus acquisition.” *Strategic Management Journal*, 3(4) : 331–345.

## RÉSUMÉ

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Cette thèse explore les implications pour la finance d'entreprise de l'importance croissante du capital intangible dans la détermination de l'avantage compétitif des entreprises. Dans le premier chapitre (avec C. Lenoir, CREST), nous montrons qu'un accès insuffisant au financement de court terme constitue un obstacle au développement de la clientèle des entreprises. Dans le deuxième chapitre (avec T. Libert de PSE et C. Hurlin de l'Université d'Orléans), nous analysons les effets de la sous-diversification des bases d'emprunteurs des banques. Nos résultats indiquent que la concentration expose les prêteurs au risque idiosyncratique de leurs emprunteurs et qu'elle amène à une plus grande synchronisation des flux de crédits entre banque. Dans le troisième chapitre (avec V. Lyonnet d'OSU et C. Hebert de Paris Dauphine/Tilburg U.), nous montrons que les entreprises utilisent les fusions-acquisitions pour acquérir un capital humain spécialisé lorsque l'embauche externe est trop coûteuse.

## MOTS CLÉS

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Finance d'entreprise, capital clientèle, capital humain, crédit commercial, fusions-acquisitions, économie bancaire.

## ABSTRACT

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The goal of this thesis is to explore the implications for corporate finance of the rising importance of intangible capital in shaping firm's growth and competitive edge. In the first chapter (with C. Lenoir from CREST), we look at the role of liquidity constraints in the accumulation of customer capital. We show that both financing and product market frictions lead firms to under-invest in customer capital. In the second chapter (with T. Libert from PSE and C. Hurlin from U. of Orléans), we study the implications of the under-diversification of the borrower base of banks. We find that it exposes lenders to considerable borrower idiosyncratic risk and leads credit variations to be more synchronized across banks. In the third chapter (with V. Lyonnet from OSU and C. Hebert from Paris Dauphine/Tilburg U.), we study how human capital shape firms' boundaries. Our results suggest that firms use M&As as a way to acquire specialized human capital when external hiring is too costly.

## KEYWORDS

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Corporate finance, customer capital, human capital, mergers and acquisitions, trade credit, empirical banking.