Searching for buyers in international markets

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Searching for buyers in internationals markets

Clémence lenoir

This thesis studies how firms meet and match with their potential buyers in international markets. Buyers accumulation abroad is a crucial component of exporters growth: sales to new buyers explain almost 50% of firms' export growth rate heterogeneity in the medium run. Yet, in international markets, heightened geographical and cultural distances exacerbate search and information frictions making it harder for firms to match with potential buyers. This thesis investigates the role of search, financial, and network barriers faced by firms willing to match with buyers abroad.

To investigate these questions this thesis relies on a unique data set covering the universe of intra-EU trade relationships of French firms in which buyers of French firms are identified. More precisely, for each transaction, the exporting firm, the product and value of the flow, and the European buyer through its European VAT number are recorded.

The first chapter explores how search frictions in international good markets distort competition between firms of heterogeneous productivity. The second chapter studies the role of liquidity constraints in preventing firms from expanding their customer base. The last chapter investigates the role of managers' networks for the acquisition of buyers in international markets.

Thesis Supervisors: Isabelle Mejean and Francis Kramarz

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Contents

Chapter 1

Introduction

1.1 Introduction

International trade plays a key role in today's global economy. Understanding its impact, both at the macroeconomic level in terms of its effect on trade deficits, global imbalances, GDP growth and at the microeconomic level in terms of its differential effect on consumers of different income, on workers of different skills, on voters from different regions, and on firms with different product mixes and productivity levels, is essential. This thesis is a contribution towards a better understanding of one of the mentioned topics: the selection and growth of firms in international markets. Why do some firms export and expand on international markets while most firms never export or export just once? What can the government do to favor firms' participation into exports and growth on international markets?

In this general introduction, I first review the literature and introduce the approach adopted for understanding the selection of firms into exports. Then, I present some stylized facts about French exporters and their buyers. Finally, I briefly discuss the contribution of the three chapters.

1.2 From trade between countries to trade between firms

Economists have long studied international trade flows. Until the beginning of the twenty first century, trade economists mostly focused their attention on trade between countries or at the industry level. In

the nineteenth century, Ricardo (1891) advanced the principle of comparative advantage to rationalize international trade between countries across industries. With this principle, trade improves welfare[1] when two countries trade even when one country is more productive than the other in producing any good. Though Ricardo's framework was based on a two-country two-good model, Dornbusch et al. (1977) showed that the principle of comparative advantage could be extended to a multi-good framework when extending the model to a continuum of goods. More recently, Eaton and Kortum (2002) further generalized the principle of comparative advantage by extending it to a multi-country multi-product framework. More precisely, they showed that, when firm productivity is extreme value distributed, then it is always possible to rank countries and to keep track of comparative advantage. In a separate vein, international trade has also been rationalized through differential factor endowments across countries in the so called Hecksher-Ohlin-Samuelson model, (Heckscher, 1919).

These frameworks did not model demand and trade was motivated by efficiency gains. Ricardian models of trade failed in explaining an important feature of the data: most world trade occurred between similar countries trading different varieties of the same good. To capture this feature of the data, a more micro-economic approach, modeling both some heterogeneity in the supply side and demand, was needed. Krugman (1980) rationalized intra-industry trade by introducing producers of differentiated products and love for variety on the demand side through monopolistic competition. Though this approach was more micro-oriented than the Ricardian model, heterogeneity is not present, producers were differentiated only by their variety, and consumers' love for variety implied that all firms export.

Yet, both the classical and new Krugman-type trade models mostly studied industry or country level trade and did not explore which firms took part in trade and how they were affected by trade. Most notably, they do not capture a crucial empirical finding: (i) only a few firms exports and (ii) exporters differ from non exporter in many dimensions. Exporters are more productive, they realize higher sales, and they pay higher wages, (Bernard and Jensen, 1997, 1999; Mayer and Ottaviano, 2008).

Since 2000, research in international trade put emphasis on the role of individual plants and firms to understand the causes and consequences of aggregate trade (Redding, 2011). The canonical trade model with firm heterogeneity was introduced by Melitz (2003), who embeded a richer supply side by introducing

[1]Welfare is measured by aggregate production in this context.

heterogeneity in the productivity of potential producers in a trade model with love of variety preferences as in Krugman (1980). Notably, in this model not all firms participate in exports and the self-selection of firms into exports is the consequence of firms' heterogeneity in their productivity level. In the canonical model extended by Chaney (2008), there is a continuum[2] of firms whose productivity is distributed Pareto. In Melitz (2003), firms' activity and trade participation requires paying sunk and fixed costs. Consequently, conditional on their productivity draws firms decide whether to export and this delivers a non-random selection of firms into exports: only the most productive firms export, the more so the higher the fixed cost of exports is. These models capture the features of exporters found in the empirical literature. Namely, as the productivity distribution is directly mapped into sales distribution, the skewed distribution of productivity (from the Pareto assumption) rationalizes that a small number of firms realizes a large share of exports and serves many destinations.

While much attention has been devoted to the supply side of the economy, little emphasis has been put on the demand side. In most trade models, there is a representative consumer, making these models quite asymmetric between supply and demand. Some recent papers focus their attention on firms' sourcing strategies and introduce heterogeneous importers while keeping a homogeneous supply side, (Antras et al., 2017). Recent access to firm-to-firm trade data allowed researchers to dive into the microeconomic underpinnings of international trade relationships, (Bernard and Moxnes, 2018). It allows researchers to better approach the true nature of international trade: the sum of a considerable amount of transactions between buyers and sellers. Current theoretical trade research introduces heterogeneity on both demand and supply sides and explores its consequences for firm-level and aggregate trade. A seminal paper by Chaney (2014), develops a dynamics model of trade in which exporters face information friction about their potential buyers and buyers differ in their location. Exporters meet their potential buyers randomly at first and then expand their buyers' portfolio in the neighborhood of their current buyers. This model replicates the dynamics of the extensive margin of trade. Yet, this model is silent about aggregate trade and the intensive margin of trade. More recently, Eaton et al. (2015) have developed a firm-to-firm trade model that captures both firm-to-firm trade

[2]The continuum assumption is a very practical modeling assumption that triggers two effects. First, the ex-ante distribution of events coincides exactly with the ex-post distribution via the exact law of large numbers. As a result any assumption on the distribution of productivity ends up being the actual distribution of firms productivity. Second, since a firm is a point in a continuum, it has a zero-measure and has no effect on aggregate variables. These two assumptions are crucial for the tractability and simplicity of such models.

patterns and aggregate trade patterns. This thesis is in line with these approaches.

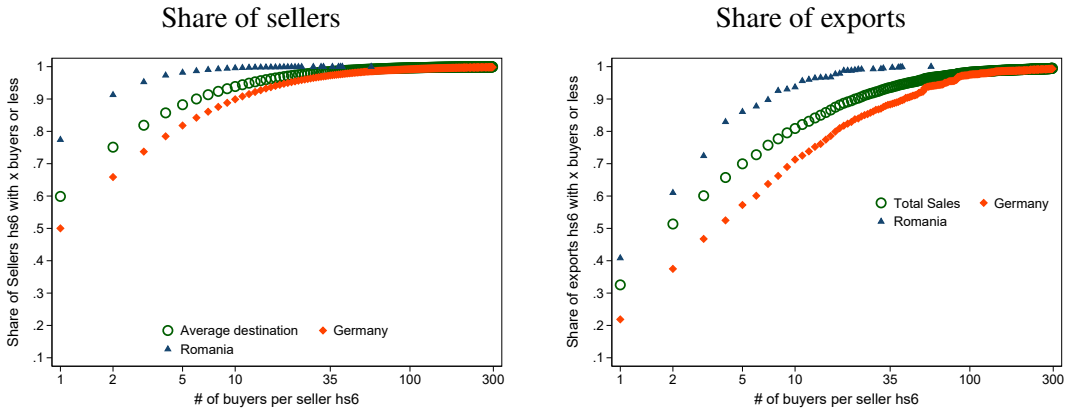
In the following section, I document the somehow new questions raised when considering firm-to-firm trade through two motivating stylized facts of firm-to-firm trade.

1.3 French exporters and their buyers

Empirical firm-to-firm trade papers reveal an additional level of heterogeneity across exporters: the vast majority of exporters have a small number of buyers, while a small number of exporters have many buyers. Similar patterns are found for sourcing strategies: most importers have a few suppliers, and a few have many suppliers. These findings reveal that heterogeneity is two-sided, as a few firms are very well connected both on the demand and supply side (Bernard et al., 2019b, 2018b; Carballo et al., 2018; Bernard et al., 2018a).

French data reveal similar patterns. Figure 1-1 shows the substantial heterogeneity in the number of buyers per seller within a destination. The left panel documents the share of sellers interacting with a given number of buyers while the right panel depicts their relative weight in overall exports. To illustrate the amount of heterogeneity across destination countries, Figure 1-1 displays the distribution obtained in the average European destination (circle points) as well as those computed for two specific destinations Romania and Germany (triangle and diamond points, respectively). In France's typical export market, 65% of sellers interact with a single buyer, and 90% with at most 5 buyers. On the other side of the spectrum, one percent of sellers interact with more than 100 buyers in the same destination. As shown by the right panel in Figure 1-1, sellers interacting with a single buyer in their typical destination account for about a third of French exports and are thus smaller than the average firm in the distribution. Still, 80% of trade is made up by sellers interacting with at most 10 buyers. From this, we conclude that French exports are dominated by sellers interacting with a small number of buyers.

Figure 1-1 – Distribution of the number of buyers per seller, across exporters



Notes: The figure displays the proportion of sellers (left panel) and the share of trade accounted for by sellers (right panel) that serve x buyers or less in a given destination, in 2007. A seller is defined as an exporter-HS6 product pair. The green circles correspond to the average across EU destinations. The blue triangles and red diamonds are respectively obtained from exports to Romania and Germany.

To rationalize these empirical patterns, Bernard et al. (2018b) introduce two-sided heterogeneity in the classic trade model à la Melitz. In their framework, there is a continuum of heterogeneous sellers and buyers, and they assume that to match, sellers have to pay a relation-specific fixed cost. As a result, not every exporter sells to every buyer in a market, and the more productive suppliers are, the more buyers they have. Moreover, conditional on productivity, the matching process is deterministic, implying that all barriers to trade are embedded in the relation-specific fixed cost. Yet this approach raises many questions. Is the buyer margin of exports another trade margin that can be explained by productivity? What is the nature of the relation-specific fixed cost? This thesis is an attempt to explore these questions.

Approaching trade as a combination of buyer-seller relationships raises many issues which are not addressed by the standard modeling tools of international trade. One of the most prominent is the question of search frictions and visibility abroad.[3] Assuming that all firms know about all countries in the world is a reasonable assumption that allows previous trade models to abstract from potential search frictions. This assumption can no longer be made with firm-to-firm trade. Assuming that all buyers observe all potential suppliers and *vice versa* is no longer realistic when considering firm-to-firm trade. As anecdotal evidence,

[3]Note that Chaney (2014) and Eaton et al. (2015) introduce search frictions in their firm-to-firm trade framework, while many other papers have emphasized the prominence of trade frictions without actually modeling firm-to-firm trade, (Allen, 2014; Startz, 2016; Steinwender, 2018).

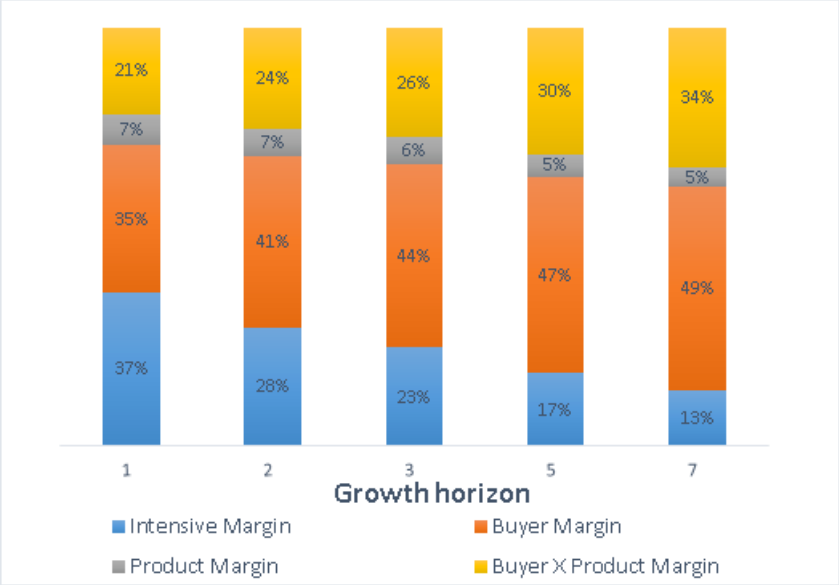
the main program of Business France[4] supports this claim and is aptly named "S'informer sur les marchés à l'international". This program is centered toward information and is based on communication strategy, canvassing activities, and participation in trade fairs. Even if access to information and visibility is correlated with firms' technical efficiency and productivity, there is no reason to think that this correlation is perfect. As a result, productivity may not be the only systematic[5] determinant of firms' participation in exports and firms' number of buyers abroad. Chapter 2 shows that when introducing search friction between buyer and seller, productivity is no longer the only determinant of the number of buyers reached. It studies the consequences of search frictions at the firm and aggregate levels and reveals that when buyers search randomly for their potential suppliers, low-productive suppliers can benefit from it. Chapters 3 and 4 explore the strategies implemented by firms to reduce information frictions, be it by investing in marketing and intangible assets or by recruiting well-connected managers.

Moreover, approaching firms' sales as a sum of seller-buyer relationships has implications for firms dynamics and corporate finance. First, the recent empirical literature has shown the importance of demand factors in explaining firms' and exporters' heterogeneity. Hottman et al. (2016) show using barcode data that 50 to 75% of the heterogeneity in firm size is explained by variations in demand, while differences in technical efficiency drive less than 20% of heterogeneity. Similarly,Bernard et al. (2019a) find that 81% of the variation in firm sales in the Belgian production network originate from factors related to the number and the identity of customers. French exporters display similar patterns.

[4]Business France is a French governmental agency whose purpose is to develop French exports and French attractiveness.

[5]Eaton et al. (2011) explore the randomness displayed by firm selection into exports. While the Melitz model holds on average, firm-level trade flows display many deviations from these patterns. Eaton et al. (2011) add a lot of random shocks on both the fixed and variable costs of exports to match them.

Figure 1-2 – Exporter growth heterogeneity and exports margin



Notes: All customs transactions within EU 1995-2017, restricted to countries present in EU in 1995. The decomposition of export growth rate is $\frac{2\times\Delta Exports_{ft}}{(Exports_{ft-1}+Exports_{ft})}$, the product margin $\frac{2\times\Delta Products_{ft}}{(Exports_{ft-1}+Exports_{ft})}$, the buyer margin $\frac{2\times\Delta Customer\ Base_{ft}}{(Exports_{ft-1}+Exports_{ft})}$, the Buyer×product margin $\frac{2\times\Delta Product\times Buyer_{ft}}{(Exports_{ft-1}+Exports_{ft})}$ and the intensive margin $\frac{2\times\Delta Intensive\ Margin_{ft}}{(Exports_{ft-1}+Exports_{ft})}$

Figure 1-2 shows the contribution of each margin of exports in explaining the heterogeneity of firm-level export growth (at various horizons). It highlights a new fact about exporter growth conditional on survival: while the intensive margin matters in the short-term, the buyer margin is the main contributor to exporter growth heterogeneity in the medium and long-term. The buyer margin explains 35 % of 1-year exporter growth heterogeneity, 44% for 3-year exporter growth heterogeneity, and 49% of 7-year export growth variance. Adding the buyer×product margin increases these figures to 56% for 1-year growth, and to 83% for 7-year growth. The intensive margin contributes to the bulk of short-term growth variance as it explains 37% of 1-year growth variance. However, it becomes secondary for medium and long-run growth (23% over 3-year horizons and 13% for 7-year growth variance). This fact shows that the ability of a firm to build and to maintain a demand for its products (or "customer capital") is a key driver of its size, survival, and long-term growth.

Acquiring new buyers is essential in exporters' growth. Therefore, it is necessary to understand why some firms succeed in acquiring new buyers beyond usual explanations involving efficiency, productivity or other supply side factors. This thesis is an attempt to explore the factors driving exporters heterogeneity with a particular emphasis on demand factors. Most precisely, chapter 3 studies financial constraints affecting investment in customer capital and preventing some firms from acquiring new buyers. Finally, Chapter 4 shows that firms hire sales managers with contacts in foreign destinations to expand their customer base.

1.4 Search frictions

The first chapter of this thesis explores how search frictions in international good markets can distort competition between firms of heterogeneous productivity. We add bilateral search frictions between buyers and sellers in a Ricardian model of trade. Search frictions prevent buyers from identifying the most productive sellers which induces competitive distortions and benefits low-productivity firms at the expense of high-productivity ones. We use a GMM estimator to recover search frictions faced by French exporters at the product and destination level. They are found more severe in large and distant countries and for products that are more differentiated. In a counterfactual exercise, we show that reducing the level of search frictions leads to an improvement in the efficiency of the selection process because the least productive exporters are pushed out of the market while the export probability and the conditional value of exports increase at the top of the productivity distribution. As a consequence, the mean productivity of exporters increases significantly.

1.5 Financing intangible capital and canvassing activities

The second chapter 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 on 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. Further, we provide evidence that liquidity constraints prevent firms from reaching out to new customers, but not from competing on prices. As a result, the presence of liquidity constraints dampens the ability of firms to trade with distant customers and to sell differentiated products.

1.6 Network and trade

The last chapter paper investigates the role of managers' networks for the acquisition of buyers in international markets. In this paper we explore one action firms can undertake to accumulate buyers: investing in connected managers. We leverage upon sales managers' job-to-job transitions to explore whether managers bring their former clients to their new firm. Thanks to a staggered adoption design, we find that recruiting a manager knowing a particular buyer increases the firm's probability to match with this buyer by 0.14 percentage points. Small business stealing effects seem to indicate that managers transitions across firms is welfare-enhancing. Overall, our results emphasize the very specific role of sales managers in overcoming the information frictions which preclude firms from expanding abroad.

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Chapter 2

Search Frictions in International Good Markets

This first chapter is a joint project with Isabelle Mejean (CREST-Ecole Polytechnique) and Julien Martin (UQAM).

Abstract

This paper studies how search frictions in international good markets can distort competition between firms of heterogeneous productivity. We add bilateral search frictions between buyers and sellers in a Ricardian model of trade. Search frictions prevent buyers from identifying the most productive sellers which induces competitive distortions and benefits low-productivity firms at the expense of high-productivity ones. We use French firm-to-firm trade data and a GMM estimator to recover search frictions faced by French exporters at the product and destination level. They are found more severe in large and distant countries and for products that are more differentiated. In a counterfactual exercise, we show that reducing the level of search frictions leads to an improvement in the efficiency of the selection process because the least productive exporters are pushed out of the market while the export probability and the conditional value of exports increase at the top of the productivity distribution. As a consequence, the mean productivity of exporters increases significantly.

JEL Classification: F10, F11, F14, L15
Keywords: Firm-to-firm trade, Search frictions, Ricardian trade model, Structural estimation

2.1 Introduction

Since the seminal paper by Melitz (2003), the trade literature has extensively discussed the self-selection of firms into exporting as an engine of welfare gains from trade.[1] While the Melitz model holds true on average, it is well-known that its performances are more mixed when it comes to explaining individual firms' export decisions (Eaton et al., 2011). This is especially true among the sub-sample of small and medium firms, as illustrated in Figure 2-1. While the correlation between export probability and destination's market access is as strong as .88 among the subsample of the 15% largest exporters (the red labels in Figure 2-1), it is substantially lower, at .65, for relatively small exporters represented by the green labels.

This paper argues that adding search frictions into a Ricardian model of trade is an attractive way of accounting for such fuzzy export patterns at the bottom of the productivity distribution. Search frictions prevent buyers from identifying the most efficient suppliers which distorts the strength of competition in international markets in favor of low-productivity exporters. The randomness observed in the data is partly explained by search frictions as the strength of the self-selection mechanisms is lowered in highly frictional markets. In these markets, a relatively large share of low-productivity sellers enter which reduces the average productivity of exports.

Our model is a partial equilibrium version of Eaton and Kortum (2002) in which there is a large number of ex-ante homogeneous buyers of each variety located in each country. As in Eaton et al. (2018), each of these buyers meet with a random number of suppliers drawn from the overall distribution of potential producers of the variety. Conditional on their draw, buyers choose to interact with the lowest-cost supplier. Importantly, it is assumed that the random matching is systematically biased geographically due to heterogeneous bilateral search frictions. In practice, all sellers from, say, France face the same level of search frictions and thus have the same probability of meeting with a foreign buyer when exporting to a given destination. But the bilateral heterogeneity implies that French exporters face different frictions in different markets. Moreover, they compete within a market with firms originating from other countries, which do not face the same level

[1] See Melitz and Redding (2015) and the literature cited therein. A vast empirical literature has provided support to the theory. From this literature, it is well-known that exporters are on average more productive than non-exporters (Bernard and Jensen, 1995; Mayer and Ottaviano, 2008), and that the mean productivity of exporters is higher in more difficult destinations (Eaton et al., 2004). Episodes of trade liberalization have also been used to show how opening to international trade affects the within and between productivity of domestic firms (Fernandes, 2007; Topalova and Khandelwal, 2011; Pavcnik, 2002).

of frictions.

We first draw analytical predictions regarding how the magnitude of search frictions affects export patterns, at the product-level and for individual firms. At the product-level, bilateral exports are negatively correlated with the relative size of search frictions there. A larger share of a country's consumption is spent on goods produced in countries displaying low search frictions, everything else equal. From this point of view, search frictions are no different from other physical barriers to international trade studied in Eaton and Kortum (2002). At most, their introduction into the model can help explain why countries that are culturally closer trade more together.[2] More interesting are the model's predictions regarding individual firms' export patterns. Theoretically, the impact of frictions on export probabilities is indeed non-monotonic along the distribution of productivities. While more productive firms always suffer from more frictions, the impact is lower, or actually reversed, at the bottom of the distribution. The non-monotonicity is a direct consequence of the model's assumptions. In our framework, serving a given client abroad requires to i) meet with her and ii) be chosen as her partner, conditional on a meeting. While the meeting probability is constant across firms, the likelihood that a firm is chosen depends on its productivity, in relative terms with competing firms in the importer's random choiceset.[3] The strength of competition is reduced in highly frictional destinations where each importer on average meets with a smaller number of potential partners. This tends to increase the chance that a low-productivity exporter ends up serving the firm.

This prediction is the key element of the model which we argue can explain fuzzy export patterns at the bottom of the distribution of exporters' size. By chance, even a poorly productive exporter can end up serving any foreign country, the probability that this happens being increased in more frictional destinations. The prediction is also what lets us estimate the frictions structurally, separately from other barriers to international trade. To this aim, we exploit firm-to-firm trade data covering the universe of French exporters and each of their individual client in the European Union.[4] Such data allow us to document a new dimension of

[2]It has long been recognized that physical barriers to international trade are not the only impediment to international trade. In the gravity literature, a common language or former colonial ties are well-known to contribute substantially to the model's explanatory power (Head and Mayer, 2014). More closely related to the interpretation we have of search frictions, Rauch (1999); Rauch and Trindade (2002) provide evidence that the stock of migrants from one origin in a country is significantly correlated with more bilateral trade. Their interpretation of this finding is that migrants help reduce information frictions characterizing international good markets.

[3]Dickstein and Morales (2018) find that large firms have more knowledge of foreign markets than small firms. We discuss in Appendix the robustness of our predictions if large firms face less export frictions than small firms.

[4]See Bernard et al. (2018b); Carballo et al. (2018) for examples of papers using similar data covering other exporting countries.

heterogeneity among exporters, regarding the number of partners they serve in a given destination country. This number displays a significant degree of heterogeneity within a product and destination. On average, large firms tend to serve more buyers. Within a firm, the number of partners served in a destination is decreasing in distance from France but is systematically larger in destinations that have closer links to France through past bilateral migration flows.

Our estimation of search frictions exploits this heterogeneity. Namely, we use as empirical moment the dispersion across French exporters in terms of the *number* of partners they serve in a given destination. This heterogeneity, we argue, cannot be explained by physical trade barriers. In our model, the dispersion comes from search frictions affecting individual firms' export probabilities. More frictions reduce the dispersion across individual firms by dampening high-productivity firms' export premium. Since iceberg trade costs do not have such distorsive effect, exploiting this moment of the data is useful to recover search frictions separately from other trade barriers.

Using this empirical moment and its theoretical counterpart, bilateral search frictions are estimated by the generalized method of moments for about 10,000 product and destination country pairs. In countries for which the product set is sufficiently comparable, the maximum degree of average frictions faced by French exporters is found in Greece and Finland while the less frictional country is Belgium. Search frictions are estimated to be stronger in differentiated product markets. Within a product, they are more pronounced in distant and more populated countries, while lower in countries where the population of French migrants is larger. Importantly, the estimated model is able to fit the distribution of the number of buyers served per firm, notably the skewness of the distribution. Moreover, it explains about one fifth of the heterogeneity observed in the data regarding the share of exporters serving a given number of importers in a destination. Given the simplicity of the model which relies on a single parameter to explain this heterogeneity and the random search assumption we find this measure of fit quite encouraging.

Once estimated the model can be used to run counterfactuals. Our main experiment consists in simulating the impact that a reduction in bilateral frictions with Greece to the level observed in Belgium would have on aggregate and firm-level export patterns. Results can be summarized as follows. First, a reduction in frictions with Greece, keeping everything else unchanged, explains a 7 percentage point increase in the market share of the median French product in Greece. This aggregate effect however hides a substantial

impact on the allocation of resources across exporting firms. Namely, the export probability to Greece falls in the bottom 15% of the distribution, by 3.5 percentage points, on average, to reach less than 3.5%. At the top of the distribution instead, export probabilities increase from 65.3 to 84% among the top 15% productivity percentiles and from 70 to 92.5% among the top 5%. Within the sub-sample of exporters, a reduction in search frictions also reallocates market shares with the expected number of clients served by high-productivity firms increasing substantially. All in all, the mean productivity of exporters increases by 10 to 20% as a consequence of Greek importers being better able to identify the most productive French suppliers.

In comparison with other barriers to international trade, search frictions thus have important misallocative consequences. For this reason, reducing such frictions might be of especially strong policy relevance. It also comes with a cost for the least efficient firms that are likely to exit the market. Within the toolbox of export-promoting agencies, programs aimed at increasing the visibility of domestic sellers abroad can be an efficient tool for increasing export flows in a non-distortive way, especially if they target small but highly productive firms.[5]

Our paper is related to two strands of the literature. The first one concerns a number of recent contributions which have used similar firm-to-firm trade data to study the matching between exporters and importers in international markets (Bernard et al., 2018b; Carballo et al., 2018). The heterogeneity between exporters in terms of the number of buyers they serve is explained in models imposing an additional source of ex-ante heterogeneity, regarding the productivity or the preferences of importers in foreign markets. Our model instead displays ex-ante homogenous importers which ex-post heterogeneity is solely driven by the randomness in the matching process (Chaney, 2014; Eaton et al., 2018; McCallum and Krolikowski, 2018).[6] Our contribution is closely related to the point made by Eaton et al. (2011). Yet, we claim that one single dimension of randomness, search frictions, can explain the fuzziness of exports patterns at both the extensive

[5]The French export promoting agency offers several programs, which are meant to help firms meet with foreign clients. The agency notably helps financing firms' participation to international trade fairs or organizing bilateral meetings with representatives of the sector in the destination country. See details on the agency's website, www.businessfrance.fr

[6]As will become clear from the presentation of the model, the fact that buyers are homogenous ex-ante implies that this side of the market is very stylized. In particular, the model will not reproduce a stylized fact which is extensively analyzed in Bernard et al. (2018b), namely that individual importers display a strong degree of heterogeneity in terms of the number of sellers they are connected to, ex-post. Because our purpose is to explain the fuzziness in *exporters*' participation to trade, we see this property of our model innocuous, although unrealistic.

margin and at the sales realized within a country. As search frictions affect the number of potential buyers they affect both entry into destination and sales realized in these destinations. In Eaton et al. (2011), two shocks are needed to reproduce such fuzziness : a country-specific demand shock combined with a fixed-cost shock. In terms of modeling, our framework borrows from Eaton et al. (2018) and Eaton et al. (2012) by introducing random frictions in a Ricardian model of trade. Eaton et al. (2018) use this framework to study the interplay between trade and the labor share both at the firm and at the aggregate levels. Instead, we analyze the heterogeneous impact of frictions on high- vs low-productivity exporters. Our analysis departs in two dimensions from theirs. First, while Eaton et al. (2018) model and estimate search frictions at the country level and aggregate products within firm, we introduce search frictions at the product-country level. To do so, we conduct our analysis at the firm-product level.[7] We find that the product dimension is of particular importance as it captures 43% of the variation of estimated search frictions. Second, as our analysis is partial equilibrium we are able to develop an estimation strategy which allows us to estimate search frictions separately from ice-berg costs.

The role of search and information frictions in international markets is the topic of an older empirical and theoretical literature. Rauch (2001) thus explains the role of migrant networks in international markets by way of such frictions. More recently, Lendle et al. (2016), Bernard et al. (2018a), Akerman et al. (2018), and Steinwender (2018) provide evidence of such frictions being an important barrier to international trade, using various natural experiments of a decrease in information frictions, namely the launching of a telegraph line between London and New York in Steinwender (2018), the opening of the Japanese high-speed train (Shinkansen) in Japan in Bernard et al. (2018a), the adoption of broad band internet in Norwegian municipalities in Akerman et al. (2018), and the development of online markets in Lendle et al. (2016). This topic has also been studied theoretically in several recent contributions. In Allen (2014), information frictions hit the seller side of the economy; exporters ignore the potential price of their crops abroad, thus enter into a sequential search process. We instead introduce frictions on the demand side of the economy, with buyers having an imperfect knowledge of the supply curve. From this point of view, our model is closer to Dasgupta and Mondria (2018). Their model of inattentive importers assumes that buyers optimally choose

[7]Our assumption comes back to slicing a multi-product firm into various firm-product units, assuming implicitely that multi-product firms do not benefit from economies of scale across products in terms of search frictions. On the contrary Eaton et al. (2018) assumes that the product portfolio of firms does not affect the level of frictions they face.

how much to invest into information processing to discover potential suppliers. In comparison with theirs, our model is based on simpler assumptions since the search process is purely random. The tractability of this framework allows us to derive closed-form solutions and estimate frictions structurally.[8] This tractability also allows us to emphasize the non-monotonic impact of search frictions at the individual level.[9]

The rest of the paper is organized as follows. In section 4.2, we present the data and stylized facts on firm-to-firm trade which we will later use to build and test the model. We most specifically focus on the number of buyers served by a given firm, and study how it varies across firms, products and destinations. Section 2.3 describes our theoretical model and derives analytical predictions regarding the expected number of clients that an exporter will serve in its typical destination. Section 2.4 explains how we estimate the magnitude of search frictions using a GMM approach. We also provide summary statistics on the estimated frictions and the model fit. Section 2.5 uses the estimated frictions in a counterfactual exercise to discuss how search frictions affect the allocation of resources across exporters. Finally, Section 3.8 concludes.

2.2 Data and stylized facts

2.2.1 Data

The empirical analysis is conducted using detailed export data covering the universe of French firms. The data are provided by the French Customs and are described in details in Bergounhon et al. (2018). The full data set covers all transactions that involve a French exporter and an importing firm located in the European Union, over 1995-2017. Our analysis focuses on data for 2007 but we checked that statistics are not sensitive to the choice of the reference year. Since the analysis is conducted at the product-level, we have no choice but to drop all transactions that are reported under the simplified declaration regime, for which the product category is not recorded. This concerns 10% of firms which overall exports in the European Union during

[8]The cost of this tractability is an extreme degree of passivity of firms regarding frictions. In general, one would expect high-productivity firms to be willing to invest in advertising so that to increase their visibility in foreign markets (Arkolakis, 2010). Instead, our model assumes that large exporters have the same probability of meeting with a buyer as low-productivity ones. While this is not very realistic, our purpose is to explain what happens at the bottom of the distribution, whereby low-productivity firms display fuzzy export patterns. For these firms, the assumption that the meeting probability is taken as given seems more realistic. We discuss in Appendix .1.2 the sensitivity of our results to this assumption.

[9]In our framework, the effect of frictions is ambiguous at the individual level but not at the aggregate level. See Petropoulou (2011) for a model where search frictions may have a non-monotonic impact on aggregate trade flows.

the year is below 150,000 euros.[10]

For each transaction, the data set records the identity of the exporting firm (its SIREN identifier), the identification number of the importer (an anonymized version of its VAT code), the date of the transaction (month and year), the product category (at the 8-digit level of the combined nomenclature) and the value of the shipment. It is also possible to link each exporter to its sector of activity using INSEE data. In the analysis, data are aggregated across transactions within a year, for each exporter-importer-hs6 product triplet. Such aggregation helps focus on the most important novelty in the data, which is the explicit identification of both sides of the markets; the exporter and its foreign partner. The product dimension will allow conditioning our results on the good being traded, as in the model. A "seller" will thus be an exporter of a specific product. This hypothesis comes down to redefining a French exporter as a single-product firm and neglecting any potential complementarity between products sold by the same firm.

Since we are interested in the extent of search frictions that an exporter faces in foreign markets, we restrict each exporter's product portfolio to products that represent at least 10% of export sales for at least one French seller in the firm's sector of activity.[11] This restriction substantially reduces the number of exporter $\times$ product pairs covered (by almost 50%) without having much of an impact on the aggregate value of exports (-8%), on the population of importers (-4%) and on the population of exporters (which is left unaffected).

Table A1 in appendix provides summary statistics on the number of sellers, buyers and products, by destination. In 2007, we have information on 44,255 French firms exporting to 572,536 individual importers located in the 26 countries of the European Union. Total exports by these firms amount to 216 billions euros. This represents 53% of France worldwide exports. Table A1 displays the number of individuals

[10]One might be concerned that this selection bias our empirical analysis since the neglected small exporters are likely to display systematically different patterns of exports. While we cannot rule this out with certainty, we believe that the bias should not be substantial based on evidence reported in Figure A.1. Namely, the distribution of sellers' degrees, which product-specific equivalent is used to compute the empirical moments in the estimation, is very similar in the whole sample and in the sample restricted to the 90% of exporters that declare a product category. While there are obviously more exporters with one buyer in the restricted sample, the difference is roughly proportional to the total number of such exporters in the whole dataset (bottom panel).

[11]The rationale for such restriction is that we see in the data firms selling many different products, some of which being relatively "close" to the firm's activity (say exports of wine in agricultural sectors) and others being hardly related to their main activity (e.g. export of glasses for wine producers). In this example, glasses are most probably side products which the firm sells to its customers while they buy some of its wine. While information frictions might be important to identify potential wine consumers, we shall not expect frictions in the market of glasses to affect the wine producer's ability to sell this product; such tied selling only depends on the firm's ability to meet with wine consumers. In practice, it is almost impossible to decide which products are tied and which are not. The statistical criterion that we use thus considers that a product which no firm in the sector sells in large enough quantities is probably tied and is thus removed from the sample.

involved in each bilateral trade flow. Most of the time, the number of importers is larger than the number of exporters selling to this destination (Columns (1) and (2)). This suggests that the degree of exporters (number of importers they are connected to) is on average larger than the degree of importers (number of French exporters they interact with). This is even more true once we focus on product-specific trade flows as in Columns (4) and (5). Column (3) in Table A1 reports the number of exporter-importer pairs which are active in 2007 and Column (6) the number of exporter-importer-product triplets. These numbers are small in comparison with the number of *potential* relationships, equal to the number of active exporters times the number of importers. This suggests that the density of trade networks is low on average.

The firm-to-firm dataset is complemented with several product-level and aggregate variables used to run gravity regressions in Section 2.2.2. Distance data are taken from CEPII (Mayer and Zignago, 2011). We control for the market's overall demand using HS6-specific imports in the destination, less the demand for French goods. Multilateral import data are from ComTrade. Finally, information frictions are controlled for using the stock of migrants per origin and destination countries, taken from the UN database on Trends in International Migrant Stock. Following Rauch and Trindade (2002), the degree of information frictions between France and destination i is expected to be inversely related to the share of French citizens in the destination's population and the share of migrants from i in France.

2.2.2 Descriptive Statistics

As explained in Section 4.2.1, the most important novelty in our data is the identification of both sides of international trade flows, not only individual exporters but also their foreign clients in each destination. We now present stylized facts exploiting this dimension to characterize the nature of interactions between sellers and buyers engaged in international trade. The facts are later used to motivate the model's assumptions and back out a number of theoretical predictions.

Figure 2-2 shows the strong heterogeneity in the number of buyers per seller within a destination.[12] The left panel documents the share of sellers interacting with a given number of buyers while the right panel depicts their relative weight in overall exports. To illustrate the amount of heterogeneity across destination

[12]Remember that here and in the rest of the paper, a seller is identified by its siren number *and* the product category. The statistics underlying this graph is thus somewhat difference than in Bernard et al. (2018b), although the conclusion regarding the strong heterogeneity in exporters' number of clients holds in both cases.

countries, Figure 2-2 displays the distribution obtained in the average European destination (circle points) as well as those computed for two specific destinations, which represent extreme cases around this average, namely Romania and Germany (triangle and diamond points, respectively).

In France's typical export market, 65% of sellers interact with a single buyer, and 90% with at most 5 buyers. At the other side of the spectrum, one percent of sellers interact with more than 100 buyers in the same destination. As shown by the right panel in Figure 2-2, sellers interacting with a single buyer in their typical destination account for about a third of French exports and are thus smaller than the average firm in the distribution. Still, 80% of trade is made up by sellers interacting with at most 10 buyers. From this, we conclude that French exports are dominated by sellers interacting with a small number of buyers.

Figure 2-2, circle points, hides a substantial amount of heterogeneity in the number of buyers per seller, across both sectors and destinations. The other two distributions depicted in Figure 2-2 illustrate the cross-country heterogeneity.[13] While the median degree of sellers is equal to just one buyer in all destination countries, the mean varies quite substantially, due to varying shares of sellers who manage to serve more clients. Such heterogeneity also exists across sectors, although perhaps less pronounced. A full variance decomposition however shows that more than 80% of the heterogeneity in the number of buyers served by a seller is within a sector and destination. This is the dimension of heterogeneity that the structural estimation uses to identify search frictions.

At this level, heterogeneity in terms of the number of buyers is significantly correlated with the seller's size, as measured by the worldwide value of the firm's exports. The conditional correlation coefficient is equal to .28 and size explains 37% of the within-variance. The positive correlation between a seller's size and the number of importers it is able to serve within a destination is consistent with evidence in Bernard et al. (2018b) and Carballo et al. (2018) based on similar data for other countries. In Bernard et al. (2018b), the heterogeneity in exporters' degrees is explained in a two-sided heterogeneity model in which importers of heterogeneous size can interact with several exporters. In our model instead, it is assumed that an importer is matched with a single seller, at a point in time. This is justified by another property of our data, which is that more than 89% of importers purchase a given product from a single French exporter. This explains that the mean degree of buyers which can be recovered from the comparison of columns (5) and (6) in Table A1

[13] Table A2 in Appendix provides more systematic evidence based on the whole set of destination countries.

is very close to one in all destinations.[14]

Having documented new dimensions of heterogeneity in firm-to-firm trade data, we close this section with an empirical analysis using the gravity framework to show how the buyer margin affects the geography of French exports. Table 2.1 summarizes the results. The gravity equation is run at the product level (columns (1)-(4)) and within a firm (columns (5)-(7)). Bilateral trade is explained by distance to France, proxies for market size, namely the country's (product-specific) import demand and GDP per capita, and proxies for information frictions, the stock of natives from the destination country in France and the stock of French citizens in the destination.

Column (1) confirms the results found in the rest of the literature, namely that product-level bilateral trade is larger towards closer, bigger and wealthier destination markets. Moreover, it is positively correlated with the stock of French migrants leaving in the destination country which we interpret as information frictions having a negative impact on bilateral trade.[15] These results are also confirmed within a firm, in Column (5). As largely documented in the previous literature, see e.g. Bernard et al. (2007), gravity effects in international trade are attributable to the cross-country heterogeneity of bilateral trade flows at the intensive margin, i.e. in terms of the mean shipment per firm, *and* at the extensive margin, in terms of the number of firms exporting. We confirm this result in Columns (2)-(4) and Columns (6)-(7), where bilateral trade flows are further decomposed into intensive and extensive components. Importantly, the buyer dimension of the data allows us to control for an additional source of extensive adjustments, namely the number of buyers in existing exporters' portfolio of clients (see also Bernard et al. (2018b) for a similar decomposition based on Norwegian data).[16] All margins of bilateral trade significantly contribute to the sensitivity of trade to

[14]While our model is consistent with this property of the data, it fails to take into account another property of the data, which Bernard et al. (2018b) analyze, namely that importers are heterogeneous in terms of the *number of products they import*, which also determines the number of exporters they are connected to. Because we work at the product-level, we implicitly assume that the same importer importing two products can be considered as two importers purchasing two different products. This assumption might be problematic if these buyers were able to enjoy economies of scale on search costs by purchasing the two products from the same exporter. This is not what happens in general, as shown by the very high correlation in the data between the number of sellers a buyer is connected to and its number of seller×product pairs.

[15]In comparison with a specification that does not control for information frictions, the impact of distance is reduced by about a third. This suggests that information frictions are correlated with distance from France in this sample. The result is also found by controlling for the number of migrants from the destination country leaving in France.

[16]More specifically, the product-level decomposition used in Table 2.1, Columns (1)-(4), is based on the following decomposition:

$$\ln x_{pd} = \underbrace{\ln \#^{S}_{pd}}_{\#\ Sellers} + \underbrace{\ln \frac{1}{\#^{S}_{pd}} \sum_{s \in S_{pd}} \#^{B}_{spd}}_{\#\ Buyers\ per\ Seller} + \underbrace{\ln \frac{1}{\#^{SB}_{pd}} \sum_{s \in S_{pd}} \sum_{b \in B_{spd}} x_{sbpd}}_{Mean\ exports\ per\ Buyer-seller}$$

gravity variables. In particular, the "buyer" extensive margin is responsible for 28% of the overall distance elasticity at the product-level, a number that jumps to 69% once gravity coefficients are identified within a firm.[17] Likewise, the buyer margin accounts for a substantial share of the overall impact of migrants. Our interpretation of this finding is that migrants help alleviate information frictions in international markets, which in turn facilitates the matching between exporters and buyers.

This analysis thus confirms previous results in the literature regarding the heterogeneity across exporting firms, in terms of the number of buyers they serve in a destination. This number is systematically correlated with the size of the exporter. It also varies within a firm, across destinations, with on average less buyers served in distant destinations displaying more information frictions. In the next section, we build a model which is consistent with the main features of the data.

2.3 Model

This section presents a Ricardian model of firm-to firm trade with search frictions. The analysis is conducted at the level of a product, given factor prices and we do not aggregate across sectors. After having summarized the main assumptions, we derive a number of analytical predictions which are later used in the structural estimation.

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where x_{pd} denotes the value of French exports of product p in destination d which is the sum of all firm-to-firm transactions x_{sbpd}. S_{pd} is the set of the sellers serving this market and B_{spd} the set of the importers purchasing product p from seller s. $\#^{S}_{pd}$, $\#^{B}_{spd}$ and $\#^{SB}_{pd}$ respectively denote the number of sellers, the number of buyers seller s is connected to and the total number of active seller-buyer pairs in market pd.

Likewise, the decomposition of firm-level exports in Columns (5)-(7) of Table 2.1 is based on the following decomposition of trade into an extensive and an intensive terms:

$$\ln x_{spd} = \underbrace{\ln \#^{B}_{spd}}_{\#\,Buyers} + \underbrace{\ln \frac{1}{\#^{B}_{spd}} \sum_{b \in B_{spd}} x_{sbpd}}_{Mean\ exports\ per\ Buyer}$$

[17]Note that the contribution of the buyer margin is artificially low in the decomposition of product-level trade in Columns (1)-(4) because of the multicolinearity between the "seller" and 'buyer" extensive margins. If we instead work with this decomposition:

$$\ln x_{pd} = \ln \#^{S}_{pd} + \ln \#^{B}_{pd} + \ln \frac{\#^{SB}_{pd}}{\#^{S}_{pd} \times \#^{B}_{pd}} + \ln \frac{1}{\#^{SB}_{pd}} \sum_{s \in S_{pd}} \sum_{b \in B_{spd}} x_{sbpd}$$

which treats sellers and buyers symmetrically, the distance elasticity is found larger on the buyer than the seller margin (i.e. $\left|\frac{d \ln \#^{B}_{pd}}{d \ln Dist_{d}}\right| > \left|\frac{d \ln \#^{S}_{pd}}{d \ln Dist_{d}}\right|$).

2.3.1 Assumptions

The economy is composed of N countries indexed by $i = 1, ..., N$. The partial equilibrium analysis focuses on a single good produced into perfectly substitutable varieties by a discrete number of firms that are heterogeneous in productivity.[18] As in Eaton et al. (2012), there is a discrete number of producers of the good in each country j. These firms produce with a constant-returns-to-scale technology using an input bundle which unit price c_j is taken as exogenous. The productivity of a firm s_j located in country j is independently drawn from a Pareto distribution of parameter θ and support $[z_{min}, +\infty[$. The number of firms with productivity higher than z is the realization of a Poisson random variable with parameter $T_j z^{-\theta}$. In the rest of the analysis, firms will be designated by their productivity, with z_{s_j} being the realized productivity of firm s_j. The exporter-hs6 product pairs studied in Section 4.2 are the empirical counterpart of these firms. Heterogeneity across firms regarding the number of buyers they serve in a destination will later be explained by the underlying productivity heterogeneity.

There are iceberg trade costs between countries but there is no entry cost. To serve market i with one unit of the good, firms from country j need to produce $d_{ij} > 1$ units. The cost of serving market i for a firm s_j is thus $\frac{c_j d_{ij}}{z_{s_j}}$. Given input prices and international trade costs, the number of firms from j that can serve market i at a cost below p is a Poisson random variable of parameter $\mu_{ij}(p) = T_j \left(\frac{d_{ij} c_j}{p} \right)^{-\theta}$. Summing over all producing countries, the number of firms from any country in the world that can serve country i at a cost below p is distributed Poisson of parameter $\mu_i(p) = p^\theta \sum_{j=1}^{N} T_j (d_{ij} c_j)^{-\theta} = p^\theta \Upsilon_i$. As in Eaton and Kortum (2002), $\Upsilon_i = \sum_{j=1}^{N} T_j (d_{ij} c_j)^{-\theta}$ reflects "multilateral resistance" in country i and governs the country's price distribution: the higher Υ_i, the more competitors with low costs in this country.

In most trade models, the demand side of the model is summarized by the CES demand of a representative consumer in each country i. We depart from these frameworks and instead assume that each country is populated by a large number B_i of (ex-ante) homogeneous buyers, each one characterized by its own iso-elastic function. Because of search frictions, each buyer b_i meets with a random subset of the potential suppliers of the good, each supplier from country j having a probability λ_{ij} of being drawn. Conditional on

[18] It would be possible to plug the partial equilibrium model described here in a general equilibrium framework, by assuming that there is a continuum of such goods, that countries trade in equilibrium. Labor and good market equilibria would then be used to solve for equilibrium factor prices consistent with balanced trade. As the purpose of the model is to help identify search frictions in the data, and the data cover a single exporting country, this development is not necessary.

the subset of producers met, the buyer decides on which one to purchase from, by comparing the prices they offer.

In the rest of the analysis, we will assume that producers price at their marginal cost, as in a perfect competition framework. As a consequence, buyer b_i chooses to purchase the good from the lowest-cost supplier who she met and pays the price:[19]

$$p_{b_i} = \underset{s_j \in \Omega_{b_i}}{\arg\min} \left\{ \frac{c_j d_{ij}}{z_{s_j}} \right\}$$

where Ω_{b_i} is the set of producers drawn by buyer b_i.

The number of potential suppliers in the set Ω_{b_i} reflects the extent of search frictions in the economy. In a frictionless world, for $\lambda_{ij} = 1 \ \forall \ (i, j)$, each buyer b_i would meet with all suppliers. Within a destination, all buyers would thus end up paying the same price for the homogenous good and the assumption of a representative consumer would be suitable. This is the assumption in Eaton and Kortum (2002), which generates an ex-post degenerated distribution of firms since at most one, the lowest-cost supplier, is active in any market i. This is no longer the case in our model, where each buyer b_i ends up matched with a Poisson number of potential suppliers, of parameter $\sum_j \lambda_{ij} T_j z_{min}^{-\theta}$. Likewise, the number of suppliers from j (resp. from any country) offering a price below p can be represented by a Poisson process of parameter $\lambda_{ij}\mu_{ij}(p)$ (resp. $\sum_j \lambda_{ij}\mu_{ij}(p)$). Under this assumption, any supplier from j has a strictly positive probability of ending up serving market i. In the rest of the analysis, λ_{ij} is interpreted as an inverse measure of frictions, which we assume is specific to each country pair (and each product). A coefficient closer to one implies that buyers from i gather more information on potential suppliers in country j and are thus more likely to identify the most competitive one.

Heterogeneity in the magnitude of search frictions across countries means that the subset of firms which a buyer meets is biased towards firms located in countries with which search frictions are lower, on average.

[19] One might question the assumption of marginal cost pricing in a context of frictional good markets. We think of marginal cost pricing as the result of some "price-posting" process, a situation in which producers need to define their price ex-ante, before the matching process. Under such pricing rule, and because the extent of competition across potential suppliers is important, marginal cost pricing is an equilibrium outcome. Ex-post, the producer might however be willing to deviate from this pricing rule. An alternative would be to assume that firms drawn by a buyer b_i compete à la Bertrand. Under such assumption, buyer b_i would optimally match with the lowest cost supplier, as in the case of marginal cost pricing, but would be charged a price which would equal the marginal cost of the second lowest-cost supplier. As most of the results discussed here rely on the realization of the match rather than the value traded conditional on a match, most of our results would remain unchanged.

Within an origin country, all producers however have the same probability of being drawn, no matter their productivity. This is the key assumption which will generate ex-post heterogeneity across buyers regarding the price they pay. Namely, lucky buyers will end up with a random choiceset Ω_{b_i} which contains low cost producers. As a consequence, they will pay the homogeneous good at a low price. On the export side, even poorly productive sellers can end up serving a distant and frictional country, which happens if they are lucky enough to be drawn by an unlucky buyer which has no better choice than buying the good from this high cost producer.

Given the property of the Poisson distribution, the minimum price at which a buyer b_i can purchase the good can be shown to follow a Weibull distribution:[20]

$$G_i(p) = 1 - e^{-p^\theta \Upsilon_i \kappa_i}$$

where $\kappa_i \equiv \frac{\sum_j \lambda_{ij} T_j (c_j d_{ij})^{-\theta}}{\sum_j T_j (c_j d_{ij})^{-\theta}}$ measures the expected number of suppliers met at a given price, in relative terms with the expected number of suppliers met under no search frictions. κ_i can also be interpreted as a weighted average of bilateral search frictions, with the weights representative of the relative comparative advantage of the different origin countries in market i, i.e. $\kappa_i = \sum_j w_{ij} \lambda_{ij}$ with $w_{ij} \equiv \frac{T_j (c_j d_{ij})^{-\theta}}{\sum_j T_j (c_j d_{ij})^{-\theta}}$.

As in Eaton and Kortum (2002), the ex-post distribution of prices in this economy depends on the strength of competition there, as measured by Υ_i, and the amount of heterogeneity in firms' prices, which is inversely proportional to θ. In comparison with standard ricardian models, expected prices are however inflated by search frictions (since $\kappa_i < 1$). The presence of search frictions indeed implies that buyers fail to identify who is the lowest-cost supplier in the whole distribution of potential producers. This lack of information is distortive and thus induces an average raise in prices paid by consumers in country i. The size of this distortion is inversely related to κ_i. It is larger when search frictions λ_{ij} are negatively correlated with country's comparative advantages as measured by $T_j (c_j d_{ij})^{-\theta}$. Intuitively, it is all the more costly for consumers to be unable to meet with all potential suppliers when search frictions increase the relative probability that they meet with poorly competitive firms. In the rest of the analysis, we will thus refer to κ_i as an inverse measure of the distortive impact of frictions.

[20]The proof is straightforward. The probability that the minimum price is below p is one minus the probability that all suppliers met offer a price above p which is equal to $1 - e^{p^\theta \sum_{j=1}^{N} \lambda_{ij} T_j (d_{ij} c_j)^{-\theta}}$.

2.3.2 Analytical predictions

In this section, we first derive predictions regarding the magnitude of bilateral trade flows between any two countries. Such predictions help understand how search frictions modify the predictions of ricardian model à la Eaton and Kortum (2002). We then derive predictions regarding export probabilities along the distribution of firms' productivities, which are later used to identify search frictions in the data, separately from other barriers to trade.

Aggregate trade

In this model, the share of country j's consumption which is imported from country i, denoted π_{ij}, is the expected value of goods purchased by buyers that end up interacting with a supplier from j, normalized by aggregate consumption:

$$\pi_{ij} = \mathbb{E}\left[\sum_{b_i=1}^{B_i} I_{b_i j}^{(1)} \frac{X_{b_i}}{X_i}\right]$$

where $I_{b_i j}^{(1)}$ is a dummy variable which is equal to one if the lowest cost supplier met by b_i originates from country j, and X_{b_i} and X_i respectively denote the demand expressed by buyer b_i and market i. Properties of the Poisson distribution implies that the probability of the lowest-cost supplier being located in j is constant and independent of b_i. From this, it comes that trade shares simplify into:

$$\pi_{ij} = \frac{\lambda_{ij}\mu_{ij}(p)}{\sum_{j=1}^{N}\lambda_{ij}\mu_{ij}(p)} = \frac{T_j(d_{ij}c_j)^{-\theta}}{\Upsilon_i}\frac{\lambda_{ij}}{\kappa_i} \tag{2.1}$$

The share of products from country j in destination i's final consumption depends on i) the relative competitiveness of its firms in comparison with the rest of the world, $\frac{T_j(d_{ij}c_j)^{-\theta}}{\Upsilon_i}$, and ii) the relative size of search frictions its firms encounter while serving market i, $\frac{\lambda_{ij}}{\kappa_i}$. The first ratio is the formula derived in Eaton and Kortum (2002), though they derive it for the aggregate economy exploiting the law of large numbers across imperfectly substitutable varieties rather than across buyers within a product. It shows how the combined impact of technology and geography determines international trade flows in a Ricardian world. The key insight from our model is that search frictions can distort trade flows, in comparison with this benchmark. This is what the second term in equation (2.1) captures. Taking the derivative of equation (2.1)

with respect to λ_{ij} yields Proposition 1 regarding the sensitivity of aggregate trade to search frictions:

Proposition 1. The market share of a country always increases following a reduction in bilateral frictions:

$$\frac{d \ln \pi_{ij}}{d\lambda_{ij}} = \frac{1 - \pi_{ij}}{\lambda_{ij}} > 0, \ \forall \ \lambda_{ij} \ \in \ [0, 1]$$

See the Proof in Appendix .1.1.

To recover the intuition surrounding this result, first note that

$$\frac{d \ln \pi_{ij}}{d\lambda_{ij}} = \underbrace{\frac{d \ln \lambda_{ij}}{d\lambda_{ij}}}_{\text{Visibility channel}} - \underbrace{\frac{d \ln \kappa_i}{d\lambda_{ij}}}_{\text{Competition channel}}$$

The impact of a reduction in bilateral search frictions on aggregate trade flows can be decomposed into two channels. First a "Visibility" channel that captures the direct impact of search frictions on the likelihood that any exporter from j meets with a buyer from i. Second, a "Competition" channel which affects the likelihood that any seller is chosen for serving a buyer, conditional on meeting with her. The first effect is positive since lower search frictions increase the probability that any supplier from j will be drawn by any buyer from i. As shown in Appendix .1.1, the "Competition" channel plays in the opposite direction since less frictions increase the strength of competition between French firms, conditional on being drawn, thus reducing the likelihood that any seller from j is chosen by a buyer from i. However, the "Visibility" effect always dominates the "Competition" channel at the product level. The reason is that the strength of the competition channel induced by a change in bilateral frictions exerts over the subsample of firms from j competing for foreign buyers in i. Because of this, a reduction in search frictions unambiguously increases the exporting country's share in the destination's absorption. This is in line with the argument in Rauch (1999) that search frictions can contribute to reducing the magnitude of bilateral trade between more distant countries, if correlated with (physical and cultural) distance between countries.

Finally, note that the model is compatible with structural gravity. Namely, log-linearizing equation (2.1) implies:

$$\ln \pi_{ij} = FE_i + FE_j - \theta \ln d_{ij} + \ln \lambda_{ij} \tag{2.2}$$

where $FE_i \equiv \ln \Upsilon_i \kappa_i$ and $FE_j \equiv \ln T_j (c_j)^{-\theta}$. The cross-sectional variation in bilateral trade flows can be explained by a full set of origin- and destination-country fixed effects and a number of bilateral variables correlated with the magnitude of trade frictions. In comparison with standard gravity-compatible models, the difference is that our model predicts physical trade barriers d_{ij} as well as information frictions λ_{ij} to enter the gravity equation. A corollary is that predictions on product-level trade cannot be expected to help identify search frictions, separately from other barriers to trade, since both sources of frictions have the same qualitative impact on trade. We now explain why this is no longer true when studying the model's predictions regarding firm-level trade.

Firm-to-firm matching

Having derived predictions regarding the magnitude of aggregate trade flows, we now study the matching process between any two firms. Such predictions are new to our model and can be confronted to firm-to-firm trade data. Because we observe the universe of French exporters, and their clients abroad, we will take the point-of-view of individual sellers and derive predictions regarding the expected number of clients they can reach, in each destination.

Consider first the probability that a given supplier from j, France in our data, serves a buyer in i. In our framework, this probability decomposes into the probability that s_j meets with b_i times the probability that it is the lowest cost supplier, within b_i's random set:[21]

$$\begin{aligned} \rho_{s_j i} &= \mathbb{P}\left(s_j \in \Omega_{b_i}\right) \mathbb{P}\left(\min_{s'_k \in \Omega_{b_i}} \left\{ \frac{c_k d_{ik}}{z_{s'_k}} \right\} = s_j \right) \\ &= \lambda_{ij} e^{-\left(c_j d_{ij}\right)^{\theta} z_{s_j}^{-\theta} \Upsilon_i \kappa_i} \end{aligned} \tag{2.3}$$

Because of the Poisson assumption, the probability of being drawn by a buyer is constant and only depends on the size of search frictions. More productive sellers however have a higher probability to end up serving any buyer from i because, conditional on being drawn, they have a higher chance to be the lowest cost supplier. And conditional on productivity, a seller has a higher chance to serve a buyer located in a market which can

[21] Since buyers are ex-ante homogeneous, the probability is the same for all buyers b_i located in country i.

be served at a low cost (d_{ij} close to one), where competition is limited (Υ_i low) and which displays highly distortive search frictions (κ_i small). These predictions are consistent with evidence presented in Section 2.2.2.

One can verify that, under some parameter restrictions, an increase in the meeting probability has an ambiguous impact on the probability of a seller to be chosen by a particular buyer. This leads us to Proposition 2:

Proposition 2. The impact of search frictions varies along the distribution of productivities, with high-productivity firms benefiting more, in terms of export performances, from a reduction in search frictions:

$$\frac{\partial \ln \rho_{s_j i}}{\partial \lambda_{ij}} = \frac{1}{\lambda_{ij}} - z_{s_j}^{-\theta} T_j \quad \text{and} \quad \frac{\partial^2 \ln \rho_{s_j i}}{\partial \lambda_{ij} \partial z_{s_j}} > 0. \tag{2.4}$$

For low-enough search frictions, an increase in λ_{ij} has a negative impact on firms at the bottom of the distribution, i.e.:

$$\frac{\partial \ln \rho_{s_{min} i}}{\partial \lambda_{ij}} < 0 \quad \text{if} \quad \lambda_{ij} > \frac{1}{z_{min}^{-\theta} T_j} \tag{2.5}$$

where $\rho_{s_{min} i}$ is the export probability in i of a firm with productivity z_{min}. .

See the Proof in Appendix .1.2.

The ambiguous impact of more bilateral search frictions (a lower meeting probability λ_{ij}) on the probability to serve a particular buyer conditional on the level of productivity again explains by the opposite impact of the visibility and competition channels:

$$\frac{\partial \ln \rho_{s_j i}}{\partial \lambda_{ij}} = \underbrace{\frac{\partial \ln \lambda_{ij}}{\partial \lambda_{ij}}}_{\text{Visibility channel}} - \underbrace{\frac{\partial \left(c_j d_{ij}\right)^{\theta} z_{s_j}^{-\theta} \kappa_i \Upsilon_i}{\partial \lambda_{ij}}}_{\text{Competition channel}}$$

On the one hand, a decrease in search frictions through the "visibility" channel increases the likelihood that seller s_j will serve any buyer in country i as it enhances its probability to meet with the buyer. On the other hand, conditional on being drawn, less bilateral search frictions means than s_j faces fiercer competition from other domestic suppliers. This reduces the probability that it is the lowest-cost supplier met by any

particular buyer, especially if the seller's productivity is low. For high-productivity sellers, the visibility channel dominates and they always benefit from a reduction in search frictions. For these firms, the main impediment to their export development is a lack of visibility in foreign markets. For low-productivity sellers instead, the competition channel is stronger which explains that their privately optimal value of the meeting probability, defined as the level of λ_{ij} which maximizes their export probability, is low. If frictions are not too strong, the competition channel dominates the visibility channel at the bottom of the productivity distribution and sufficiently low-productivity sellers benefit from more frictions.[22]

A corollary of Proposition 2 is that the export premium of high-productivity firms is affected by the level of frictions:

$$\ln \frac{\rho_{\bar{z}_j i}}{\rho_{\underline{z}_j i}} = (c_j d_{ij})^{-\theta} \Upsilon_i \kappa_i \left(\underline{z}_j^{-\theta} - \bar{z}_j^{-\theta} \right) \tag{2.6}$$

where $\rho_{\bar{z}_j i}$ and $\rho_{\underline{z}_j i}$ denote export probabilities in country i of a firm from j with a high-productivity $\bar{z}_j$ and a low productivity $\underline{z}_j$, respectively. Equation (2.6) is positive which reflects the fact that, everything else being equal, high productivity firms are more likely to serve any buyer in country i. However, it is increasing in κ_i, which is consistent with the idea that more distortive search frictions reduce the competitive advantage of high-productivity firms. In markets displayins high and distortive search frictions, buyers meet with a small number of relatively low competitive firms, on average. This reduces the strength of competition, thus the competitive advantage of high-productivity exporters. Because of this, the export premium of high-productivity firms is smaller. This feature of the model is what will help us identify search frictions in the data, separately from other barriers to international trade. Indeed, while the export premium of high-productivity firms is reduced in highly frictional countries, it is exhacerbated in countries featuring high iceberg trade costs, i.e. $\frac{d \ln \frac{\rho_{\bar{z}_j i}}{\rho_{\underline{z}_j i}}}{d \ln d_{ij}} > 0$. Using the heterogeneity in export performances across firms allows identifying search frictions, separately from iceberg trade costs.

Since all buyers play independently from each other, equation (2.3) immediately delivers an analytical expression for the expected number of buyers served in country i, conditional on the location and productivity

[22]While the analytical results crucially rely on the size of the visibility channel being independent of firms' productivity, we argue in Appendix .1.2 that the result is more general than this. In particular, we discuss the case in which the probability of a meeting is increasing in firms' productivity, as high-productivity firms are arguably less likely to suffer from a lack of visibility abroad. We argue that this should not overcome our result as long as the cross derivative of the meeting probability with respect to λ_{ij} and z_{s_j} is not too negative.

of the seller. Namely, the expected number of clients in i of a seller s_j, which is also the expected value of exports, is:

$$\mathbb{E}[B_{s_j i}|z_{s_j} > z_{min}] = \lambda_{ij} e^{-\left(c_j d_{ij}\right)^{\theta} z_{s_j}^{-\theta} \Upsilon_i \kappa_i} B_i$$

where $B_{s_j i}$ denotes the number of buyers from i in s_j's portfolio of clients. Again, more productive sellers are expected to serve more buyers in each destination, a prediction which is consistent with evidence in Figure 2-2. In our framework, this relationship comes from more productive sellers being more likely to be chosen by any buyer. This differentiates us from Carballo et al. (2018) and Bernard et al. (2018b) who also rationalize the relationship between a firm's productivity and the number of buyers it serves in a destination, though with quite different arguments.[23]

2.4 Estimation

In this section, we first justify the moments used to estimate search frictions, independently from other barriers to international trade. We then describe the GMM estimator and its implementation, with details postponed to Appendix .2. Finally, we discuss the results.

2.4.1 Moment choice

Results in Section 2.3.2 provide insights on the *expected* number of buyers in each destination. The randomness of the matching process however generates dispersion around this mean. To confront the model with the data, we thus derive the probability that seller s_j has *exactly* M buyers in country i, conditional on its productivity. Given the independence of draws, one can show that it follows a binomial law of parameters B_i and $\rho_{s_j i}$:

$$\mathbb{P}(B_{s_j i} = M|z_{s_j} > z_{min}) = C_{B_i}^{M} \rho_{s_j i}^{M} (1 - \rho_{s_j i})^{B_i - M}$$

[23] In Carballo et al. (2018), more productive exporters serve more consumers in each destination because they can produce and sell products further away from their "core segment", thus reaching a wider set of heterogeneous buyers. In Bernard et al. (2018b), the heterogeneity comes from more productive exporters being able to serve a larger range of less productive buyers in presence of match-specific fixed costs. Both papers need to introduce another source of ex-ante heterogeneity, between buyers. We instead assume buyers to be ex-ante homogeneous and attribute all the ex-post heterogeneity to the random meeting process.

Integrating over the expected distribution of productivities gives the expected number of firms from j with exactly $M > 0$ buyers in i (See details in Appendix .1.3)[24]

$$h_{ij}(M) = \frac{\pi_{ij}}{\lambda_{ij}} \frac{1}{M} I_{\lambda_{ij}}(M, B_i - M + 1) \tag{2.7}$$

where $I_a(b, c) = \frac{B(a;b,c)}{B(b,c)}$ denotes the regularized incomplete beta function.

Equation (2.7) shows that the expected number of firms serving a given number of clients is decreasing in M, which is consistent with evidence in Section 2.2.2. In our model, this comes from the independence of matches: The probability that a given seller is drawn by a large number of buyers shrinks rapidly when the number of buyers increases. The shape of $h_{ij}(M)$ is also a function of λ_{ij}. Conditional on π_{ij} and B_i, one can use the predicted value for $h_{ij}(M)$ and its counterpart in the data to recover a structural estimate for λ_{ij}, for each product and destination.[25]

Once normalized by the expected number of firms in the market ($T_j z_{min}^{-\theta}$) to recover a convergent moment, equation (2.7) can be used to estimate search frictions. We decided not to use this exact moment, though, because of its empirical sensitivity to distance, that potentially reflects the impact of other physical trade barriers on the firm-level stock of partners within a destination. This sensitivity is illustrated in Table 2.2 which shows the correlation between various transformations of the empirical moment, and distance from France, used as a proxy for iceberg trade costs.[26] The correlation between the number of firms with exactly M buyers in a destination and the distance to this destination is negative and strongly significant. This is consistent with evidence in Section 2.2.2 that French sellers tend to serve less partners, if any at all, in more distant countries. This result should be expected from the model, since the π_{ij} component in equation (2.7) is negatively correlated with iceberg trade costs d_{ij} which can reasonably be assumed to be increasing in distance. In principle, this can be controlled for using readily available data for those trade shares.

[24] We integrate over the expected distribution of productivities in order to assume away the distortive effect of the discrete number of French supplier. As the number of French supplier is discrete and finite the ex-ante distribution of productivities (Pareto) does not perfectly coincide with the ex-post distribution of productivities. Here, we act as if it was so that the distribution of the number of buyers per firm served is entirely driven by the frictional meeting between buyer and seller and not by the ex-post distribution of productivities.

[25] Since our dataset only covers exporters located in France, the j country will always be France and we will use the heterogeneity across destinations and sectors to recover a distribution of estimated parameters.

[26] For practical reasons detailed below, we restrict our attention to four values for $h_{ij}(M)$, corresponding to the bottom of the distribution of sellers' degrees.

What is not explained by the model is that the correlation with distance survives when these shares are further normalized by the destination-specific proportion of sellers with one buyer, i.e. when the empirical counterpart of $\frac{h_{ij}(M)}{h_{ij}(1)}$ is correlated with distance, as in the second panel of Table 2.2. In principle, the normalization shall neutralize the impact of trade shares, thus of iceberg trade costs. While the correlation may be explained by search frictions being correlated with distance, there might also be other channels through which iceberg trade costs affect the ratios, which the model does not encompass but the data reveal. To avoid that this pollutes our estimates of search frictions, we decided to use an alternative moment which is not affected by distance to France and is thus more likely to help us extract from the data information on pure search frictions.

The moment chosen exploits information on the *dispersion* in the number of buyers served by sellers serving the same destination with the same product. Namely, the theoretical moment is defined as the variance in the $\frac{h_{ij}(M)}{h_{ij}(1)}$ ratios:

$$Var_{ij}\left(\lambda_{ij}\right) = \frac{1}{B_i - 1}\sum_{M=2}^{B_i}\left(\frac{h_{ij}(M)}{h_{ij}(1)} - \frac{1}{B_i - 1}\sum_{M=2}^{B_i}\frac{h_{ij}(M)}{h_{ij}(1)}\right)^2 \tag{2.8}$$

This moment is related to the curvature of the distribution of sellers' number of partners represented in Figure 2-2 (left panel) and is positively correlated with λ_{ij}. Intuitively, less frictions reduce the expected number of exporters serving a small number of buyers while increasing the density at high values of M. This tends to increase the variance in equation (2.8). We use this property to identify search frictions.

In theory, the dispersion can be calculated across $B_i - 1$ ratios. However, these ratios do not convey a lot of relevant information since they are almost all equal to zero above a certain level of M.[27] For this reason, we decided to restrict our attention to the variance computed over three empirically relevant $\frac{h_{ij}(M)}{h_{ij}(1)}$ ratios, namely $M = \{2, [3, 4], [5, B_i]\}$, $M = \{2, 3, [4, B_i]\}$ or $M = \{[2, 3], [4, 5], [6, B_i]\}$ depending on the product and destination. As documented in the last panel of Table 2.2, the empirical counterpart of the moment in equation (2.8) is not correlated with distance from France. However, it is negatively correlated with the stock of French migrants in the destination, our proxy for information frictions. This moment is thus a good

[27] As shown in Figure 2-2 (left panel), most of the variance in the number of buyers served by French exporters is indeed found at values for $B_{s_j i}$ below 10 and thus using all the individual moments regarding the number of firms with $B_{s_j i} > 10$ clients would be inefficient. Moreover, this would artificially reduce the dispersion in the data, in a way that is not independent from B_i.

candidate for estimating search frictions independently from other physical trade barriers. The intuition behind this empirical finding can directly be drawn from the model. Physical trade barriers affect French exporters in a homogeneous way along the whole distribution. They reduce their relative competitiveness with respect to foreign competitors. However, search frictions do not impact small and large exporters in the same way, as discussed in Proposition 2. Small exporters "benefit" from high search frictions because they reduce competition exerted by other French firms on these low-competitive sellers. Instead, large exporters suffer from the lack of visibility induced by large enough frictions. This non-monotonic relationship is the key reason why the dispersion in sellers' degrees is informative on the size of search frictions in our framework.

2.4.2 Estimation strategy

We estimate search frictions with a Generalized Method of Moments. As just explained, we focus on the theoretical moment defined in equation (2.8) which conditional on B_i solely depends on λ_{ij}. The empirical counterpart of this theoretical moment is observed in our data:

$$\widehat{Var_{ij}} = Var\left(\frac{\sum_{s_j=1}^{S_j}\mathbb{1}\{B_{s_ji}=m_1\}}{\sum_{s_j=1}^{S_j}\mathbb{1}\{B_{s_ji}=1\}}, \frac{\sum_{s_j=1}^{S_j}\mathbb{1}\{B_{s_ji}=m_2\}}{\sum_{s_j=1}^{S_j}\mathbb{1}\{B_{s_ji}=1\}}, \frac{\sum_{s_j=1}^{S_j}\mathbb{1}\{B_{s_ji}=m_3\}}{\sum_{s_j=1}^{S_j}\mathbb{1}\{B_{s_ji}=1\}}\right) \tag{2.9}$$

where $\mathbb{1}\{B_{s_ji}=M\}$ is an observed dummy equal to one when firm s_j has exactly M buyers in destination i and m_1, m_2 and m_3 respectively denote the first, second and third element of $M=\{2,[3,4],[5,B_i]\}$, $M=\{2,3,[4,B_i]\}$ or $M=\{[2,3],[4,5],[6,B_i]\}$.

As explained in Appendix .2.1, the following convergence result applies:

$$\sqrt{S_j}\left(\widehat{Var_{ij}} - Var_{ij}(\lambda_{ij})\right) \underset{S_j\to+\infty}{\xrightarrow{\mathcal{D}}} \mathcal{N}(0,\Omega_{ij}(\lambda_{ij})) \tag{2.10}$$

where $\Omega_{ij}(\lambda_{ij})$ is the variance of $\widehat{Var_{ij}}$.[28]

Using the convergence result, it is possible to identify λ_{ij} uniquely. Indeed, $Var_{ij}(\lambda_{ij}) - \widehat{Var_{ij}} = 0$ has a

[28] $\Omega_{ij} = \nabla g(\lambda_{ij})\Sigma_{ij}\nabla' g(\lambda_{ij})$ where g is the variance function and Σ_{ij} is the variance-covariance matrix of the random variables $\mathbb{1}\{B_{s_ji}=M\}$ for $M=m_1,m_2,m_3$.

unique solution on [0, 1]. The minimization program writes as follows:

$$\min_{\lambda_{ij}} [Var_{ij}(\lambda_{ij}) - \widehat{Var_{ij}}]' \Omega_{ij}^{-1}(\lambda_{ij}) [Var_{ij}(\lambda_{ij}) - \widehat{Var_{ij}}] \tag{2.11}$$

Note that $\Omega_{ij}(\lambda_{ij})$ is the optimal matrix of weights as defined in Appendix .2.1. Moreover, with an Asymptotic Least Squares estimation methodology, the estimated variance of estimated frictions writes:

$$\widehat{\Sigma}_{\lambda_{ij}} = \left[\frac{\partial Var_{ij}(\widehat{\lambda_{ij}})}{\partial \lambda_{ij}}' \Omega_{ij}^{-1}(\hat{\lambda_{ij}}) \frac{\partial Var_{ij}(\widehat{\lambda_{ij}})}{\partial \lambda_{ij}} \right]^{-1}$$

In the rest of the analysis, we focus on sellers from one single country, $j = France$ and buyers from each European country. Search frictions are estimated independently for each product and destination. With a targeted moment which has an analytical formula, the implementation is straightforward. The only practical difficulty concerns the measurement of S_j and B_i in the data. Indeed, the theoretical moment in (2.8) is a function of λ_{ij} and B_i such that we need to measure the population of buyers in each destination country and sector. Moreover, the total number S_j of potential suppliers of a $hs6$ reference is needed to compute both the optimal weights entering the objective function and the asymptotic variance of the estimator (see details in Appendix .2.1).

We recover measures of the population of buyers in each destination country and sector using predictions of the model regarding trade shares. Under the assumptions of the model, π_{ij} is both the share of goods from j in country i's total consumption and the ratio of the number of buyers from i buying their consumption from a seller in j divided by the total number of buyers in i ($\pi_{ij} = B_{ij}/B_i$). π_{ij} can easily be recovered from sectoral bilateral trade and absorption data.[29] B_{ij} is directly observed into our data. Based on this, one can recover a value of B_i for each destination and sector.[30]

Information on the number of *potential* suppliers by $hs6$ product is not available in any administrative

[29] We use bilateral trade flows from the CEPII-BACI database (Gaulier and Zignago, 2010) and production data from Prodcom. π_{ij} is defined as the ratio of trade from j to i over absorption in country i.

[30] In sectors and countries in which the market share of French firms is very low, our empirical strategy implies very high values for B_i, above a million firms. Such high values might artificially bias our estimation of λ_{ij} down. To avoid this, we winsorized the number of potential buyers at 20,000, i.e. $B_i = min\left\{20,000; \frac{B_{iF}}{\pi_{iF}}\right\}$.

dataset. To proxy S_j for each product, we exploit information on the universe of French firms recovered from the INSEE-Ficus database and the sector of activity they belong to. All firms belonging to a sector in which at least one firm makes 10% of its exports in a product are considered potential suppliers of the product. Atalay et al. (2014) use a comparable strategy to proxy the number of firms susceptible of purchasing a firm's output.

Using information on the number of potential sellers and buyers in each country and destination plus the information on the number of buyers in each seller's portfolio, one can directly solve the program in (2.11) and recover estimated values for the meeting probabilities. Since the minimization program in (2.11) is somewhat sensitive to the initial value, we use a grid search algorithm over 200 values of λ_{ij} to select a country and product-specific starting point.

2.4.3 Results

Summary statistics. Search frictions are estimated at the (sector×country) level for a total of 10,402 λ_{ij} parameters.To get meaningful comparisons, we restrict our analysis to countries where we have at least 200 estimated parameters. With this restriction, we keep 9,855 λ_{ij} parameters covering 15 countries.

Table 2.3, first column, provides summary statistics on the estimated parameters. Remember that, in the model, the λ_{ij} coefficient is defined as the share of the (continuum of) sellers from country i a given buyer in country j would meet, on average. We see an important level of dispersion in these probabilities. Indeed, ten percent of product-country pairs have a meeting probability below .01%; while 10 percent of the pairs have a meeting probability above 2.3%. A basic variance decomposition exercise shows that 13% of the dispersion in our friction parameters is driven by the destination country dimension, 43% is sector-specific, and the remaining 55% is within a sector×country.

In Table 2.4, we examine how the estimates relate to different country and product characteristics. Columns (1) and (2) focus on country characteristics, controlling for HS6-product fixed effects. In column (3), we remove the product fixed effects to include a measure of product differentiation. In column (4), we focus on the role of product characteristics and thus control for country fixed effects. The results show that market size (measured by population) and physical distance are positively correlated with frictions. The positive correlation between frictions and market size suggests that the search process is easier when

economic activity is spatially concentrated. This might be explained by spillovers in the search process. While, search frictions are higher in large markets, the probability to meet a buyer increases with market size as there are more buyers in large markets. It is worth noting that distance has a negative impact on frictions, even though the moments used to estimate frictions are not correlated with distance (see the last panel in Table 2.2). The impact of distance on trade flows is often associated to transportation costs, our findings show that distance further impacts trade flows by impeding the search process between buyers and foreign sellers. As expected, search frictions are found lower in countries where French migrants are more numerous (though the effect is not always significant at conventional levels). This is consistent with the view that migrants convey information on their origin country, thus reducing information frictions. Finally, the results show that search frictions are higher for more differentiated products (according to the Rauch classification). This is consistent with the view that the search process is easier for products traded in organized markets.

While the λ_{ij} parameters are interesting to investigate, they are not easy to interpret. More easy to interpret is the implication of these estimates in terms of the probability that a given French exporter meets with zero buyer in each destination, which is positively linked with the extent of frictions. Since the meeting process is a binomial, this probability is equal to $(1 - \lambda_{ij})^{B_i}$, with B_i the number of consumers in country i. The distribution of probabilities over all country and hs6 product pairs is summarized in the second column of Table 2.3. On average, the probability of meeting with zero buyer in a destination is 12%. This number however hides a lot of heterogeneity. In more than 50% of country and sector pairs, the probability is below one percent. At the other side of the distribution, 10% of country×sector pairs display high frictions, with French exporters having more than 56% of chances of meeting with no buyer there. Figure 2-3 compares these probabilities, on average across destinations.[31] Belgium and Luxembourg, two countries contiguous to France with a high share of French speakers, are found to display low levels of search frictions for French sellers, on average. At the other side of the distribution, no match probabilities are found the largest, on average, in Greece, Finland, and Poland, three countries which are relatively distant from France along several metrics.

[31] As the probability of no match has a product dimension, we measure the country-specific probability of no match by regressing this probability on product and country fixed effects. The product fixed-effects control for sectoral composition effects. The country-fixed effects allow us to compare the probability of no match across countries. One cannot estimate all the fixed effects and thus choose to present this measure in relative terms with respect to Germany.

Another way of assessing the validity of our estimates is to confront the model's predictions to the data. Proposition 1 unambiguously shows that an increase in bilateral search frictions within a product category between France and a trade partner should lead to a reduction in French market shares. We thus regress the logarithm of French market shares (computed by destination-HS6 product pair) on our estimates of search frictions. We further control for other trade barriers, namely the share of French migrants and bilateral distance between France and the destination country. We also include product-fixed effects in all specifications to capture differences in French comparative advantages across product categories.

The results are presented in Table 2.5. Because we focus here on the subsample of products and destinations for which frictions are estimated, Column (1) first shows how market shares in this sample correlate with distance, the share of French migrants in the destination, and the share of migrants from the destination country in France. As expected, bilateral distance is an impediment to French exports while migrant networks foster bilateral trade. In column (2), we include our estimates of bilateral search frictions. In column (3), we include only the bilateral search frictions. Finally, column (4) controls for the probability of no meeting instead of the raw measure of search frictions. The results in columns (2) to (4) show that French market shares are lower for product-destination pairs that exhibit a higher level of search frictions. This is consistent with Proposition 1. Alone, search frictions can explain as much as 55.7% of the variance in market shares across destinations within a product. This is sizable.

Model Fit. Having shown that our estimates of search frictions correlate with observables in a theory-consistent way, we now evaluate the ability of the model to reproduce key features of the data. We use our parameter estimates to simulate the expected number of sellers interacting with zero to ten buyers within a destination market. Based on this, it is possible to predict the cumulated distribution of sellers' number of buyers in a destination, and compare it with the data.[32] Figure 2-4 reports the observed and predicted CDFs for the 15 countries in our sample. A visual inspection shows that the model nearly matches the distribution in most destinations. The parameters are estimated from the dispersion in the stock of buyers across French sellers serving the same destination. For reasons detailed in section 2.4.1, we do not consider the expected

[32]More precisely, we use the estimated λ_{ij} coefficients to predict the share of exporters serving a given number of buyers, in each destination and product. These shares are then aggregated across products using information on the relative number of suppliers of each product in France.

number of sellers serving one client in our set of moments. Interestingly, our simple model captures quite well the share of sellers serving a single buyer within a destination, i.e. the fit is good regarding the curvature of CDFs *and* their intercept.[33] While the first moment is targeted in our estimation, the second is not.

The ability of the model to match the share of sellers serving a single buyer is further evaluated in Table 2.6. Instead of aggregating across products within countries, we predict the share of sellers serving one buyer for each product-country pair where we have estimates of frictions. Table 2.6 reports the correlation between the observed and predicted shares. In the first column, we report the unconditional correlation. In column (2), country fixed effects are introduced while column (3) has country and product fixed effects. The R^2 of the first regression is .19, suggesting that our simple model accounts for one-fifth of the dispersion in the share of sellers serving a single buyer. The correlation is highly significant in the three specifications which shows that the correlation is valid within countries across products as well as across products within countries.[34]

2.5 Counterfactual Results

Having shown that our methodology delivers convincing estimates of bilateral search frictions faced by French exporters, we now use them to run a counterfactual analysis. The exercise is meant to quantify the extent to which search frictions contribute to explaining the randomness in export behaviors discussed in the introduction. We also provide estimates of the extent of the distortion induced by this particular form of barriers to trade.

2.5.1 Methodology

Throughout the exercise, we focus on the Greek market, identified as the second most frictional country in our data, on average.[35] Using this benchmark, we simulate how French exporters' behaviors would adjust would

[33] One country for which we underestimate the share of sellers having a single buyer is Luxembourg. A possible reason for this poor performance is that the market share of French firms in Luxembourg is somewhat mismeasured due to bilateral trade data in BACI recording exports towards Belgium and Luxembourg together.

[34] We have run similar regressions considering the share of sellers with two buyers and with three buyers. The fit between the predicted and observed shares is very comparable.

[35] As shown in Figure 2-3, the mean probability of meeting with zero buyer is slightly larger for Finland than for Greece. We however decided to take the Greek market as reference because the cross-section of product-specific estimates is larger.

the level of bilateral frictions decrease in this destination, to the mean observed in the less frictional country in our sample, which is Belgium. In practice, this means that we compute expected export behaviors, in each product and in the aggregate, under the actual (estimated) search parameter ($\hat{\lambda}_{ij}$) and in a counterfactual in which the product-specific parameter is shifted up by the average difference in estimated frictions between Belgium and Greece (i.e for $\lambda_{ij}^{c} = \hat{\lambda}_{ij} \times 5.85$ where 5.85 is the mean difference in search frictions estimated for Belgium and Greece, conditional on product characteristics).

The distorsive impact of frictions is emphasized by comparing the impact of the counterfactual at various points of the productivity distribution. Using equations (2.1) and (2.3), the probability of serving a buyer in country i, conditional on a level of productivity z, writes:

$$\rho_{ij}(z) = \lambda_{ij} e^{-\frac{\lambda_{ij}}{\pi_{ij}} T_j z_{min}^{-\theta} \left(\frac{z}{z_{min}}\right)^{-\theta}} \tag{2.12}$$

Under Pareto, $\left(\frac{z}{z_{min}}\right)^{-\theta}$ is the share of firms with productivity above z, and is straightforward to calculate if z is interpreted as a particular percentile of the productivity distribution. The estimated value of λ_{ij} is taken as benchmark, and shifted up in the counterfactual state of the economy. Likewise, the trade share π_{ij} is observed in the benchmark and can be recovered in the counterfactual equilibrium using the formula in Proposition 1. The only unobservable component in this expression is thus $T_j z_{min}^{-\theta}$ which stands for the expected number of potential suppliers in country j (France in our experiment). We decided to calibrate this object so as to fit the data regarding large firms' export premium in any given product market:[36]

$$\ln \frac{\rho_{\bar{z}_j i}}{\rho_{\underline{z}_j i}} = \frac{\lambda_{ij}}{\pi_{ij}} T_j z_{min}^{-\theta} \left[\left(\frac{\underline{z}_j}{z_{min}}\right)^{-\theta} - \left(\frac{\bar{z}_j}{z_{min}}\right)^{-\theta} \right]$$

Given observed λ_{ij} and π_{ij}, it is possible to calibrate $T_j z_{min}^{-\theta}$ so as to fit observed export premiums at different points of the productivity distribution. In practice, we use data on the apparent labor productivity of French firms, by sector, to assign each exporter to a productivity percentile. For each product and destination, we then compute the ratio of mean exports among firms below the 50th percentile in their sector

[36] In the context of our model the export premium of large firms is the same whether expressed in terms of their relative probability of serving a given buyer, in terms of their expected number of buyers or in terms of the expected value of their exports. In the data, we use export premia recovered from average exports at different points of the productivity distribution. Results are qualitatively the same if we use instead information on firms' number of partners.

and among firms above the 80th. The ratio of the later over the former is our measure of the product- and destination-specific export premium.[37] It is used to recover a calibrated value of $T_j z_{min}^{-\theta}$, for each product and destination. Consistent with the model, this object is assumed invariant to the counterfactual shift in search frictions.

Armed with the calibrated number of firms in each sector and destination, the observed trade shares and the estimated search frictions, one can recover an estimate of $\rho_{ij}(z)$ for each percentile of the (Pareto) productivity distribution, and from this estimate the probability of exporting $(1-(1-\rho_{ij}(z))^{B_i})$ and the mean value of exports $(B_j \rho_{ij}(z))$, for each percentile. We now present results, focusing on two counterfactual exercises that help quantify the distortive impact of search frictions.

2.5.2 Results

Figure 2-5, left panel, shows how the probability of a firm exporting to Greece evolves along the productivity distribution, in the data (solid line) and in the counterfactual (dotted line). As expected, exporting to Greece is increasingly likely when moving right to the productivity distribution. In the equilibrium calibrated to actual data, less than 7% of firms in the first percentile serve at least one Greek client against more than 70% among the 1% most productive firms. More interesting is the model's prediction regarding the impact of shifting search frictions down, to the average level observed in Belgium. In this counterfactual less frictional Greek market, the export probability decreases at the bottom of the distribution while increasing at the top, i.e. some low-productivity firms are evicted from the Greek market while higher-productivity firms enter. The selection of firms is actually strong since only the last quartile of the distribution benefits from the reduction in frictions in this experiment. As a consequence, the overall export probability falls from 29.9% to 28.8% but the mean productivity of exporters improves, by 10 to 20%.[38]

[37] The export premium is undefined in about 15% of product×destination pairs, either because we do not observe any firm in one of the two quantiles of the distribution used as reference or, in rare instances, because the recovered export premium is negative, i.e. low-productivity firms are found to export more on average than high-productivity firms. For Greece, negative export premia are found in 12 hs6 products out of 404. When the export premium is computed based on the export probability (instead of the mean value of exports), the number of negative premia falls to 2 out of 404 products. Since the model is not consistent with a negative export premium, we have no choice but to discard the corresponding products from the counterfactual analysis.

[38] By definition, the mean productivity of exporters writes:

$$\mathbb{E}(Z|Export) = \frac{\int_{z_{min}}^{+\infty} z f(z) \mathbb{P}(Export|z) dz}{\int_{z_{min}}^{+\infty} f(z) \mathbb{P}(Export|z) dz}$$

To further document the impact of less frictions on the allocation of resources, Figure 2-6 shows the export premium that firms at the 90th percentile enjoy in comparison with competitors at the 25th percentile, in the benchmark and the counterfactual equilibrium. In the benchmark equilibrium, the simulated export premium matches exactly what is observed in the data for each product. It is equal to 40 for the median product, i.e. firms at the 90th percentile in this product market export 40 times more than firms at the 25th percentile, in expectations. In the counterfactual equilibrium (y-axis), export premia are an order of magnitude larger, to reach 3,800 for the median product. The reason why the effect is massive is obviously because many firms in the 25th percentile no longer exports in the counterfactual, as can be seen in Figure 2-5, left panel. The impact of low-productivity firms being evicted from the Greek market is further amplified by the value of exports, conditional on exporting, which also raises for high-productivity firms, in comparison with less productive exporters (Figure 2-5, right panel). Interestingly, this reinforcing force is entirely driven by large firms increasing their market share, in the counterfactual equilibrium in comparison with the benchmark. At the bottom of the distribution, the expected number of buyers conditional on exporting does not change much, and stays very close to one in many product markets and for firms in the first half of the distribution, roughly speaking. But the reduction in frictions has a strong positive effect on the expected number of clients for exporters at the top of the distribution. For the mean exporter at the 75th percentile of its sector's productivity distribution, the expected number of partners increases from 3.0 to 3.8. At the 90th percentile, the effect is more pronounced, with the expected number of clients shifting from 4.9 to 9.9. Finally, in the last percentile, the impact is substantial with the expected number of clients increasing from 7.6 to 29.8.

All in all, these results confirm the quantitatively important role of frictions. In comparison with standard barriers to international trade, they distort competition among potential exporters. This benefits, in relative terms, to low-productivity firms while reducing the export probability and expected exports at the top of the

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where $f(z) = \frac{\theta z_{min}^{\theta}}{z^{\theta+1}}$ is the density of z and $\mathbb{P}(Export|z)$ is the probability of exporting conditionally on z. After some simplifications, the change in the productivity of exporters in the counterfactual state of the economy, in relative terms with the benchmark, becomes:

$$\frac{\mathbb{E}^c(Z|Export)}{\mathbb{E}(Z|Export)} = \left[\int_{z_{min}}^{+\infty} \frac{\left(\frac{z}{z_{min}}\right)^{-\theta}\mathbb{P}(Export|z)}{\int_{z_{min}}^{+\infty}\left(\frac{z}{z_{min}}\right)^{-\theta}\mathbb{P}(Export|z)dz}\frac{\mathbb{P}^c(Export|z)}{\mathbb{P}(Export|z)}dz\right]\frac{\int_{z_{min}}^{+\infty}\left(\frac{z}{z_{min}}\right)^{-\theta-1}\mathbb{P}^c(Export|z)dz}{\int_{z_{min}}^{+\infty}\left(\frac{z}{z_{min}}\right)^{-\theta-1}\mathbb{P}(Export|z)dz}$$

where the ^{c} superscript refers to the counterfactual state. After discretizing the productivity space in percentiles, this formula can be used, together with a calibrated value for θ, to recover the change in the mean productivity of exporters. For $\theta = 3$, the overall productivity improvement is found to be 17.25%, a value which is reduced to 9.9% for $\theta = 5$.

distribution.

2.6 Conclusion

This paper shows how search frictions in international good markets can distort competition between firms of heterogeneous productivity. We develop a Ricardian model of trade in which buyers in each market meet with a random subset of potential suppliers of a perfectly substitutable good. The model combines two barriers to international trade. Physical (iceberg) trade costs reduce the competitiveness of exporters in foreign markets, in a way which is homogenous across firms. Instead, bilateral search frictions reduce the likelihood that any exporter will meet with a foreign consumer but also decrease competitive pressures, conditional on having met with a potential buyer. The relative strength of these two forces varies along the distribution of firms' productivity. While high-productivity firms always suffer from a lack of visibility in foreign markets, low-productivity firms can sometimes benefit from high search frictions because, conditional on having met with a buyer, these frictions reduce the strength of competition thus increasing the chances that the firm will be chosen to serve the buyer. This heterogeneity, we argue, is the key reason why search frictions can help explain the randomness in small and medium firms' export patterns that we observe in firm-level data. In highly frictional markets, the export premium of high-productivity firms is lowered and the export probability of small and medium firms increased.

Bilateral search frictions are estimated structurally using firm-to-firm trade data at the product and destination level. For each French firm and each product it sells, we can measure the number of clients it serves in a particular destination. In the model and in the data, heterogeneity across firms in this number is explained by firms' heterogeneous productivity and the magnitude of search frictions in this particular destination. Intuitively, more frictional markets induce more distorsions, which reduces the export premium of high-productivity firms. We use this property of the model to structurally recover a measure of search frictions, for each product and destination. Estimated frictions are found more severe in large and distant countries and for products that are more differentiated.

A counterfactual analysis allows quantifying the size of the distorsion induced by search frictions. When we simulate the impact of reducing the level of search frictions, in the most frictional country to the mean

level observed in the least frictional one, we estimate substantial selection effects. Increasing the meeting probability between French sellers and Greek buyers on average pushes the least productive exporters out of the market while substantially increasing the export probability and the conditional value of exports for firms in the last quartile of the productivity distribution. Because of this, the mean productivity of exporters increases, by 10 to 20%, and their export premium is substantially increased.

The distortive impact of search frictions can rationalize a number of active policies used by export-promoting agencies. In a frictional world, any policy instrument that can help high-productivity firms that suffer from a lack of visibility abroad meet with foreign buyers induces aggregate productivity gains. Such policies may however hurt low-productivity exporters.

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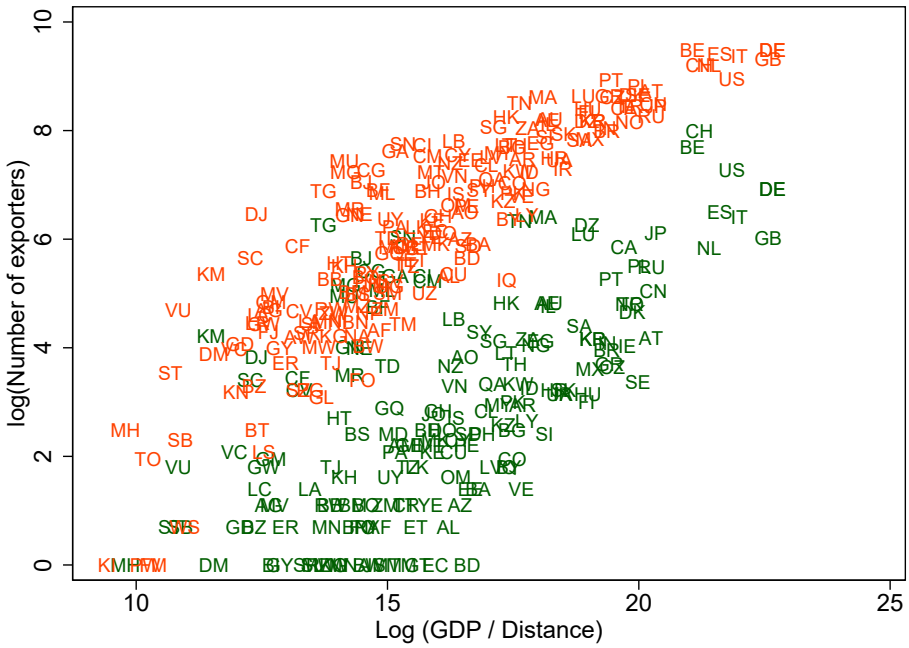
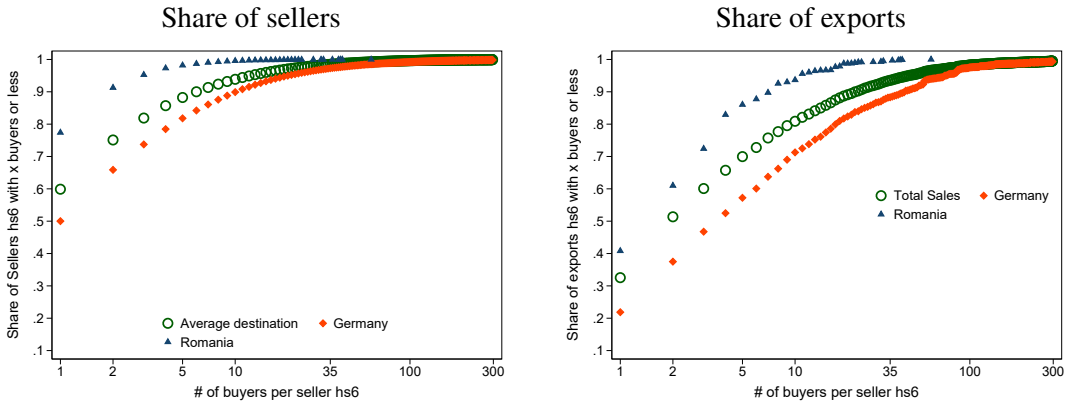
Figure 2-1 – Export probability as a function of market potential, small and large exporters



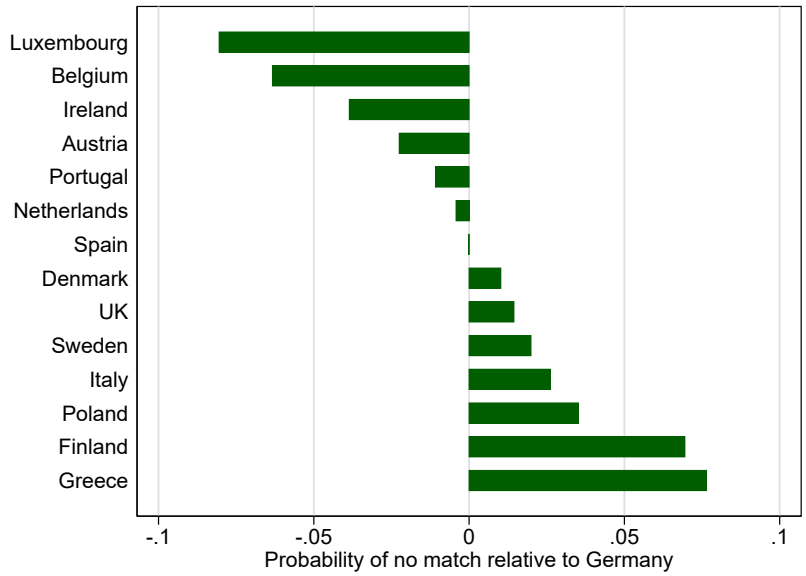
Notes: This figure correlates the stock of French exporters active in a given destination with the destination's market potential, for the top 15% and the bottom 15% of firms (red and green labels, respectively). The size of a firm is defined as the value of its worldwide exports. Source: French customs described in Bergounhon et al. (2018).

Figure 2-2 – Distribution of the number of buyers per seller, across exporters



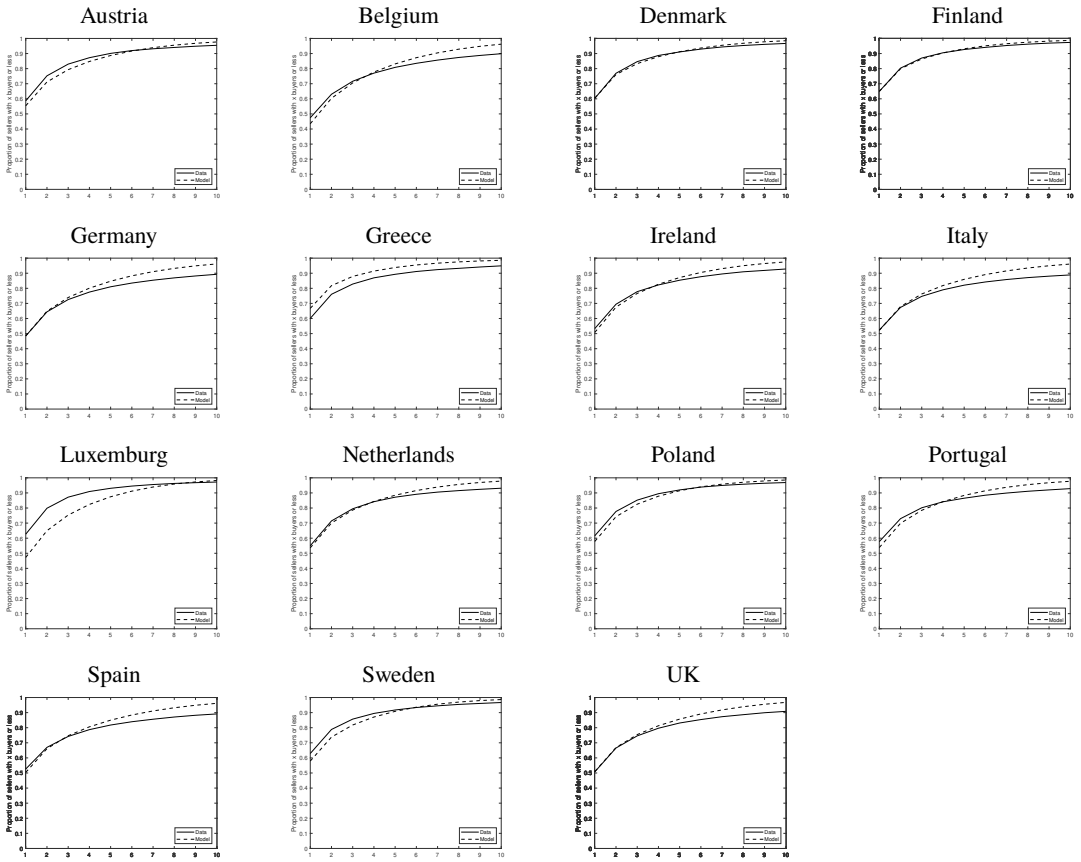
Notes: The figure displays the proportion of sellers (left panel) and the share of trade accounted for by sellers (right panel) that serve x buyers or less in a given destination, in 2007. A seller is defined as an exporter-HS6 product pair. The green circles correspond to the average across EU destinations. The blue triangles and red diamonds are respectively obtained from exports to Romania and Germany.

Figure 2-3 – Comparison of frictions faced by French exporters across countries



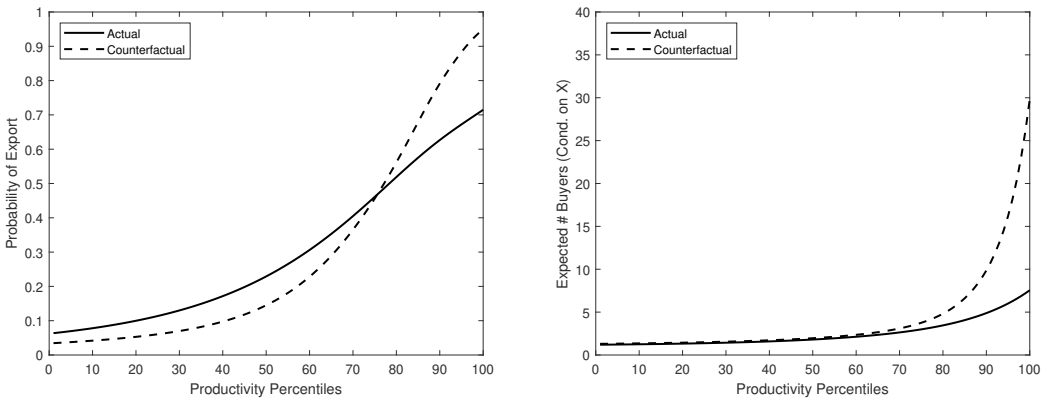
Notes: Mean probability of meeting with zero buyer across countries, in relative terms with respect to Germany.

Figure 2-4 – Model fit: Distribution of sellers' degrees



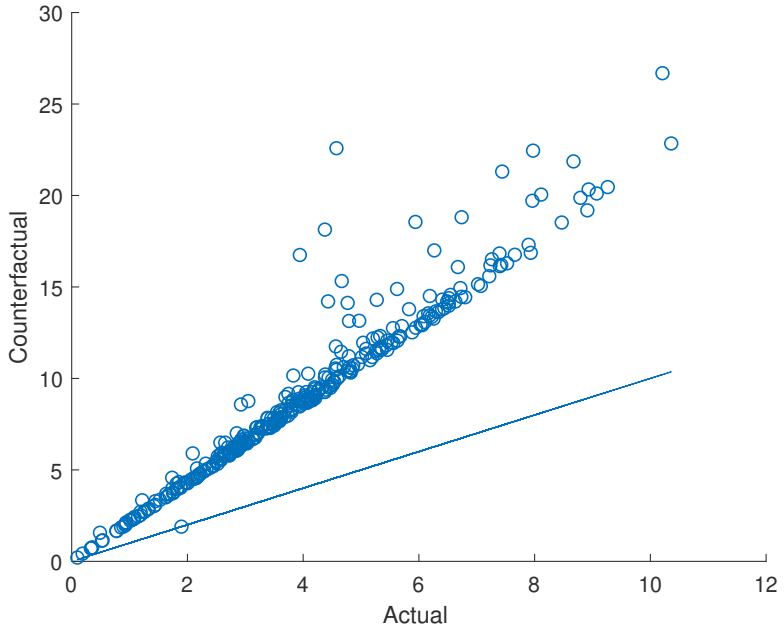
Notes: Observed and predicted CDF of sellers' numbers of buyers, by country. Predicted CDF are obtained using the model's definition of $h_{ij}(M)$, at the country and product level, before aggregating across products using information on the relative number of producers of each good in France.

Figure 2-5 – Probability of exporting to Greece and expected number of buyers conditional on export, along the productivity distribution: Actual versus counterfactual



Notes: The graphs plot the probability of export to Greece (left panel) and the expected number of partners, conditional on exporting (right panel), conditional on the firm's position in the productivity distribution. The solid lines correspond to the actual equilibrium while the dotted lines are the counterfactual. Export probabilities and the expected number of exporters are both calculated at the product level following the strategy described in Section 2.5.1, before being aggregated across products using information on the relative number of firms in each product market.

Figure 2-6 – Export premium (90th/25th percentiles) by product: Actual versus counterfactual



Notes: The graph plots the (log of the) export premium of firms at the 90th percentile in comparison with firms at the 25th percentile, by product, in the data (x-axis) and in the counterfactual (y-axis). The straight line is the 45-degree line.

Table 2.1 – Product- and Firm-level gravity equations

	Dependent Variable (all in log)						
	Product-level				Firm-level		
	Value of Exports	# Sellers	# Buyers per Seller	Mean export per Buyer-seller	Value of Exports	# Buyers	Exports per Buyer
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
log Distance	-0.653***	-0.308***	-0.193***	-0.152***	-0.196***	-0.194***	-0.006
	(0.068)	(0.033)	(0.024)	(0.046)	(0.052)	(0.026)	(0.042)
log Import Demand	0.795***	0.238***	0.137***	0.419***	0.423***	0.171***	0.253***
	(0.015)	(0.008)	(0.006)	(0.010)	(0.013)	(0.007)	(0.011)
log GDP per Capita	-0.117***	-0.052**	0.018	-0.084***	-0.084***	-0.066***	-0.018
	(0.044)	(0.020)	(0.014)	(0.025)	(0.032)	(0.018)	(0.020)
log French Migrants	0.372***	0.206***	0.091***	0.075***	0.189***	0.103***	0.086***
	(0.020)	(0.008)	(0.007)	(0.012)	(0.015)	(0.008)	(0.011)
Observations	60,770	60,770	60,770	60,770	578,947	578,947	578,947
R-squared	0.648	0.788	0.441	0.588	0.691	0.439	0.720
Fixed effects	Product	Product	Product	Product	Firm	Firm	Firm

Notes: Standard errors, clustered in the country dimension, in parentheses with ***, ** and * respectively denoting significance at the 1, 5 and 10% levels. "log Distance" is the log of the weighted distance between France and the destination. "log Import demand" is the log of the value of the destination's demand of imports for the hs6-product, less the demand addressed to France. "log GDP per capita" is the log-GDP per capita in the destination. "French migrants" is the number of French citizens in the destination country, per 1000 inhabitants. "Migrants in France" is the number of migrants from the destination in France, expressed as a stock per 1000 inhabitants in France. The dependent variable is either the log of product-level French exports in the destination (column (1)) or one of its components, namely the number of sellers involved in the trade flow (column (2)), the mean number of buyers they serve (column (3)) and the mean value of a seller-buyer transaction (column (4)). Column (5) uses as left-hand side variable the log of firm-level bilateral exports while columns (6) and (7) use one of its components, the number of buyers served (column (6)) or the value of exports per buyer (column (7)).

Table 2.2 – Correlation between various empirical moments and distance from France

	log Distance	Std Dev.	Adjusted R-squared
Dependent Variable			
# sellers with:			
1 buyer	-16.04***	(1.48)	.697
2 buyers	-5.87***	(.559)	.534
3 buyers	-3.23***	(.363)	.416
4 buyers	-2.00***	(.253)	.333
# sellers (in relative terms with respect to the sellers with 1 buyer) with:			
2 buyers	.020***	(.008)	.343
3-4 buyers	-.027***	(.008)	.374
5+ buyers	-.123***	(.021)	.410
Variance of the relative shares of sellers:			
across M	.001	(.010)	.211
across M, controlling for migrants	-.016	(.014)	.212
	coef. on migrants: -.008** (.003)		

Notes: Robust standard errors, clustered at the country level, in parentheses with ***, ** and * respectively denoting significance at the 1, 5 and 10% levels. The last regression uses as right-hand side variables the (log of) distance from France and the stock of migrants.

Table 2.3 – Summary statistics on estimated coefficients

	Meeting Probability λ_{ij} (en %)	Probability of Meeting 0 Buyer $(1-\lambda_{ij})^{B_i}$ (en %)
Mean	0.76	12
Percentile 10	.01	.00
Percentile 25	.06	.00
Percentile 50	.21	.02
Percentile 75	.69	4.37
Percentile 90	1.79	56.74
# Observations	9,855	9,855

Notes: The first column in this table presents summary statistics on the λ_{ij} coefficients, estimated by country × hs6 product. The second column summarizes the subsequent probabilities that a French exporter meets with no buyer in the destination computed as $(1-\lambda_{ij})^{B_i}$ for each country and product.

Table 2.4 – Correlates of bilateral search frictions

	(1)	(2)	(3)	(4)
	Dep. Var: $\ln(\lambda_{ij})$			
ln distance		-0.527*	-0.809***	
		(0.248)	(0.190)	
ln population	-0.478***	-0.508***	-0.208***	
	(0.071)	(0.056)	(0.046)	
ln French migrants	0.179*	0.072	0.218***	
	(0.088)	(0.076)	(0.057)	
Rauch dif.			-0.382***	-0.384***
			(0.080)	(0.081)
Fixed Effects	Product	Product	No	Country
Observations	9,855	9,855	9,855	9,855
R-squared	0.580	0.585	0.103	0.115

Notes: Robust standard errors, clustered at the country level, in parentheses with ***, ** and * respectively denoting significance at the 1, 5 and 10% levels.

Table 2.5 – Search frictions and French market shares

	(1)	(2)	(3)	(4)
	Dep. Var: ln French Market Share			
ln distance	-0.749***	-0.711***		-0.736***
	(0.221)	(0.177)		(0.221)
ln French migrants	0.365***	0.262***		0.367***
	(0.063)	(0.049)		(0.064)
ln Meeting proba		0.255***	0.352***	
		(0.017)	(0.056)	
Proba no meeting				-0.008***
				(0.002)
Fixed Effects	Product	Product	Product	Product
Observations	9,855	9,855	9,855	9,808
R-squared	0.659	0.745	0.610	0.662

Notes: The dependent variable is the log of France market share in the destination, by product (π_{ij} using the model's notations). French migrants is the share of French migrants in the destination while migrants in France is the share of migrants from country i in France. Meeting proba is the estimated coefficient λ_{ij}. Proba no meeting is the probability that a French exporter does not meet any buyer in the destination country. Is is computed as $(1-\lambda_{ij})^{B_i}$ where B_i is the number of buyers in country i. Robust standard errors, clustered at the country level, in parentheses with ***, ** and * respectively denoting significance at the 1, 5 and 10% levels.

Table 2.6 – Model fit: Share of one-buyer sellers

	Dep.Var.: Empirical share of one buyer		
	(1)	(2)	(3)
Predicted share	.295***	.276***	.177***
	(.006)	(.005)	(.005)
Constant	.391***		
	(.003)		
# obs	10,427	10,427	10,059
Fixed Effects	No	Country	Country Product
R-squared	.194	.276	.579

Notes: The predicted share of sellers with one buyer is calculated as $h_{ij}(1)/\sum_{M=1}^{B_i} h_{ij}(M)$. Robust standard errors in parentheses with *** denoting significance at the 1% level.

.1 Appendix: Proof of analytical results

.1.1 Proof of proposition 1

Start with the definition of trade shares:

$$\pi_{ij} = \frac{\lambda_{ij}}{\kappa_i} \frac{T_j (d_{ij} c_j)^{-\theta}}{\Upsilon_i}$$

implying:

$$\frac{d \ln \pi_{ij}}{d\lambda_{ij}} = \frac{1}{\lambda_{ij}} - \frac{1}{\kappa_i} \frac{d\kappa_i}{d\lambda_{ij}}$$

Using

$$\kappa_i = \frac{\sum_{j=1}^{N} \lambda_{ij} T_j (d_{ij} c_j)^{-\theta}}{\sum_{j=1}^{N} T_j (d_{ij} c_j)^{-\theta}}$$

the derivative of κ_i with respect to λ_{ij} is just $\frac{T_j (d_{ij} c_j)^{-\theta}}{\sum_{j=1}^{N} T_j (d_{ij} c_j)^{-\theta}} = \frac{\pi_{ij} \kappa_i}{\lambda_{ij}}$. This finally implies:

$$\frac{d \ln \pi_{ij}}{d\lambda_{ij}} = \frac{1 - \pi_{ij}}{\lambda_{ij}} > 0$$

.1.2 Proof of proposition 2

The sensitivity of export probabilities to search frictions can be assessed through the following derivative:

$$\begin{aligned}
\frac{\partial \ln \rho_{s_j i}}{\partial \lambda_{ij}} &= \underbrace{\frac{\partial \ln \lambda_{ij}}{\partial \lambda_{ij}}}_{\text{Visibility channel}} + \underbrace{\frac{\partial \ln e^{-\left(c_j d_{ij}\right)^{\theta} z_{s_j}^{-\theta} \kappa_i \Upsilon_i}}{\partial \lambda_{ij}}}_{\text{Competition channel}} \\
&= \frac{1}{\lambda_{ij}} - (d_{ij} c_j)^{\theta} z_{s_j}^{-\theta} \Upsilon_i \frac{d\kappa_i}{d\lambda_{ij}} \\
&= \frac{1}{\lambda_{ij}} - z_{s_j}^{-\theta} T_j
\end{aligned}$$

Depending on the current level of frictions (λ_{ij}), the expected number of firms in country j ($T_j z_{min}^{-\theta}$) and the position of s_j in the productivity distribution ($\left(\frac{z_{s_j}}{z_{min}}\right)^{-\theta}$), the derivative can be positive or negative. It is all the more positive since z_{s_j} is high with, at the limit, $\lim_{z_{s_j} \to +\infty} \frac{\partial \ln \rho_{s_j i}}{\partial \lambda_{ij}} = \frac{1}{\lambda_{ij}}$. Instead, low-productivity

sellers' export probability is less sensitive to frictions, and can even be negatively affected by a decrease in frictions. Namely, if the level of frictions is such that $\lambda_{ij} > \frac{1}{z_{min}^{-\theta} T_j}$, i.e. if frictions are not too strong, there is a strictly positive mass of firms which export probability decreases when search frictions are reduced: $\frac{\partial \ln \rho_{s_{min}i}}{\partial \lambda_{ij}} < 0$ where $\rho_{s_{min}i}$ denotes the export probability of the least productive firm.

The sensitivity of export probabilities to iceberg trade costs is instead unambiguously negative, less so for more productive sellers:

$$\begin{aligned}\frac{\partial \ln \rho_{s_j i}}{\partial d_{ij}} &= -(c_j d_{ij})^{\theta} z_{s_j}^{-\theta} \Upsilon_i \kappa_i \left[\frac{\theta}{d_{ij}} + \frac{\partial \ln \Upsilon_i}{\partial d_{ij}} + \frac{\partial \ln \kappa_i}{\partial d_{ij}} \right] \\ &= -\frac{\theta}{d_{ij}} (c_j d_{ij})^{\theta} z_{s_j}^{-\theta} \Upsilon_i \kappa_i (1 - \pi_{ij}) < 0\end{aligned}$$

These contrasted results are the key reason why search frictions and iceberg costs can be identified separately in firm-level export patterns in this model. Larger iceberg trade costs decrease the probability of serving any buyer in the destination, less so for more productive sellers. In contrast, more search frictions are more costly for high-productivity firms, in relative terms. This distorsive effect of search frictions is a direct consequence of the competition channel. While functional forms obviously matter to obtain the analytical predictions, we argue that this result applies more generally whenever:

$$\frac{d^2 \rho_{s_j i}}{d\lambda_{ij} dz_{s_j}} > 0 \quad \text{and} \quad \frac{d^2 \rho_{s_j i}}{dd_{ij} dz_{s_j}} > 0$$

In particular, one may wonder whether imposing the same meeting probability to all firms, whatever their productivity, is a key driver of the result. An alternative would be a model in which the meeting probability takes the form: $\lambda_{is_j} = f(\lambda_{ij}, z_{s_j})$ with $\frac{df(\lambda_{ij}, z_{s_j})}{d\lambda_{ij}} > 0$ and $\frac{df(\lambda_{ij}, z_{s_j})}{dz_{s_j}} > 0$, i.e. high-productivity firms meet with more buyers. In such model:

$$\frac{d^2 \rho_{s_j i}}{d\lambda_{ij} dz_{s_j}} = \left[\frac{\rho_{s_j i}}{\lambda_{ij}} \frac{d^2 f(\lambda_{ij}, z_{s_j})}{d\lambda_{ij} dz_{s_j}} + \frac{\rho_{s_j i}}{\mathbb{P}()} \frac{d^2 \mathbb{P}\left(\min_{s'_k \in \Omega_{b_i}} \left\{ \frac{c_k d_{ik}}{z_{s'_k}} \right\} = s_j \right)}{d\lambda_{ij} dz_{s_j}} \right]$$

As in the benchmark case, the second term is likely to be negative and increasing in z_{s_j}. The second derivative should be larger than in the benchmark since a reduction in frictions implies that the typical buyer in i meets with more sellers and the additional sellers met are more productive, on average. From this point of view, the competitive channel is even more distorsive in this case. However, a reduction in frictions also affects the relative meeting probabilities at different points of the distribution, i.e. $\frac{d^2 f(\lambda_{ij}, z_{s_j})}{d\lambda_{ij} dz_{s_j}}$ might no longer be zero. From this, it comes that the distortive impact of frictions is likely to show up in this model as well, whenever the cross derivative of the meeting probability with respect to λ_{ij} and z_{s_j} is not too negative.

.1.3 Expected number of firms serving M buyers

Integrating the probability of having exactly M buyers along the distribution of expected productivities gives the expected number of firms from j with exactly M buyers in i:

$$h_{ij}(M) = -\int_{z_{min}}^{+\infty} C_{B_i}^M \rho_{s_j i}^M (1 - \rho_{s_j i})^{B_i - M} d\mu_j^Z(z)$$

Using the following change of variable:

$$\rho_{s_j i} = \lambda_{ij} e^{-\frac{\lambda_{ij}}{\pi_{ij}} T_j z_{s_j}^{-\theta}}$$

one can show that:

$$h_{ij}(M) = \frac{\pi_{ij}}{\lambda_{ij}} C_{B_i}^M \int_{\rho_{s_{min} i}}^{\lambda_{ij}} \rho_{s_j i}^{M-1} (1 - \rho_{s_j i})^{B_i - M} d\rho_{s_j i}$$

where $\rho_{s_{min} i}$ is the probability of the least productive firm in j to serve a buyer in i.

If we assume that $M > 0$ we can recognize a function of the family of the Beta function:

$$h_{ij}(M) = \frac{\pi_{ij}}{\lambda_{ij}} C_{B_i}^M \left(B(\lambda_{ij}, M, B_i - M + 1) - B(\rho_{s_{min} i}, M, B_i - M + 1) \right)$$

with $B(\lambda_{ij}, M, B_i - M + 1) = \int_0^{\lambda_{ij}} \rho_{s_j,i}^{M-1} (1 - \rho_{s_j,i})^{B_i - M} d\rho_{s_j,i}$ being the incomplete beta function.

Using properties of the Beta function, notice that :

$$\begin{aligned} B(M, B_i - M + 1) &= \frac{\Gamma(M)\Gamma(B_i - M + 1)}{\Gamma(M + B_i - M + 1)} = \frac{\Gamma(M)\Gamma(B_i - M + 1)}{\Gamma(B_i + 1)} \\ &= \frac{(M-1)!(B_i - M)!}{B_i!} = \frac{1}{M}\frac{(M)!(B_i - M)!}{B_i!} \\ &= \frac{1}{M}\frac{1}{C_{B_i}^M} \end{aligned}$$

Then, the regularized incomplete beta function is :

$$I_{\lambda_{ij}}(M, B_i - M + 1) = \frac{B(\lambda_{ij}, M, B_i - M + 1)}{B(M, B_i - M + 1)} = B(\lambda_{ij}, M, B_i - M + 1)C_{B_i}^M M$$

Now, we can rewrite the expression for the mass of suppliers from j with M buyers in i with the help of the regularized incomplete beta function:

$$h_{ij}(M) = \frac{\pi_{ij}}{\lambda_{ij}}\frac{1}{M}\left(I_{\lambda_{ij}}(M, B_i - M + 1) - I_{\rho_{s_{min^i}}}(M, B_i - M + 1)\right)$$

Finally, note that if $\rho_{s_{min}i}$ goes to 0, $I_{\rho_{s_{min^i}}}(M, B_i - M + 1)$ goes to 0 as well:

$$\lim_{\rho_{s_{min^i}} \to 0} I_{\rho_{s_{min^i}}}(M, B_i - M + 1) = \lim_{\rho_{s_{min^i}} \to 0} \int_0^{\rho_{s_{min^i}}} \rho_{s_j,i}^{M-1}(1 - \rho_{s_j,i})^{B_i - M} d\rho_{s_j,i} = 0$$

Using this, one recovers equation (2.7) in the text:

$$h_{ij}(M) = \frac{\pi_{ij}}{\lambda_{ij}}\frac{1}{M}I_{\lambda_{ij}}(M, B_i - M + 1)$$

.2 Details on the empirical strategy

.2.1 Distribution of the Auxiliary Parameter

We will work with the following convergent moments as auxiliary parameters:

$$\theta_{ij}(\lambda_{ij}, M) = \frac{h_{ij}(M)}{\sum_{M=0}^{B_i} h_{ij}(M)} = \frac{1}{M} \frac{I_{\lambda_{ij}}(M, B_i - M + 1)}{\int_0^{\lambda_{ij}} \frac{(1-\rho_{s_j i})^{B_i}}{\rho_{s_j i}} d\rho_{s_{ji}} + \sum_{M=1}^{B_i} \frac{1}{M} I_{\lambda_{ij}}(M, B_i - M + 1)} \tag{13}$$

i.e. the proportion of firms from j having exactly M buyers in destination i.[39] We first show that the empirical counterparts of these auxiliary parameters are normally distributed. Then we apply the delta-method to work with the moment we chose to identify λ_{ij}. Finally, we discuss the asymptotic distribution of our estimator of λ_{ij}.

In line with our theoretical framework we note $\left[\mathbb{1}\{B_{s_j i} = M\}\right]_{s_j \in S_j}$ the vector of dummy variables which equal one whenever a firm in the sample has exactly M buyers in country i. The vector is of size S_j, the number of observations in the sample under consideration. The dummies are independent and identically distributed random variables of mean $\theta_{ij}(\lambda_{ij}, M)$ and of variance $\sigma^2_{ij}(M)$. This is true for all $M \in [0, B_i]$.[40] The Central Limit Theorem implies:

$$\sqrt{S_j}\left(\hat{\theta}_{ij} - \theta_{ij}(\lambda_{ij})\right) \xrightarrow[S_j \to +\infty]{\mathcal{D}} \mathcal{N}_B(0, \Sigma_{ij}) \tag{14}$$

[39] Here and in the rest of the section, the number B_i of buyers in country i is treated as known. Section 2.4.2 explains how we measure it in the data.

[40] Independence comes from the fact that sellers are independent from each other. Note that this assumption could be relaxed since we could eventually use a version of the central limit theoreim based on weak dependence conditions. They are identically distributed ex-ante as sellers draw there productivity in the same distribution and face the same degree of search frictions.

where

$$\hat{\theta}_{ij} = \begin{pmatrix} \frac{\sum_{s_j=1}^{S_j} \mathbb{1}\{B_{s_j i}=1\}}{S_j} \\ \frac{\sum_{s_j=1}^{S_j} \mathbb{1}\{B_{s_j i}=2\}}{S_j} \\ \dots \\ \frac{\sum_{s_j=1}^{S_j} \mathbb{1}\{B_{s_j i}=B_i\}}{S_j} \end{pmatrix} \quad \text{and} \quad \theta_{ij}(\lambda_{ij}) = \begin{pmatrix} \frac{h_{ij}(1)}{\sum_{M=0}^{B_j} h_{ij}(M)} \\ \frac{h_{ij}(2)}{\sum_{M=0}^{B_i} h_{ij}(M)} \\ \dots \\ \frac{h_{ij}(B_i)}{\sum_{M=0}^{B_i} h_{ij}(M)} \end{pmatrix}$$

respectively denote the vector of empirical and auxiliary parameters and Σ_{ij} is the variance-covariance matrix of the B_i random variables $\mathbb{1}\{B_{s_j i} = M\}$, for $M \in \{1..., B_i\}$.

We then consider the function

$$\begin{array}{ccccc} g & : & \mathbb{R}^{B_i} & \mapsto & \mathbb{R} \\ & & \begin{pmatrix} \theta_{ij}(\lambda_{ij}, 1) \\ \theta_{ij}(\lambda_{ij}, 2) \\ \dots \\ \theta_{ij}(\lambda_{ij}, B_i) \end{pmatrix} & \to & Var\left(m_1 = \frac{\theta_{ij}(\lambda_{ij}, 2)}{\theta_{ij}(\lambda_{ij}, 1)}, m_2 = \frac{\sum_{M=3}^{6} \theta_{ij}(\lambda_{ij}, M)}{\theta_{ij}(\lambda_{ij}, 1)}, m_3 = \frac{\sum_{M=7}^{B_i} \theta_{ij}(\lambda_{ij}, M)}{\theta_{ij}(\lambda_{ij}, 1)} \right) \end{array}$$

where $Var(.)$ is the variance operator. g is derivable and verifies the property $\nabla g(\theta_{ij}(\lambda_{ij})) \neq 0$. Using the Delta-Method, one can show that an estimate of λ_{ij} based on $g(.)$ is asymptotically normal:

$$\sqrt{S_j}[g(\hat{\theta}_{ij}) - g(\theta_{ij}(\lambda_{ij}))] \xrightarrow[S_j \to +\infty]{\mathcal{D}} \mathcal{N}\left((\ 0\ ), \Omega(\theta_{ij}(\lambda_{ij})) = \nabla' g(\theta_{ij}(\lambda_{ij})) \Sigma_{ij} \nabla g(\theta_{ij}(\lambda_{ij})) \right) \tag{15}$$

where $\nabla g(\theta_{ij}(\lambda_{ij}))$ is of dimension $[B_i, 1]$ and is defined as

$$
\left(\begin{array}{c}
\frac{\partial g}{\partial \theta_{ij}(\lambda_{ij},1)} = -\frac{2}{3}\sum_{p=1}^{3}\frac{(m_p-\bar{m})m_p}{\theta_{ij}(\lambda_{ij},1)} \\
\frac{\partial g}{\partial \theta_{ij}(\lambda_{ij},2)} = \frac{2}{3}\frac{m_1-\bar{m}}{\theta_{ij}(\lambda_{ij},1)} \\
\frac{\partial g}{\partial \theta_{ij}(\lambda_{ij},3)} = \frac{2}{3}\frac{m_2-\bar{m}}{\theta_{ij}(\lambda_{ij},1)} \\
\cdots \\
\frac{\partial g}{\partial \theta_{ij}(\lambda_{ij},6)} = \frac{2}{3}\frac{m_2-\bar{m}}{\theta_{ij}(\lambda_{ij},1)} \\
\frac{\partial g}{\partial \theta_{ij}(\lambda_{ij},7)} = \frac{2}{3}\frac{m_3-\bar{m}}{\theta_{ij}(\lambda_{ij},1)} \\
\cdots \\
\frac{\partial g}{\partial \theta_{ij}(\lambda_{ij},B_i)} = \frac{2}{3}\frac{m_3-\bar{m}}{\theta_{ij}(\lambda_{ij},1)}
\end{array}\right)
$$

with $\bar{m} = \frac{1}{3}\sum_{p=1}^{3} m_p$.

In practice, our estimation is implemented in two steps. First we use an estimation of the $\Omega(\widehat{\theta_{ij}})$ weight matrix using our observations $\triangledown g(\hat{\theta}_{ij})$ and $\widehat{\Sigma_{ij}}$. Second, with the $\hat{\lambda}_{ij}$ estimated in the first step we re-run our estimation with $\Omega(\theta(\hat{\lambda}_{ij}))$.

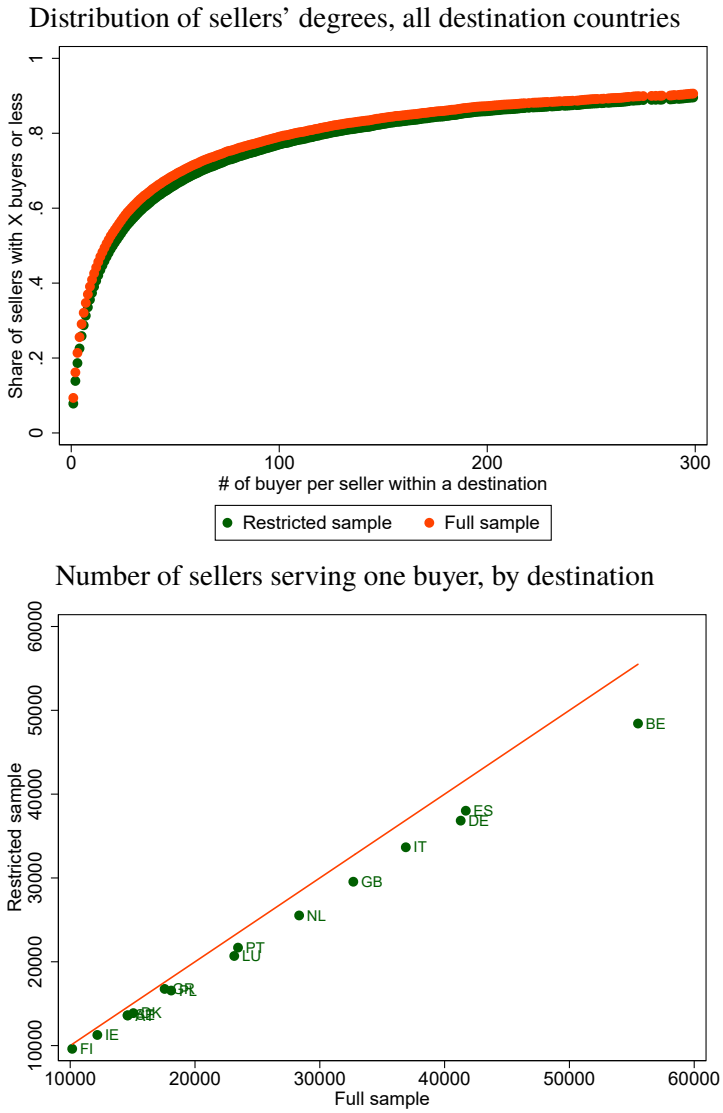
As proved in Gouriéroux et al. (1985), the variance of the GMM estimator of λ_{ij} is:

$$
\Sigma_{\lambda_{ij}} = \left[\frac{\partial g(\theta_{ij}(\lambda_{ij}))}{\partial \lambda_{ij}}\Omega(\theta_{ij}(\lambda_{ij}))^{-1}\frac{\partial g(\theta_{ij}(\lambda_{ij}))}{\partial \lambda_{ij}}\right]^{-1}
$$

with

$$
\begin{aligned}
\frac{\partial g(\theta_{ij}(\lambda_{ij}))}{\partial \lambda_{ij}} &= \tfrac{2}{3}(m_1-\bar{m})\frac{\partial \theta_{ij}(\lambda_{ij},2)/\theta_{ij}(\lambda_{ij},1)}{\partial \lambda_{ij}} \\
&\quad +\tfrac{2}{3}(m_2-\bar{m})\sum_{M=3}^{6}\frac{\partial \theta_{ij}(\lambda_{ij},M)/\theta_{ij}(\lambda_{ij},1)}{\partial \lambda_{ij}} \\
&\quad +\tfrac{2}{3}(m_3-\bar{m})\sum_{M=7}^{B_i}\frac{\partial \theta_{ij}(\lambda_{ij},M)/\theta_{ij}(\lambda_{ij},1)}{\partial \lambda_{ij}}
\end{aligned}
$$

Figure A.1 – Number of buyers per seller, full and restricted sample



Notes: This figure compares the number of buyers per seller, in the whole dataset and in the estimation dataset, restricted to the 90% of exporters that declare the product category of their exports ("Restricted sample"). The top panel compares the distributions of sellers' degrees, where a firm's degree is computed as the total number of buyers it serves in a given destination. The bottom panel compares the number of exporters declaring to serve one buyer in a given destination, in the full sample (x-axis) and the restricted sample (y-axis). The red line is the 45-degree line.

Table A1 – French sellers and EU buyers, 2007

	Number of			*Number of*		
	Exporters	Importers	Pairs	Exporter-HS6	Importer-HS6	Triplets
	(1)	(2)	(3)	(4)	(5)	(6)
Overall	44,255	572,536	1,260,001	184,435	2,390,249	2,879,448
Austria	8,205	14,035	28,128	21,393	52,916	61,478
Belgium	29,468	71,271	214,070	97,415	379,490	482,960
Bulgaria	2,294	2,287	3,657	5,747	6,886	7,630
Cyprus	2,362	1,627	3,735	7,252	8,342	10,041
Czech Republic	6,846	6,117	13,196	16,544	21,491	25,192
Denmark	8,356	8,832	20,846	21,105	37,411	46,574
Estonia	1,802	1,235	2,494	5,230	5,477	6,358
Finland	5,257	5,167	11,592	13,704	21,924	26,046
Germany	24,641	117,935	236,536	73,735	391,424	462,759
Greece	7,792	11,261	25,412	26,054	55,601	68,533
Hungary	5,375	4,437	9,554	12,912	16,309	18,670
Ireland	6,351	6,670	16,265	17,938	38,169	49,297
Italy	20,123	95,864	183,238	63,494	375,681	438,393
Latvia	2,063	1,355	2,948	5,895	6,060	7,430
Lithuania	2,913	1,853	4,698	7,235	7,306	9,891
Luxembourg	10,734	7,652	28,566	31,379	54,959	70,251
Malta	1,781	930	2,552	4,709	4,715	5,781
Netherlands	16,442	33,637	69,833	43,548	131,420	157,913
Poland	9,733	12,857	30,230	24,687	43,482	52,631
Portugal	11,648	19,676	42,925	35,073	95,385	113,477
Romania	5,036	4,855	9,502	12,499	16,446	18,416
Slovakia	3,272	2,306	5,003	7,345	8,078	9,400
Slovenia	2,842	2,227	4,389	7,516	8,634	9,751
Spain	21,633	77,592	159,636	70,410	359,825	419,895
Sweden	7,682	10,198	20,391	20,212	39,315	45,462
UK	18,892	50,660	110,605	55,276	203,503	255,219

Notes: This table gives the number of exporters, importers, exporter-importer pairs, exporter-HS6 product pairs, importer-HS6 product pairs, and importer-exporter-HS6 products triplets involved in a given bilateral trade flow. The data are for 2007 and are restricted to transactions with recorded CN8-products.

Table A2 – Number of buyers per seller across destination countries

	Mean	Median	p75	Sh. with 1 buyer
	(1)	(2)	(3)	(4)
Austria	2.3	1	2	67%
Belgium	4.3	1	3	54%
Bulgaria	1.2	1	1	87%
Cyprus	1.3	1	1	82%
Czech Republic	1.4	1	1	79%
Denmark	2.2	1	2	68%
Estonia	1.2	1	1	87%
Finland	1.7	1	2	74%
Germany	5.0	1	3	55%
Greece	2.2	1	2	68%
Hungary	1.3	1	1	82%
Ireland	2.6	1	2	67%
Italy	5.0	1	3	59%
Latvia	1.2	1	1	87%
Lithuania	1.3	1	1	83%
Luxembourg	1.8	1	2	70%
Malta	1.2	1	1	87%
Netherlands	3.3	1	2	61%
Poland	1.7	1	2	74%
Portugal	2.8	1	2	67%
Romania	1.3	1	1	81%
Slovenia	1.3	1	1	82%
Slovakia	1.3	1	1	85%
Spain	4.2	1	3	59%
Sweden	2.0	1	2	67%
United Kingdom	3.9	1	3	59%
Across countries	12.6	2	8	39%

Notes: Columns (1)-(3) respectively report the mean, median, and third quartile number of buyers per seller in each destination. Column (4) gives the share of sellers having a unique buyer. A seller is defined as an exporter-HS6 product pair. The data are for 2007 and are restricted to transactions with recorded CN8-products.

Chapter 3

Building a customer base under liquidity constraints

This chapter is co-authored with Paul Beaumont (Paris-Dauphine).

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 on 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. Further, we provide evidence that liquidity constraints prevent firms from reaching out to new customers, but not from competing on prices. As a result, the presence of liquidity constraints dampens the ability of firms to trade with distant customers and to sell differentiated products.

JEL codes: F14, G31.

Key words: liquidity constraints, customer capital, search costs, trade credit.

3.1 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 et al. (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.[1] 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.[2] Since a customer base cannot be pledged as collateral, firms are likely to face financial constraints when trying to meet 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.[3] By 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.[4]

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

[1] 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.

[2] Clark et al. (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 et al., 2009).

[3] 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.

[4] The economic literature (e.g., Bagwell (2007)) traditionally distinguishes between the "persuasive" (i.e., altering 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.

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. By 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.[5,6] 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.[7] 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, leading to a potential permanent increase in cash holdings of up to 9% from the pre-reform mean.[8]

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 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

[5]We refer to contractual payment limits as "payment terms", and to the time it actually takes for customers to pay as "payment periods".

[6]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.

[7]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.

[8]The average turnover of firms in our sample is 14,6 million euros, which means that a three-days decrease in payment periods unlocks 3/365*14,6 = 0.12 million euros. This represents approximately 9% of average cash holdings, and 1% of average total assets.

the existing customer base. Specifically, our "shift-share" instrument for the variation of 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. By 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.[9] 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 of 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 of 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 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. 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

[9]This type of strategy is also called a Bartik instrument in reference to Bartik (1991). Adão et al. (2019) and Borusyak et al. (2018); Goldsmith-Pinkham et al. (2018) respectively analyze the challenges to inference and identification in shift-share designs. We discuss these issues extensively in section 3.4.

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.[10] 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 by 1.5 percentage points.[11] 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.[12] Second, we run pre-reform covariate balance tests

[10]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.

[11]To limit the role of outliers, we measure export growth using the mid-point growth rate à la Davis et al. (1996).

[12]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.

and find no evidence of pre-trends in export growth. Third, cross-sectional heterogeneity tests to 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 look in an alternative identification strategy at the effects of the reform on the variation of 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 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. By 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.[13] 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 on 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.

[13]For instance, Bernard et al. (2019a) 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.

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 start by looking at 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 marketing expenditures separately, we find by 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%.[14] These findings suggest that liquidity frictions do not limit the ability of firms to compete on prices, but rather to match with new customers through advertising.

We then exploit the type of markets targeted by firms after the relaxation of liquidity constraints. First, looking at 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 the quality is more difficult to establish ex ante or more relationship-specific (Rauch, 1999; Martin et al., 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 et al., 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 allows alleviating informational frictions to trade with new customers (e.g, Chaney (2014))

[14]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 effect on purchases of external services is completely driven by advertising costs, the 1.3% rise would correspond to a 12% increase in advertising expenditures.

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 such as price levels (Phillips, 1995; Chevalier, 1995b; 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).[15] This paper contributes in three ways. First, we provide 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 et al., 2016; Bernard et al., 2019b), life-cycle growth (Foster et al., 2016; Moreira, 2016; Fitzgerald et al., 2016; Atkin et al., 2017; Sedláček and Sterk, 2017; Eslava and Haltiwanger, 2019; Maksimovic et al., 2019), or stock returns (Gourio and Rudanko, 2014; Dou et al., ming). 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.[16] Existing research that investigates the determinants of the formation 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 et al., 2019) or transportation systems

[15] More broadly, the literature in corporate finance has also investigated how financial factors shape industry structure (Brander and Lewis, 1986; Chevalier, 1995a; 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).

[16] An exception is Dou et al. (ming) 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.

(Duranton et al., 2014; Donaldson, 2018; Bernard et al., 2019a). 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 et al., 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.

3.2 Institutional and theoretical background

3.2.1 The reform

Faced with a general increase in payment periods across European economies, the European Union called in the early 2000s on the member countries to take action against what was considered to be 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 indicative and rarely applied in practice. Acknowledging the limitations of the 2001 law, the French government enacted in 2006 a reform capping contractual payment terms to thirty days in the trucking sector (see Barrot (2016) for more details). The cap on payment terms was then extended to any transaction involving French firms, regardless of the sectors they were operating in. This extension was part of a broader package of reforms called "Law on the

Modernization of the Economy" approved by the French assembly in 2008.[17]

The reform prohibited firms as of January 1st, 2009 from agreeing on contractual payment terms exceeding sixty days after reception of the invoice (or 45 days following the end of the month).[18] The government ensured that the reform was implemented by introducing large sanctions for non-complying firms and by urging the French competition authority to conduct regular audits.[19] Some sectors were exempted from the cap on payment terms as lawmakers were concerned that the reform might have been impractical or detrimental to the economic activity. The complete list of derogations is displayed in appendix II. 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 as exporters could choose to contract under the trade code of the foreign customer or the CISG international trade code.[20]

To illustrate the reform and its implementation, Figure A.1 displays the evolution of payment periods between 1999 and 2012 (the datasets and the construction of the measures are described in section 4.2). The introduction of the reform is correlated with a sharp decrease in payment periods for firms operating mainly in the domestic market, from around 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 the law has largely been anticipated (ODDP, 2009). Professional organizations had been made aware of the new law since they took part in its design. Moreover, French firms are required by the 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 year to come. To comply with the

[17]The Law of 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 or the removal of regulatory hurdles to apply for public procurement contracts. More importantly, the law facilitated price discrimination between suppliers and customers. These measures, however, are not a concern for identification. Indeed, the payment periods reform is the only one relying on a specific payment periods threshold. Consequently, the exposure of firms to the payment periods reform through their distance to this threshold is unlikely to be correlated with the other LME measures.

[18]Importantly, asking suppliers to delay their invoices is considered as an abusive practice and is subject to important sanctions.

[19]Contractual payment terms exceeding the legal limit must be reported to public authorities by firms' accounting auditors. Penal procedures can be initiated in case of a violation and may result in a 75,000 euros fine. Non-complying firms are subject to civil sanctions amounting 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).

[20]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 more details (in French)

reform as of January 1st, 2009, therefore, firms had in principle to apply the new rules in 2008.

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

3.2.2 Trade credit provision and liquidity constraints

Should 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 answer to liquidity frictions affecting customers.[21] The different theories based on this idea predict that trade credit flows from large, creditworthy suppliers to small and financially constrained customers.[22] Consistently 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.[23]

[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 et al., 2012; Fabbri and Klapper, 2016).[24] Murfin and Njoroge (2015) shows that the provision of trade credit depletes small firms' internal funds, leading them to cut back capital expenditures. Looking at an early implementation of the reform in the trucking sector in 2007, Barrot (2016) finds that long payment periods

[21] Ng et al. (1999) estimate the cost of trade credit to be as high as 44% in annualized terms.

[22] 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 a greater ability to screen customers (Smith, 1987; Biais and Gollier, 1997), to prevent fund diversion (Burkart and Ellingsen, 2004; Cunat, 2007) or to liquidate intermediate goods (Long et al., 1993). Providing trade credit to customers is optimal from the point of view of suppliers as it allows to increase total sales.

[23] See also Restrepo et al. (ming) for evidence of increased reliance on accounts payable in the face of an adverse shock on short-term bank financing.

[24] Anecdotal evidence suggests that the financial gains at stake are massive for high bargaining power firm. 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 et al., 2016).

raises firms' exit rate (corporate defaults) and lowers the number of new entrants in the industry.[25] Under this view, 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 A.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 hard to reconcile with the first view of trade credit.[26] 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 3.5 by estimating how the cap on payment terms affected firms' cash holdings and credit lines drawdowns.

Of course, the cap on payment terms might have additional effects than just increasing liquidity availability for suppliers, 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 a direct effect on the ability of treated firms to attract or keep 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 can offer to their international clients.

[25]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 largely limited to big firms. High costs or a lack of visibility are the main obstacles put forward to explain the low penetration of this type of short-term financing (Garcin and Charpin, 2013).

[26]There is, however, a "third" view of trade credit that is compatible with high bargaining-power firms receiving trade credit and that would predict a negative effect of the reform. Giannetti et al. (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 so as 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 et al., 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 3.5.3 for more details.

3.3 Data and summary statistics

3.3.1 Data

We use firm-level datasets coming respectively from the 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 custom 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 of product), the value of the shipment and the quantity of products sold. On average, 85% of French exports in value are 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 intermediate 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 the one 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 is 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 both at both time t and $t-1$ (*stable* customer), trades at time t but not at time $t-1$ (*new* customer), or trades at time $t-1$ but not at not at time t (*lost* customer). To measure exports growth, we use the "mid-point" growth rate

introduced by Davis et al. (1996) as it is conveniently bounded and define export growth as:

$$\begin{aligned}\Delta Exports_{f,m,t} &= \frac{2 * (Exports_{f,m,t} - Exports_{f,m,t\text{-}1})}{(Exports_{f,m,t} + Exports_{f,m,t\text{-}1}} \\ &= \frac{2 * (Exports^{S}_{f,m,t} - Exports^{S}_{f,m,t\text{-}1})}{(Exports_{f,m,t} + Exports_{f,m,t\text{-}1}} + \frac{2 * (Exports^{N}_{f,m,t} - Exports^{L}_{f,m,t\text{-}1})}{(Exports_{f,m,t} + Exports_{f,m,t\text{-}1}} \\ &= \Delta Stable\ customers_{f,m,t} + \Delta Customer\ base_{f,m,t}\end{aligned} \tag{3.1}$$

where the subscripts S, N and L respectively denote stable, new and lost customers.[27] This decomposition allows us to separate the contribution to export growth of the variation of sales to existing customers ($\Delta Stable\ customers_{f,m,t}$) from the role of the evolution of the customer base ($\Delta Customer\ base_{f,m,t}$).[28]

The extensive margin is analyzed through the lens of the variables $Entry_{f,m,t}$ and $Exit_{f,m,t}$ which are respectively 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) in country m at time $t-1$.

Tax returns 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 sectors (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 inferior to €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 brings us to keep approximately 480,000 firms selling in 363 sectors. To correct for reporting errors, we systematically replace outliers of all variables by missing values.[29]

Transaction-level payment information is not reported in our dataset. Instead, we rely on balance sheet

[27] Our results are entirely robust to using the standard growth rate, but we have to take into account the presence of very large values of the variation of international sales. See Table A10 of the online appendix.

[28] We focus on export growth conditional on survival. Namely, we record $\Delta Exports_{f,m,t}$ only when firm f exports in m both at time t and $t-1$.

[29] We define an outlier as an observation that is superior (resp. inferior) to 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.

statements to compute a firm-level measure of the time taken to collect payment from customers:

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

$Accounts\ receivable_{f,t}$ gives the amount of sales that customers of firm f still haven't paid at time t. The ratio is multiplied by 36.5 so that the unit of the variable is the ten days. $Payment\ periods_{f,t}$ 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.[30]

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, high payment periods appear mostly in heavy industries. By contrast, low payment periods are observed nearly exclusively for food processing firms. This is consistent with the prediction of Long et al. (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 account payable) are evenly distributed over the fiscal exercise. The instrumentation method described in the next section explicitly deals with this issue.

EAE survey. To identify precisely 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 firms in each 5-digit sector.[31] 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.

[30]The source of identification in the baseline empirical strategy comes from a 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.

[31]The firm-level sector code available in the tax returns corresponds to the sector in which the firm realizes the most of its activity.

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.[32] 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).

3.3.2 Summary statistics

The baseline sample is restricted to firms present in the intersection of the customs, EAE survey and tax returns datasets. Detailed summary statistics and descriptions of the construction of variables are given in A2. The dataset contains about 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 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. Account receivables represent 20% of total assets, and cash holdings 8%. About 40% of firms do not have long-term debt, with an average ratio of long-term debt to total assets of 4%.

The average firm in our dataset exports €9 million in 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 about 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 of 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

[32]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.

importer is associated with a higher likelihood of multiple transactions as well as with a higher transaction frequency.

3.4 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 as the reform was enacted in the middle of the global 2008 financial crisis. Figure A1 on 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 drop 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 in 80 days before the reform should have been 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

$$\textit{Distance to 60-day rule}_f = \max(0, \textit{Payment periods}_f - 60)$$

The maximum operator captures the fact that only firms that were facing 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 low 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 et al., 1999). A first reason is that most trade credit determinants emphasized in the literature are homogeneous at the sector-level.[33] 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 mostly present in sectors with high pre-reform average payment periods should be highly exposed to the reform.

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

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

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

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

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.[34] 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 dealing with 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 of payment periods (see subsection 4.2.1). In particular, by computing the average value of $\textit{Payment periods}_f$ 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.[35] This removes any potential mechanical link between the evolution of the rate of payment collection and export

[33] Among them one can mention the degree of product market competition (Brennan et al., 1988), the degree of uncertainty on the quality of the product (Long et al. (1993) and Lee and Stowe (1993)) and the information advantage of suppliers over banks to observe product quality or to enforce high effort (Smith (1987), Biais and Gollier (1997), Burkart and Ellingsen (2004) or Cunat (2007)).

[34] The main sector of activity is observable for all French firms; the average distance is therefore computed using information on over 400 thousands companies. Sectors with less than 10 non-exporting firms are discarded.

[35] Computing the average on the population of non-exporting firms may be too restrictive as a significant proportion of companies report low export sales.

activity. The construction of the instrument, moreover, intentionally ignores the derogations introduced by the law (see section 3.2.1). Indeed, these exceptions might have been implemented because of some unobservable factors that could be related to export performance. Introducing the derogation in the computation of $\overline{\textit{Distance to 60-day rule}_{f,07}}$ would in that case compromise the validity of the instrument.[36]

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

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

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

$$\begin{aligned} Y_{f,m,t} &= \alpha_f + \gamma_{m,t} + \beta_1 \cdot \Delta \textit{Payment periods}_{f,t} + \beta_X \cdot X_{f,t} + \epsilon_{f,m,t} \\ \Delta \textit{Payment periods}_{f,t} &= \delta_f + \eta_{m,t} + \theta_1 \cdot \overline{\textit{Distance to 60-day rule}_{f,t}} + \theta_2 \cdot X_{f,t} + \nu_{f,m,t} \end{aligned} \tag{3.2}$$

where $Y_{f,m,t}$ is an exporting variable, α_f and δ_f are firm fixed effects,$\gamma_{m,t}$ and $\eta_{m,t}$ are country-year fixed effects and $X_{f,t}$ 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 et al. (2018), two conditions are required for the shift-share variable to be considered as 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 big enough to influence sectoral payment conditions. This concern, however, is mitigated by the fact that we take a simple average of payment periods within a sector and that we only keep sectors in which we observe at least ten firms (a sector contains on average 1003 firms).[37]

[36]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*).

[37]Our results are broadly unaffected by changes of the definition of $\overline{\textit{Distance to 60-day rule}_{f,07}}$ such as using weighted averages in the computation of $\textit{Distance to 60-day rule}_{s,07}$ 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 conclude to a significant positive correlation between the variation in payment periods and export activity. In our baseline specification, we take advantage of the disaggregated nature of export data and introduce country-year fixed effects. Our estimations, therefore, are based on the 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 in 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. Lastly, we exploit the time dimension of the dataset to include firm fixed effects to remove the influence from time-unvarying 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 3.6.1. 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 instrument variable 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 determinant of exports, by including $log(Total\ Assets)_{f,t-1}$ and $Labor\ productivity_{f,t-1}$ (defined as the ratio

value-added to the number of employees) in the set of control variables. Lastly, 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 et al. (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.

3.5 Effects of the reform on access to liquidity

3.5.1 Payment periods

Figures A.3 and A.4 give a graphical representation of the relationship between the instrument and the variation of payment periods.[38] The x-axis in both graphics is constructed the following way:

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

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 rule. In Figure A.3, the y-axis represents the evolution of firm-level payment periods between 2007 and 2009. Firms exposed to payment periods from customers below 60 days in 2007 experienced only a small decrease in payment periods after the implementation of the reform. By contrast, there is a large and significant negative correlation between $\overline{Payment\ periods}_{f,07}$ and $\Delta Payment\ periods_{f,07\text{-}09}$ when average pre-reform payment periods exceed 60-day. This indicates that our estimation method correctly detects the effects of the 60-day rule on the variation of payment periods. Furthermore, Figure A.4 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 A.3 indeed reflects the effects of the implementation of the reform.

[38] In both figures, the sample is split in 100 percentiles along the x-axis; the ordinate axis display the average value of the y variable in each percentile.

[Insert Figures A.3 and A.4 here]

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

$$\Delta Payment\ periods_{ft} = \mu_f + \rho_t + \pi_1 \cdot \overline{Distance\ to\ 60\text{-}day\ rule}_{f,t} + \pi_X \cdot X_{f,t} + \xi_{f,t} \tag{3.3}$$

Note that this step is not formally equivalent to an estimation of the first stage of equation 3.2 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 3.1 here]

Table 3.1 displays the results of the different specifications. The coefficient π_1 is negative and significant at the 1% level in all columns: the 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 day of customer payment periods per year.

3.5.2 Capital structure

We study in this subsection how firms adjust their capital structure following the change in payment periods. Specifically, we look at the evolution induced by the drop in customer payment periods of financial characteristics related to short-term financing (working capital needs, cash and drawn credit lines) and long-term bank debt.[39] All variables are computed as a ratio to total assets. The specification includes controls, firm, and year fixed effects.

[Insert Table 3.2 here]

The F-stats reported at the bottom of Table 3.2 are well above the recommended value of 10 (**?**), which, in line with Table 3.1, 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% compared to the pre-reform mean. Firms more

[39]The leverage measure is accordingly removed from the set of control variables in this subsection.

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.[40] Overall, the results of Table 3.2 support the hypothesis that the reduction of payment periods from customers mitigated liquidity constraints.

Figure A.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 $1(\textit{Distance to 60-day rule} > \textit{Median})_f$ with time and regressing the share of cash holdings in total assets on the interacted variable. The regression includes control, 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 has been partially anticipated, and that the reduction in payment periods permanently increased cash holdings (see section 3.2.1).

3.5.3 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. At the same time, 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 keep benefiting from more advantageous payment terms. Under this hypothesis, a positive impact of the reform on export may only reflect the presence

[40] 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.

of firms redirecting their activity to international markets in response to the cap of 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 3.3.

[Insert Table 3.3 here]

The regressions of domestic sales on the variation of payment periods (first part of the hypothesis) yield a positive but not statistically 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 faced with 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.[41] 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 of the same sector of activity could ask for a three-years derogation to the 60-day rule (see Appendix II for the list of sectors). Firms present in sectors in which the reform could have severely disrupted domestic trade relationships (e.g., sectors with a 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.

[41]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.

3.6 Building a customer base under liquidity constraints

3.6.1 Export growth

Table 3.4 displays the results of the estimation of the effects of the reform on export growth (Panel A) as well as on exit and entry dummies (Panel B and C).[42] In each panel, the first column gives the estimates of the OLS regression of equation 3.2 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 3.4 here]

The OLS regressions indicate a positive association between exports and the variation of 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 et al., 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 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%). Put otherwise, a standard-deviation shock brings the median exporter to the top 5% of the most dynamic exporters.

[Insert Figure A.5 here]

[42] Note that by construction, the size of the estimation sample changes with the dependent variable (see subsection 4.2.1).

Figure A.5 breaks down the effects of the variation of payment periods on export growth over time.[43] 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 of payment periods on export growth could potentially be explained by a better export performance of firms more exposed to the reform during the crisis. For instance, firms more exposed to the reform may offer products for which the demand decreased less during the trade collapse. Looking at the relative performance of firms during the financial crisis enables to test this hypothesis. Third, analyzing the dynamics of the effects after the reform is informative as it allows to understand how firms react to a permanent shock on cash holdings. As in Figure A.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 $1(\textit{Distance to 60-day rule} > \textit{Median})_f$ interacted with time. The regression includes controls, country-year and firm fixed effects.

[Insert Table 3.5 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 the hypothesis of the presence of 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 reform did not export more in 2008-2009, which clearly shows that our results cannot be explained by a better performance during the financial crisis of firms more distant to the 60-day threshold. The presence of a gap between the effects of the reform on cash holdings (Figure A.4) and export growth (Figure A.5), then, 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 base. The breakdown over time of the effects of the reform on proxies of marketing in section 3.7.2 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.

[43] In the following of the analysis, we focus on the effects of the reform on export growth (intensive margin).

3.6.2 Expansion of the customer base

In this subsection, we look at 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 of payment periods should affect both sales to existing and new customers (Bernard et al., 2019a). A pure investment in the expansion of the customer base, by contrast, should only have effects on sales to new customers.

Using equation 4.1 in columns 1 to 3 of Table 3.5, we decompose export growth into a component capturing the variation of exports to existing customers (Δ*Stable customers*$_{f,m,t}$) and another one reflecting the evolution of the customer base (Δ*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 of columns 4 and 5 indicates that approximately two thirds of the effects on Δ*Customer base*$_{f,m,t}$ is explained by an increase in the acquisition of new customers and one third to a higher rate of retention of existing customers (the *Lost customers*$_{f,m,t}$ coefficient, however, is not statistically significant).

[Insert Table 3.6 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 other mechanisms than firms investing in the formation of a demand for their products. First, firms could have simply started selling more products, which may attract new customers. In the first three columns of Table 3.6, 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.[44]

Second, the reform may have allowed firms to expand their production capacity. This would enable 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 3.6, by sorting firms over 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, as they do not have additional units of production 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 lead average sales per customer to rise, as an increase in quality holding production costs fixed should result in higher trade volumes (Khandelwal, 2010). In columns 1 and 2 of Table 3.7, we show that neither average sales per customer nor average sales per new customer increase following the reform, which allows ruling this third and last alternative mechanism.

[Insert Table 3.7 here]

The absence of effect on average sales, moreover, suggests that firms do not target specific customers when expanding their customer base.[45] 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 ones. The expansion of the customer base, therefore, is associated with a marked reduction in sales concentration across customers (column 5).[46] Using the Herfindahl index of sales across customers in a given country m, we estimate that a standard-deviation liquidity shock lowers sales concentration by 2.3% from the pre-reform mean.

[44] In this table, we define a product as an 8-digit code from the harmonized Combined Nomenclature.

[45] 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.

[46] 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.

3.6.3 Robustness checks

The identifying assumption underlying our instrumentation strategy is that the exposure to the reform $\overline{\textit{Distance to 60-day rule}_{f,t}}$ only has effects on exports through its impact on the variation of payment periods. The exposure to the reform, however, 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 3.8 presents the estimation of the reduced form equation based on the equation displayed in section 3.6.1. In the reduced form specification, the variation of payment periods is not instrumented but directly replaced by $\overline{\textit{Distance to 60-day rule}_{f,t}}$, the ex-ante exposure to the reform.[47] 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.[48]

[Insert Table 3.8 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 III and IV 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 of payment periods on exports is reassessed using different levels of aggregation (firm, firm-year). Third, we test several alternative methods of construction of 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.

[47] 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.

[48] Note that in the reduced form specification, the $\overline{\textit{Distance to 60-day rule}_{f,t}}$ coefficient is positive, as an increase in the ex-ante exposure to the reform is associated with higher export growth.

It could then be objected 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 looking at the effects of the variation of payment periods in *net* terms. As both payment periods from customers and to suppliers decreased all the more following the reform than 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 customers were 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.

3.6.4 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 start by looking at the role of financial constraints (see section VI 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 et al. (2004)), we proxy the intensity of financial constraints by the size of the firm (measured by the volume of total sales), the ratio of cash holdings over assets and of long-term debt over assets. We also draw on Bates et al. (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 3.9 here]

Table 3.9 presents the estimations of the effects of the reform on export growth on 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, firms with low levels of cash, high levels of debt and exhibiting high idiosyncratic risk. Combined with the results of Table 3.2, this finding strongly supports the idea that the decrease in payment periods spurs export growth by easing the access to short-term financing of liquidity-constrained firms.

[Insert Table 3.10 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 hurt by disadvantageous payment terms (Klapper et al. (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 their 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 fall in payment periods, while dominant firms appear largely unaffected (columns 3 and 4).

3.7 Liquidity constraints and informational frictions

3.7.1 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.[49] We confront this hypothesis to data by looking at how product prices reacted to the variation of payment periods. The tested hypothesis predicts that we should observe a positive relationship between the variation of payment periods and the evolution of prices. To test for this prediction, exports are aggregated at the level of a product p (defined as an 8-digit item of the Combined Nomenclature)[50], 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

[49] 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 lower current cash-flows, it attracts customers which ultimately results in higher future expected profits. As liquidity-constrained firms value more current profits, they charge higher prices and, therefore, invest less in customer capital.

[50] We harmonize the product nomenclature over time following the procedures of Pierce and Schott (2012) and Bergounhon et al. (2018).

$$\Delta Price_{f,m,p,t} = \kappa_f + \chi_{m,p} + \psi_t + \zeta_1 \cdot \overline{Distance\ to\ 60\text{-}day\ rule}_{f,t} + \zeta_X \cdot X_{f,t} + \upsilon_{f,m,p,t} \tag{3.4}$$

where κ_f and ψ_t denote firm and year fixed-effects and $\chi_{m,p}$ is a country-product dummy[51]. The regression is estimated using the reduced form specification. $\Delta Price_{f,m,p,t}$ is measured in growth rates.[52]

[Insert Table 3.11 here]

Table 3.11 presents the results of the estimations. We find no evidence of a statistical link between the variation of 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 hiding some heterogeneous patterns between customers. In particular, it could be that firms raise prices with their new customers but simultaneously lower prices with their existing customer base. We look therefore separately at the evolution of prices for existing and new customers:

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

with S standing for stable customers and N for new customers as in subsection 4.2.1. Columns 2 and 3 show the results of the regression of prices charged to existing and new customers on the variation of payment periods. We find the coefficient of the variation of 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 3.12 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 of payment periods. We look at the price dynamics separately for homogeneous and differentiated products following the Rauch (1999) classification and check whether prices react more to the liquidity shock for

[51] Introducing country-product fixed effects $\chi_{m,p}$ allows to control for "pricing-to-market" patterns; see Drozd and Nosal (2012) for instance on the subject.

[52] We remove the influence of outliers by dropping the bottom 5 % and top 5% of unit values growth rates. Our results are entirely robust to alternative standard measures of the evolution of prices.

homogeneous products.[53] We do not find any significant effect of the reform on prices in both columns, indicating that firms do not rely on differentiated price strategies across products (columns 4 and 5).

3.7.2 Evidence of investment in marketing

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 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 the customer base.

[Insert Table 3.13 here]

In Table 3.12, we use the firm-level specification presented in section 3.5, to assess the reaction of the number of workers and hours worked to the decrease in payment periods. More precisely, we look at 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.[54] 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 U.S. government had positive employment effects. The fact that our reform took place in the middle of the financial crisis probably encouraged firms to turn to external service providers for their marketing activities rather than hiring sales workers.

[Insert Figures A.6 and A.7 here]

[53]Moreover, unit values better proxy prices of homogeneous products, as for differentiated products, a change in unit values can both reflect a change in quality or in price.

[54]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 to the positive effects of the reform on the export growth is that firms more 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.

In Table 3.13, we proxy investment in marketing by purchases of external services and the share of intangible assets in total assets. Purchases of external services total are defined as the sum of outsourcing expenses (39%), advertising costs (11%), travel and transportation costs as well as external R&D costs (50%).[55] 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 an increase in advertising by 12% if the increase was 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 in intangible assets over total assets by 3.6% from its pre-reform mean (column 4). Taken together, these results strongly suggest that the relaxation of liquidity constraints lowered the costs of financing the acquisition of new customers through marketing.

The results of subsections 3.5.2 and 3.6.1 show that firms did not immediately start 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 in 2008-2009 financial crisis and instead waited for the economic situation to improve. Figures A.6 and A.7 confirm this hypothesis. The graphs show that firms more exposed to the reform (i.e., distance to the 60-day threshold higher 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.

3.7.3 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 VI of the Appendix for a more detailed discussion). In this subsection, we compare the

[55]The decomposition of the different items composing total purchases of external services is only available in 2007.

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.[56]

[Insert Table 3.14 here]

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 start by comparing the effects of the reform across products. We rely on the classification of products established by Rauch (1999) to build a first proxy of informational frictions. Products are labeled as "homogeneous" if they are traded on an organized exchange (*e.g.*, cereals) or reference priced (*e.g.*, construction materials) and "differentiated" otherwise. We think of this measure as a proxy for search costs. Rauch shows that when products are differentiated, geographical proximity, as well as cultural ties have a stronger impact on bilateral country-level trade volumes as 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 the way product markets are organized. We turn to that end to the "relationship stickiness" index recently introduced by Martin et al. (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 think of this measure as a proxy for relationship specificity. A more precise description of the construction of the variable is available in section V of the Appendix.

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

$$\begin{aligned}\Delta Exports_{f,m,p,t} = \dot{\alpha}_{f,m,t} + \dot{\gamma}_p + \dot{\beta}_X \cdot X_{f,t} + \dot{\beta}_1 \cdot \overline{Distance\ to\ 60\text{-}day\ rule}_{f,t} \\ + \dot{\beta}_2 \cdot 1(Differentiated)_p \times \overline{Distance\ to\ 60\text{-}day\ rule}_{f,t} + \dot{\epsilon}_{f,m,t}\end{aligned} \tag{3.5}$$

This specification differs from equation 3.2 in two important ways. First, we use the reduced form in order

[56]By convenience, we come back in the following to the setting of Table 3.8 and define a product as 4-digits product code of the harmonized Combined Nomenclature. Our results are however robust to changing the product classification or the unit of aggregation.

to flexibly assess how the impact of the reform varies across products.[57] The difference in sensitivity of exports of differentiated products to the liquidity shock is captured by the $\dot{\beta}_2$ coefficient. Second, we use firm-country-year fixed effects instead of firm fixed effects. This specification is more demanding as the coefficients are identified by the comparison of export dynamics across products, *within firms and countries*.[58]

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 the positive effects of the liquidity shock on exports is are completely driven by exports of 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 3.15 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 to find trade partners in the same network. Importers that have already traded with French firms, therefore, should be easier to reach.[59] Every year, we identify new buyers that have never interacted with a French exporter before ("non-connected" firms) [60] and compute the growth rate of exports to connected and non-connected buyers. Table 3.15 show that exports to non-connected firms increase more following the enactment of the reform, confirming that informational frictions are the main obstacle firms face to expand their customer base.

[Insert Table 3.16 here]

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 compare therefore the effects

[57] Interacting the endogenous regressor with product variables in the 2SLS specification would require to add additional instruments in the first stage.

[58] 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 higher gap in export growth between homogeneous and differentiated products. The coefficient $\dot{\beta}_2$ should capture this widening within-firm and within-country differential between differentiated and homogeneous products as the exposure to the reform increases.

[59] 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).

[60] The year 2003 is accordingly removed from the analysis.

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 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 reforms across countries, within firms using firm-year fixed effects.

Column 1 of Table 3.16 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 points increase in export growth after the reform. In column 2, we introduce interacted terms but keep firm fixed effects. The estimates show that the average coefficient of column 1 hides 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 of 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.

3.8 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 try to avoid competition by targeting "niche" markets (e.g., differentiated products, remote geographical areas). By contrast, if the main obstacle firms face to acquire 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 on 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 on 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 both at the intensive and extensive margin. Importantly, using the 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. Looking at the effects of the reform on firms' customer acquisition strategy, we find the reduction of payment periods to be associated with sizeable increases in proxies for marketing expenditures. By 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 the 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. Put otherwise, 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.

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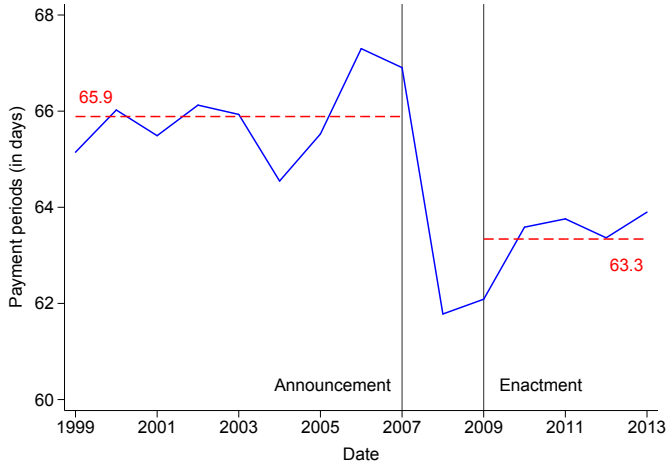
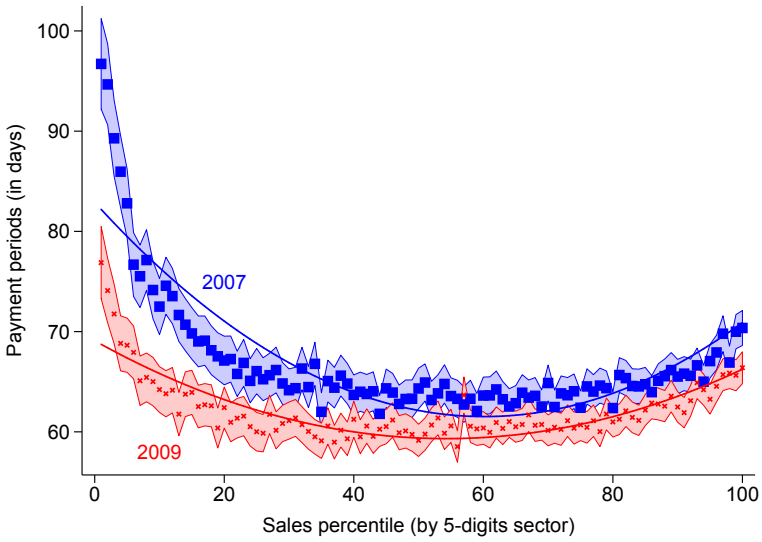
Figures and tables

Figure A.1 – Payment periods before and after the reform



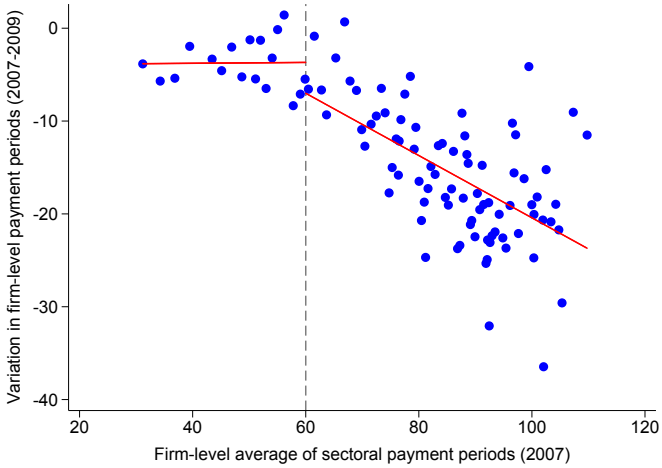
Note: This graph displays the evolution of average payment periods between 1999 and 2013 for the universe of non-financial French firms (agricultural and public firms are excluded from the sample). Payment periods are computed at the firm-level as the ratio of accounts receivable over sales multiplied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

Figure A.2 – Payment periods by firm size



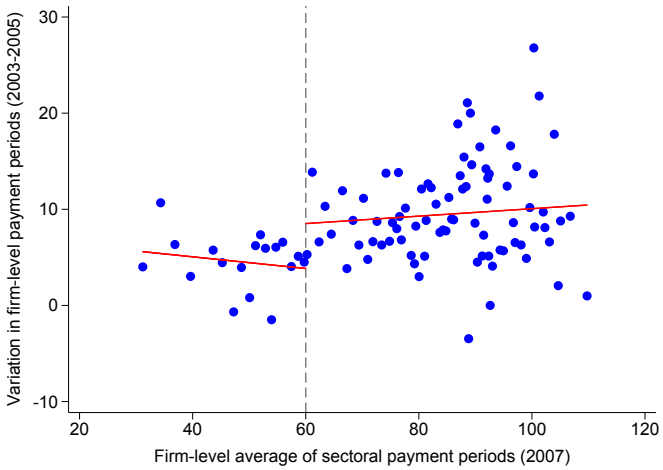
Note: This graph displays average payment periods by firm size in 2007 and 2009 for the universe of non-financial French firms (agricultural and public firms are excluded from the sample). The x-axis gives the percentile of sales computed by sector. A sector is defined as a 5-digit code of the NACE (EU 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 A.3 – Effects of the reform on payment periods



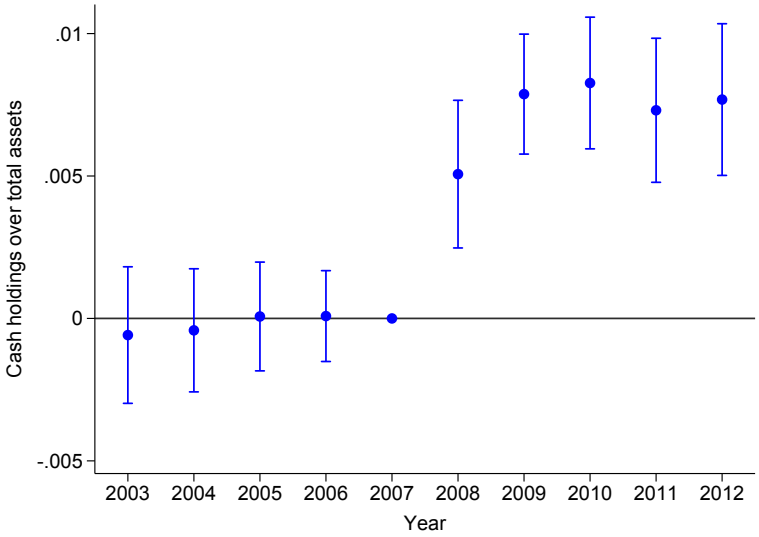
Note: The figures display the evolution of firm-level payment periods between 2007 and 2009 (top figure) and between 2003 and 2005 (bottom figure) as a function of sectoral payment periods faced by firms in 2007. Payment periods are computed as the firm-level ratio of accounts receivable over sales multiplied by 365. The x-axis variable is constructed in two steps. First, we take the average of payment periods in 2007 at the sector-level (a sector is defined as a 5-digit code of the NACE classification). Second, we take the firm-level average of sectoral payment periods weighted by the share of sales realized by the firm in each sector in 2007. The dataset is split in 100 percentiles along the x-axis; the ordinate axis represents the average value of the variation of payment periods in each percentile. The vertical dotted line marks the 60-day threshold.

Figure A.4 – Effects of the reform on payment periods- Placebo



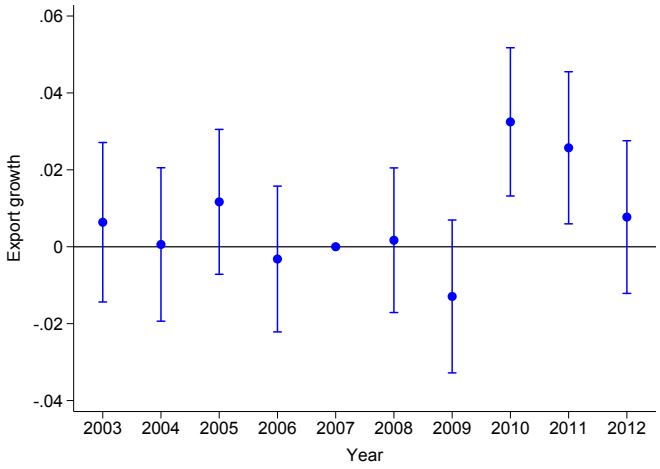
Note: The figures display the evolution of firm-level payment periods between 2007 and 2009 (top figure) and between 2003 and 2005 (bottom figure) as a function of sectoral payment periods faced by firms in 2007. Payment periods are computed as the firm-level ratio of accounts receivable over sales multiplied by 365. The x-axis variable is constructed in two steps. First, we take the average of payment periods in 2007 at the sector-level (a sector is defined as a 5-digit code of the NACE classification). Second, we take the firm-level average of sectoral payment periods weighted by the share of sales realized by the firm in each sector in 2007. The dataset is split in 100 percentiles along the x-axis; the ordinate axis represents the average value of the variation of payment periods in each percentile. The vertical dotted line marks the 60-day threshold.

Figure A.4 – Dynamics of the effects of the reform on cash holdings



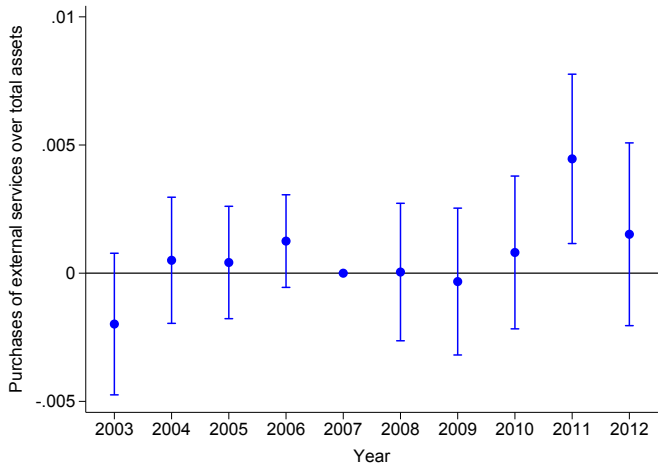
Note: This graph displays the coefficients of the regression of the share of cash holdings in total assets on a dummy $1(\textit{Distance to 60-day rule} > \textit{Median})_f$ interacted with time. The dummy is equal to one when the variable $\overline{\textit{Distance to 60-day rule}}_f$ is higher than 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: $\textit{Labor productivity}_{f,t-1}$ (value-added over the number of employees), $\textit{log(Total Assets)}_{f,t-1}$ (total assets in logarithm), $\overline{\textit{Sales growth rate}}_{f,t}$ (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 A.5 – Dynamics of the effects of the reform on export growth



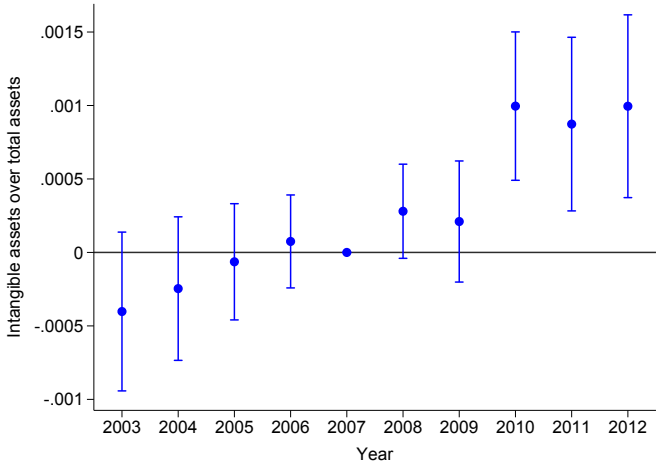
Note: The figure displays the coefficients of the regression of the variation of exports on a dummy $1(Distance\ to\ 60\text{-}day\ rule > Median)_f$ interacted with time. The dummy is equal to one when the variable $\overline{Distance\ to\ 60\text{-}day\ rule}_f$ is higher than the sample median. The 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: $Labor\ productivity_{f,t-1}$ (value-added over the number of employees), $log(Total\ Assets)_{f,t-1}$ (total assets in logarithm), $\overline{Sales\ growth\ rate}_{f,t}$ (sales-weighted average of sectoral growth rates). The regression includes firm and country-year fixed-effects. Standard errors are clustered at the firm-level. The figure displays the 95% confidence intervals.

Figure A.6 – Purchases of external services over total assets



Note: This graph displays the coefficients of the regression of purchases of external services scaled by total assets (top figure) and the share of intangible assets in total assets (bottom figure) on a dummy $1(Distance\ to\ 60\text{-}day\ rule > Median)_f$ interacted with time. The dummy is equal to one when the variable $\overline{Distance\ to\ 60\text{-}day\ rule}_f$ 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: $Labor\ productivity_{f,t-1}$ (value-added over the number of employees), $log(Total\ Assets)_{f,t-1}$ (total assets in logarithm), $\overline{Sales\ growth\ rate}_{f,t}$ (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 A.7 – Purchases of external services over total assets- intangible assets over total assets



Note: This graph displays the coefficients of the regression of purchases of external services scaled by total assets (top figure) and the share of intangible assets in total assets (bottom figure) on a dummy $1(Distance\ to\ 60\text{-}day\ rule > Median)_f$ interacted with time. The dummy is equal to one when the variable $\overline{Distance\ to\ 60\text{-}day\ rule}_f$ 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: $Labor\ productivity_{f,t-1}$ (value-added over the number of employees), $log(Total\ Assets)_{f,t-1}$ (total assets in logarithm), $\overline{Sales\ growth\ rate}_{f,t}$ (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.

Table 3.1 – Effects of the reform on payment periods

	Δ*Payment periods*$_{f,t}$		
	(1)	(2)	(3)
$\overline{\textit{Distance to 60-day rule}}_{f,t}$	−0.112***	−0.091***	−0.115***
	(0.006)	(0.005)	(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 of 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 $\overline{\textit{Distance to 60-day rule}}_{f,t}$. 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), $\overline{\textit{Sales growth rate}}_{f,t}$ (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 3.2 – 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)
Δ*Payment periods*$_{f,t}$	0.022***	−0.014***	0.014***	−0.005
	(0.006)	(0.004)	(0.003)	(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 Δ*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 of payment periods is $\overline{\textit{Distance to 60-day rule}}_{f,t}$. 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), $\overline{\textit{Sales growth rate}}_{f,t}$ (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 3.3 – Effects of the reform on domestic sales and sourcing strategies

	Δ*Domestic turnover*$_{f,t}$		*Import share*$_{f,t}$	
	(1)	(2)	(3)	(4)
Δ*Payment periods*$_{f,t}$	0.020	0.007		
	(0.014)	(0.013)		
Δ*Payment periods (suppliers)*$_{f,t}$			−0.004	−0.005
			(0.027)	(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 of 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 Δ*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 of payment periods is $\overline{\textit{Distance to 60-day rule}}_{f,t}$. 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. The instrumented variable in the last two columns is Δ*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 of payment periods to suppliers is $\overline{\textit{Distance to 60-day rule (suppliers)}}_{f,t}$. The construction of the variable is identical to that of $\overline{\textit{Distance to 60-day rule}}_{f,t}$ 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-term debt/TA*$_{f,t-1}$ (ratio of long-term debt to total assets), $\overline{\textit{Sales growth rate}}_{f,t}$ (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 3.4 – Payment periods and exports

	OLS	2SLS	2SLS
	(1)	(2)	(3)
	Panel A: $\Delta Exports_{f,m,t}$		
Δ*Payment periods*$_{f,t}$	0.012***	−0.057*	−0.053**
	(0.001)	(0.032)	(0.025)
Observations	807,650	807,650	807,650
F-stat	-	32.0	37.7
	Panel B: $Exit_{f,m,t}$		
Δ*Payment periods*$_{f,t}$	−0.001***	0.033**	0.034***
	(0.000)	(0.015)	(0.012)
Observations	939,299	939,299	939,299
F-stat	-	36.1	39.7
	Panel C: $Entry_{f,m,t}$		
Δ*Payment periods*$_{f,t}$	0.001***	−0.004*	−0.005**
	(0.000)	(0.002)	(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 of exports in country m for firms that stay in the country between time 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 Δ*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 of payment periods is $\overline{\textit{Distance to 60-day rule}}_{f,t}$. 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), $\overline{\textit{Sales growth rate}}_{f,t}$ (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 3.5 – 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**	−0.008	−0.045***	−0.032***	0.013
	(0.025)	(0.017)	(0.017)	(0.012)	(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 of exports in country m between time $t-1$ and t, (2) the variation of exports to customers in country m with whom firm f has a trade relationship at $t-1$ and t , (3) the variation of 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 time $t-1$ and t. All the dependent variables are defined only for firms that stay 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 of 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 3.6 – 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	
				$\leq P50$	$> P50$
	(1)	(2)	(3)	(4)	(5)
$\Delta Payment\ periods_{f,t}$	-0.053^{**}	-0.051^{**}	-0.002	-0.033	-0.092^{**}
	(0.025)	(0.021)	(0.011)	(0.030)	(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 of exports in country m between time $t-1$ and t, (2) the variation of exports of products in country m that firm f exported in m both at time $t-1$ and t and (3) the variation of exports of products in country m that firm f exported in m only at time t or $t-1$, (4) and (5) the variation of exports in country m between time $t-1$ and t. All the dependent variables are defined only for firms that stay 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 of 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 of 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), $Long\text{-}term\ debt/TA_{f,t\text{-}1}$ (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. 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 3.7 – Sales per customer, trade duration, and concentration of the customer base

	$log(Exports/customer)_{f,m,t}$		$\%$ *of one-time customers*$_{f,m,t}$		$log(Herfindahl)_{f,m,t}$
Customers:	All	New	All	New	All
	(1)	(2)	(3)	(4)	(5)
$\Delta Payment\ periods_{f,t}$	−0.012	−0.046	−0.001	0.003	0.078***
	(0.052)	(0.061)	(0.005)	(0.014)	(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 customes, (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 $\Delta Payment\ periods_{f,t}$. 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 of 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), $Long\text{-}term\ debt/TA_{f,t\text{-}1}$ (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 3.8 – 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**	−0.001	0.012**	0.007**	−0.005*
	(0.006)	(0.001)	(0.005)	(0.003)	(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 of payment periods. The dependent variables are in the order of the columns (1) the variation of exports in country m between time $t-1$ and t, (2) the variation of exports to customers in country m with whom firm f has a trade relationship at $t-1$ and t, (3) the variation of 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 time $t-1$ and t. 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 $Labor\ productivity_{f,t-1}$ (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 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 3.9 – Heterogeneity I - Intensity of liquidity constraints

	$\Delta Exports_{f,m,t}$							
	Cash/Assets		Debt/Assets		Total sales		Volatility of sales	
	$\leq P50$	$> P50$	$\leq P50$	$> P50$	$\leq P50$	$> P50$	$\leq P50$	$> P50$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ*Payment periods*$_{f,t}$	−0.145**	−0.000	−0.018	−0.081***	−0.084**	−0.029	−0.048	−0.066**
	(0.061)	(0.023)	(0.042)	(0.029)	(0.038)	(0.031)	(0.037)	(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 of exports in country m for firms that stay in the country between $t-1$ and t. The instrumented variable is Δ*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 of payment periods is $\overline{\textit{Distance to 60-day rule}}_{f,t}$. 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), $\overline{\textit{Sales growth rate}}_{f,t}$ (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× 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 3.10 – Heterogeneity II - Exposure to the reform

	$\Delta Exports_{f,m,t}$			
	Import share (2007)		Market share (2007)	
	$\leq P50$	$> P50$	$\leq P50$	$> P50$
	(1)	(2)	(3)	(4)
Δ*Payment periods*$_{f,t}$	−0.039	−0.084*	−0.086**	−0.015
	(0.033)	(0.047)	(0.042)	(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 of exports in country m for firms that stay in the country between $t-1$ and t. The instrumented variable is Δ*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 of payment periods is $\overline{\textit{Distance to 60-day rule}}_{f,t}$. 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), $\overline{\textit{Sales growth rate}}_{f,t}$ (sales-weighted average of sectoral growth rates). $\overline{\textit{Import share}}_{f,07}$ 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× 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 3.11 – Payment periods and product prices

	$\Delta Price_{f,m,p,t}$				
	All	Existing	New	Homogeneous	Differentiated
	(1)	(2)	(3)	(4)	(5)
$\overline{Distance\ to\ 60\text{-}day\ rule}_{f,t}$	0.001	−0.003	0.150	−0.002	0.001
	(0.000)	(0.003)	(0.132)	(0.002)	(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 of 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 in growth rate (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 $\overline{Distance\ to\ 60\text{-}day\ rule}_{f,t}$. 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 $Labor\ productivity_{f,t-1}$ (value-added over the number of employees), $log(Total\ Assets)_{f,t-1}$ (total assets in logarithm), $Long\text{-}term\ debt/TA_{f,t\text{-}1}$ (ratio of long-term debt to total assets), $\overline{Sales\ growth\ rate}_{f,t}$ (sales-weighted average of sectoral growth rates). Regressions include firm, 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 3.12 – Effects of the reform on marketing and non-marketing workers

	$\Delta Number\ of\ workers_{f,t}$			$\Delta Hours_{f,t}$		
	All	Marketing	Not mark.	All	Marketing	Not mark.
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta Payment\ periods_{f,t}$	−0.004	−0.001	−0.003	−0.008	−0.001	−0.006
	(0.009)	(0.003)	(0.009)	(0.009)	(0.004)	(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 of 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-digits occupation code (PCS code). 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 of 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), $Long\text{-}term\ debt/TA_{f,t\text{-}1}$ (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%.

Table 3.13 – Effects of the reform on marketing expenditures

	$Purchases\ of\ external\ services_{f,t}/TA_{f,t}$		$Intangible\ assets_{f,t}/TA_{f,t}$	
	(1)	(2)	(3)	(4)
$\Delta Payment\ periods_{f,t}$	−0.010**	−0.009**	−0.002**	−0.002**
	(0.004)	(0.005)	(0.001)	(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 $\Delta Payment\ periods_{f,t}$. 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 of 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. 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). 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), $Long\text{-}term\ debt/TA_{f,t\text{-}1}$ (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%.

Table 3.14 – 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***	0.001		0.004	
	(0.005)	(0.003)		(0.005)	
$1(Differentiated)_p \times \overline{Distance\ to\ 60\text{-}day\ rule}_{f,t}$		0.017***	0.022***		
		(0.001)	(0.001)		
$Q2\ Stickiness_p \times \overline{Distance\ to\ 60\text{-}day\ rule}_{f,t}$				0.011***	0.008***
				(0.002)	(0.002)
$Q3\ Stickiness_p \times \overline{Distance\ to\ 60\text{-}day\ rule}_{f,t}$				0.016***	0.010***
				(0.002)	(0.002)
$Q4\ Stickiness_p \times \overline{Distance\ to\ 60\text{-}day\ rule}_{f,t}$				0.015***	0.005***
				(0.003)	(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 of payment periods. The dependent variable is the variation of 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. superior) to 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 et al., 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), $\overline{Sales\ growth\ rate}_{f,t}$ (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%.

Table 3.15 – Connected and non-connected customers

	$\Delta Exports\ (non\text{-}connected\ customers)_{f,m,t}$		$\Delta Exports\ (connected\ customers)_{f,m,t}$	
	(1)	(2)	(3)	(4)
$\Delta Payment\ periods_{f,t}$	−0.141**	−0.134***	−0.036	−0.041*
	(0.056)	(0.051)	(0.027)	(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" 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 of 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), $Long\text{-}term\ debt/TA_{f,t\text{-}1}$ (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 3.16 – 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**	0.036***	
	(0.002)	(0.002)	
$Q2\ Market\ share_{f,m,07} \times \overline{Distance\ to\ 60\text{-}day\ rule}$		−0.017***	−0.020***
		(0.001)	(0.001)
$Q3\ Market\ share_{f,m,07} \times \overline{Distance\ to\ 60\text{-}day\ rule}$		−0.035***	−0.045***
		(0.001)	(0.002)
$Q4\ Market\ share_{f,m,07} \times \overline{Distance\ to\ 60\text{-}day\ rule}$		−0.041***	−0.057***
		(0.002)	(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 of payment periods. The dependent variable is the variation of exports in country m for firms that stay in the country between time 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

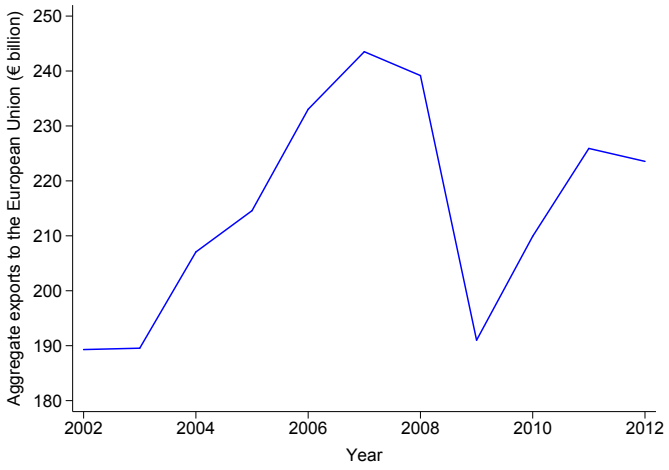
I Descriptive statistics

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



Note: The figure displays the value of aggregate exports of French firms to the European Union between 2002 and 2012 (source: customs data).

Table A2 – Description of the dataset

Panel A: Definitions of the variables	
Export variables	
$1(Differentiated)_{f,m,p,t}$	For this variable, a product p is defined as a 4-digit code of the harmonized Combined Nomenclature (CN) product classification. 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. superior) to the median. *Source: Customs.*
$\%$ *of one time customers*$_{f,m,t}$	Fraction of total sales of firm f at time t realized with customers with which firm f only trades at time t *Source: Customs.*
$\Delta Customer\ base_{f,m,t}$	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 $t-1$). *Source: Customs.*
$\Delta Exports_{f,m,t}$	Variation of the amount of exports (in mid-point growth rate) of firm f in country m between t and $t-1$ conditionally on firm f being present in m at t and $t-1$. *Source: Customs.*
$\Delta Exports_{f,m,t}$ (connected customers)	Variation of the amount of exports (in mid-point growth rate) of firm f in country m realized with customers that already had traded with a French exporter before. The variable is only defined if firm f is present in country m both at t and $t-1$. The variable is not defined for the year 2003. *Source: Customs.*
$\Delta Exports_{f,m,t}$ (non-connected customers)	Variation of the amount of exports (in mid-point growth rate) of firm f in country m realized with customers that had never traded with a French exporter before. The variable is only defined if firm f is present in country m both at t and $t-1$. The variable is not defined for the year 2003. *Source: Customs.*
$\Delta Price_{f,m,p,t}$	Variation of 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. *Source: Customs.*
$\Delta Product\ base_{f,m,p,t}$	Exports of firm f in country m at time t of new products minus the amount of exports of firm f in country m at time t of discarded products (scaled by the average of total exports in country m between t and $t-1$). A product is defined as a 8-digit code of the Combined Nomenclature. *Source: Customs.*
$\Delta Stable\ customers_{f,m,t}$	Variation of 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 $t-1$). *Source: Customs.*
$\Delta Stable\ products_{f,m,t}$	Variation of the amount of exports of firm f realized in country m of products that firm f sells at both t and $t-1$ (scaled by the average of total exports in country m between t and $t-1$). A product is defined as a 8-digit code of the Combined Nomenclature. *Source: Customs.*
$Entry_{f,m,t}$	Probability of firm f entering country m at time t conditionally on firm f being not present in m at time $t-1$. *Source: Customs.*
$Exit_{f,m,t}$	Probability of firm f exiting country m at time t conditionally on firm f being present in m at time $t-1$. *Source: Customs.*
$log(Exports/customer)_{f,m,t}$	Average sales per customer *Source: Customs.*
$log(Herfindahl)_{f,m,t}$	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. *Source: Customs.*

Panel A: Definitions of the variables (continued)	
$Lost\ customers_{f,m,t}$	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 $t-1$). *Source: Customs.*
$Market\ share_{f,m,07}$	Sales of firm f in country m in 2007. *Source: Customs.*
$New\ customers_{f,m,t}$	Exports of firm f realized in country m with new customers at time t (scaled by the average of total exports in country m between t and $t-1$). *Source: Customs.*
$Stickiness_p$	Gives the value of the "relationship stickiness" index associated with product p (Martin et al., 2018). A higher value of the index signals longer durations of trade relationships for a given product and reflects higher informational frictions (see section V). *Source: Customs*
Firm variables	
$\Delta Payment\ periods_{f,t}$	Variation of payment periods from customers. Payment periods from customers are defined as the ratio of accounts receivable over sales multiplied by 365. *Source: Tax returns.*
$\Delta Payment\ periods\ (suppliers)_{f,t}$	Variation of payment periods to suppliers. Payment periods to suppliers are defined as the ratio of accounts payable over sales multiplied by 365. *Source: Tax returns.*
$\Delta Domestic\ turnover_{f,t}$	Variation of domestic sales in mid-point growth rate. *Source: Tax returns.*
$\Delta Hours_{f,m,t}$	Variation of the number of hours worked (in mid-point growth rate) by workers employed by firm f between time t and time $t-1$. *Source: DADS.*
$\Delta Net\ payment\ periods_{f,t}$	Variation of net payment periods (see section IV). *Source: Tax returns.*
$\Delta Number\ workers_{f,m,t}$	Variation of the number of workers (in mid-point growth rate) employed by firm f between time t and time $t-1$. *Source: DADS.*
$Age_{f,t}$	Age of the firm. *Source: Tax returns.*
$Cash/TA_{f,t}$	Ratio of cash holdings to total assets. *Source: Tax returns.*
$Credit\ lines/TA_{f,t}$	Ratio of drawn credit lines to total assets. *Source: Tax returns.*
$Import\ share_{f,t}$	Ratio of total imports to total purchases. *Source: Tax returns.*
$Intangible\ assets/TA_{f,t}$	Ratio of the sum of "concessions, patents and similar brands" and "other intangible assets" to total assets. *Source: Tax returns.*
$Inventoried\ production/Sales_{f,t}$	Difference between stocked production and the variation of merchandise stocks. *Source: Tax returns.*
$Labor\ productivity_{f,t-1}$	Value-added over the number of employees (lagged value). *Source: Tax returns.*
$log(Total\ Assets)_{f,t-1}$	Logarithm of total assets (lagged value, in thousand euros).*Source: Tax returns.*
$log(Turnover)_{f,t}$	Logarithm of turnover (in thousand euros). *Source: Tax returns.*
$Long\text{-}term\ debt/TA_{f,t-1}$	Ratio of long-term debt to total assets (lagged value). *Source: Tax returns.*
$Purchases\ of\ external\ services/TA_{f,t}$	Ratio of the sum of outsourcing expenses and other external expenses to total assets. *Source: Tax returns.*
$\overline{Sales\ growth\ rate}_{f,t}$	Sales-weighted average of sectoral sales growth rates between $t-1$ and t. *Source: EAE, Tax returns.*
$Working\ capital/TA_{f,t}$	Ratio of the sum of inventories, accounts receivable net of accounts payable as well as other operating receivable to total assets. *Source: Tax returns.*
Instruments	
$\overline{Distance\ to\ 60\text{-}day\ rule}_{f,t}$	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 3.4). *Source: EAE, Tax returns.*
$\overline{Distance\ to\ 60\text{-}day\ rule\ (supplier)}_{f,t}$	Sales-weighted average of the 2007 sectoral distance of payment periods to suppliers to the 60-day threshold multiplied by a dummy equal to one after 2007 (see section 3.4). *Source: EAE, Tax returns.*
$\overline{Net\ payment\ periods}_{f,t}$	Sales-weighted average of 2007 sectoral net payment periods (see section IV). *Source: EAE, Tax returns.*

Panel B: Summary Statistics

	# Obs.	Mean	Std. Dev.	Percentiles 5th	25th	50th	75th	95th
Export variables								
1(Differentiated)$_{f,m,p,t}$	4,170,772	1.55	0.73	0.00	1.00	2.00	2.00	2.00
% of one time customers$_{f,m,t}$	807,650	0.09	0.23	0.00	0.00	0.00	0.03	0.77
Δ*Customer base*$_{f,m,t}$	807,650	0.02	0.52	-0.85	-0.02	0.00	0.03	0.96
Δ*Exports*$_{f,m,t}$	807,650	-0.01	0.81	-1.51	-0.44	0.00	0.42	1.48
Δ*Exports*$_{f,m,t}$ (connected)	268,639	-0.34	1.76	-2.00	-2.00	-1.20	2.00	2.00
Δ*Exports*$_{f,m,t}$ (non-connected)	728,844	0.08	0.93	-1.57	-0.43	0.03	0.54	2.00
Δ*Price*$_{f,m,p,t}$	3,758,105	0.63	10.86	-0.64	-0.16	0.01	0.22	1.81
Δ*Product base*$_{f,m,p,t}$	807,650	-0.00	0.46	-0.72	-0.01	0.00	0.01	0.71
Δ*Stable customers*$_{f,m,t}$	807,650	-0.02	0.62	-1.16	-0.30	0.00	0.26	1.06
Δ*Stable products*$_{f,m,t}$	807,650	-0.01	0.65	-1.19	-0.32	0.00	0.30	1.15
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
Stickiness$_{p}$	4,146,657	0.04	0.28	-0.43	-0.15	0.08	0.25	0.41
Firm variables								
Δ*Payment periods (suppliers)*$_{f,t}$	96,758	0.17	3.01	-4.18	-1.17	0.07	1.37	4.77
Δ*Payment periods*$_{f,t}$	96,758	0.10	2.53	-3.64	-0.94	0.06	1.07	3.84
Δ*Domestic turnover*$_{f,t}$	96,758	-0.00	0.29	-0.42	-0.09	0.02	0.11	0.35
Δ*Hours*$_{f,m,t}$	87,336	-0.01	0.17	-0.23	-0.06	-0.00	0.05	0.20
Δ*Net payment periods*$_{f,t}$	96,758	-0.03	2.43	-3.64	-1.07	-0.01	1.02	3.55
Δ*Number workers*$_{f,m,t}$	87,336	-0.01	0.17	-0.22	-0.06	0.00	0.05	0.20
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
Import share$_{f,t}$	96,758	0.26	0.25	0.00	0.05	0.20	0.42	0.76
Intangible assets/TA$_{f,t}$	87,336	0.02	0.03	0.00	0.00	0.01	0.02	0.07
Inventoried production/Sales$_{f,t}$	87,336	0.00	0.04	-0.05	-0.01	0.00	0.01	0.06
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
Long-term debt/TA$_{f,t-1}$	96,758	0.04	0.06	0.00	0.00	0.01	0.05	0.16
Purchases of external services/TA$_{f,t}$	87,336	0.23	0.14	0.07	0.13	0.20	0.30	0.51
Sales growth rate$_{f,t}$	96,758	0.01	0.13	-0.22	-0.03	0.03	0.07	0.17
Working capital/TA$_{f,t}$	96,758	0.20	0.18	-0.06	0.08	0.18	0.30	0.51
Instruments								
Distance to 60-day rule$_{f,t}$	96,758	2.14	1.93	0.00	0.00	2.33	3.82	4.95
Distance to 60-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
Total exports$_{f,t}$ (k€)	8690.75	47072.19	12.07	202.36	907.22	3767.93	32769.12
Exports by country$_{f,m,t}$ (k€)	1058.47	8345.16	5.95	48.01	156.18	527.72	3757.11
#*Countries served*$_{f,t}$	7.18	5.26	1.00	3.00	6.00	10.00	18.00
#*Customers by country*$_{f,m,t}$	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

Level	**#Years after entry**:	**1**	**2**	**3**	**4**	**5**
Customer	Export value (mean)	74,969	154,827	215,396	266,420	424,528
	Exit rate (%)	55	39	32	29	31
Market	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 consecutive to the entry in a country or to the formation of a new supplier-customer relationship. The last line indicate the evolution of the average number of customers per country in the five years consecutive to the time of entry.

Table A5 – Duration of trade relationships

	All	Multiple trades	
	1(Multiple)	Duration (m)	Time between trades (m)
All relationships			
Mean	0.54	24.64	4.69
SD	0.50	20.73	4.97
Observations	539,929		
Initial export value < Median			
Mean	0.47	24.23	5.25
SD	0.50	20.45	5.27
Observations	258,350		
Initial export value > Median			
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 keep 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 keep all trade relationships. In the second (third) panel, we only keep 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.

II 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

III 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 of 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 drop, which leads to a positive coefficient for the variation of 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 of domestic payment periods on international sales using different units of aggregation for exports. In an influential paper, Bertrand et al. (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 of 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. Δ*Payment periods* is defined in this context as the long difference of payment periods between 2006 and 2009. It is instrumented by $\overline{\textit{Distance to 60-day rule}}_{f,07}$. 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 of exports even before the implementation of the reform. Subsection 3.6.1 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 baselines estimates. In particular, the coefficient for the variation of 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	Derogations	OLS	No Country-Year FE	No firm FE
	(1)	(2)	(3)	(4)	(5)
$\Delta Payment\ periods_{f,t}$	-0.053^{**}	-0.205^{*}	0.012^{***}	-0.042	-0.066
	(0.025)	(0.122)	(0.001)	(0.026)	(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 of 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 of 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 $Labor\ productivity_{f,t-1}$ (value-added over the number of employees), $log(Total\ Assets)_{f,t-1}$ (total assets in logarithm), $Long\text{-}term\ debt/TA_{f,t\text{-}1}$ (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)
Δ*Payment periods*	-0.120^{***}	-0.120^{***}	-0.050^{***}	-0.083^{***}
	(0.032)	(0.030)	(0.018)	(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 Δ*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 of payment periods is $\overline{\textit{Distance to 60-day rule}}_{f,t}$ 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-term debt/TA*$_{f,t-1}$ (ratio of long-term debt to total assets), $\overline{\textit{Sales growth rate}}_{f,t}$ (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. Δ*Payment periods* is defined in this context as the long difference of payment periods between 2006 and 2009; it is instrumented by $\overline{\textit{Distance to 60-day rule}}_{f,07}$. 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)
Δ*Payment periods*$_{f,t}$	−0.053**	−0.062**	−0.056**	−0.043*
	(0.025)	(0.024)	(0.023)	(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 of exports in country m for firms that stay in the country between $t-1$ and t. The instrumented variable is Δ*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), $\overline{\textit{Sales growth rate}}_{f,t}$ (sales-weighted average of sectoral sales growth rates). In the Baseline column, the instrument for the variation of 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^{**}	-0.053^{*}	-0.053^{**}	-0.053^{**}	-0.053^{**}
	(0.025)	(0.029)	(0.023)	(0.022)	(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 of 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 of 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), $Long\text{-}term\ debt/TA_{f,t\text{-}1}$ (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*	−0.011	−0.057**	−0.064**	−0.007
	(0.039)	(0.027)	(0.024)	(0.026)	(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 time $t-1$ and t, the variation of exports to customers in country m with whom firm f has a trade relationship at $t-1$ and t, the variation of 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 of 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%.

IV 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 A3 here]

This idea is illustrated by Figure A3. 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

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

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

[Insert Tables A11 and A12 here]

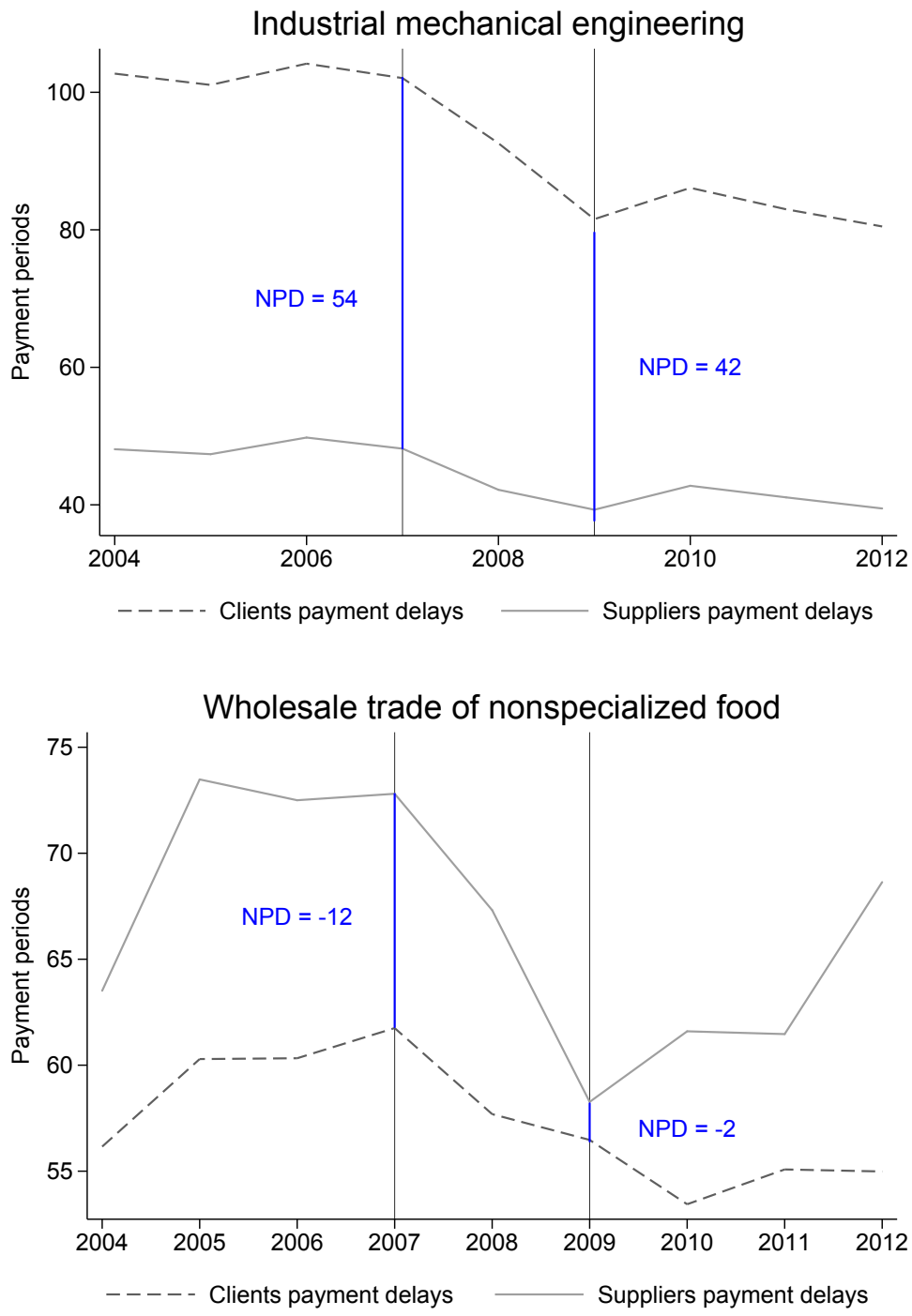
Tables A11 and A12 reproduce the results of the previous section using this alternative measure of payment periods. We can see that each additional day of imbalance between supplier and customer periods is associated with a subsequent decrease in 0.01 day, meaning that the adjustment was much less pronounced in net terms than for customer payment periods. We find that as with $\Delta \textit{Payment periods}_{f,t}$, 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***	0.007	−0.011***
		(0.044)	(0.018)	(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 of net payment periods (which are defined as the difference between payment periods from customers payment periods to suppliers), the variation of exports in country m for firms that stay in the country between time 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 of 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), $Long\text{-}term\ debt/TA_{f,t-1}$ (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%.

Figure A3 – 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***	−0.034	−0.087***	−0.078***	0.009
	(0.044)	(0.028)	(0.029)	(0.025)	(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) the variation of exports in country m between time $t-1$ and t, the variation of exports to customers in country m with whom firm f has a trade relationship at $t-1$ and t, the variation of 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 $t-1$) standardized by the average of total exports in country m of firm f between time $t-1$ and t. 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 of the difference between payment periods from customers and payment periods to suppliers. The instrument for the variation of 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), $Long\text{-}term\ debt/TA_{f,t-1}$ (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%.

V Relationship stickiness

The index of relationship stickiness developed by Martin et al. (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.[61] 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 et al. (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[62]

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

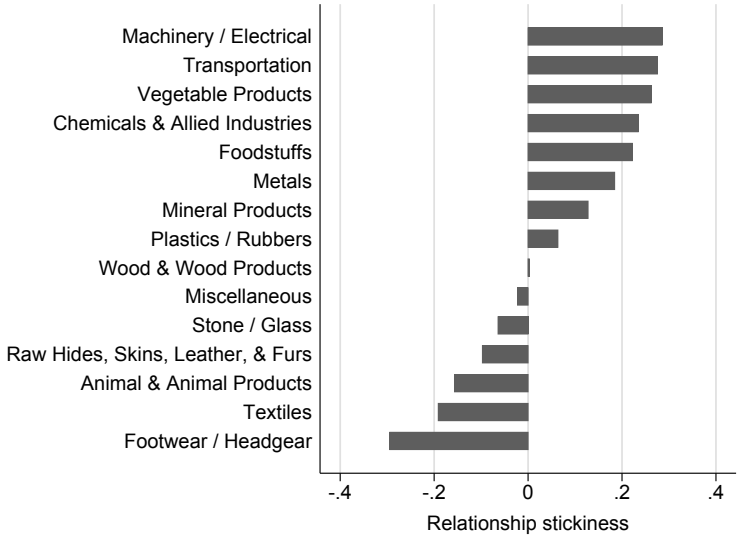
A high product fixed-effect $\widehat{FE_p}$ ("relationship stickiness index") is interpreted as reflecting the presence of significant costs of changing suppliers of a product p.

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").

[61] 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.

[62] We trim the dataset so as to remove the observations that belong to the bottom and top 1% of $Size_{c,s,p}$.

Figure A4 – Relationship stickiness by product category



VI 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^{ρ}. 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 γ) 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 γ). Conversely, firms operating in fluid product markets are likely to devote relatively more effort to maintain their existing customer base (low γ).[63]

Liquidity constraints are introduced by assuming that the firm can not obtain more than a fraction $0 < \kappa < 1$ of its future sales to finance customer acquisition spending in period 1:

$$\gamma c x^{\rho} \leq \kappa a x \tag{6}$$

We borrow this specification of the working capital constraint from Bigio and La'o (2016).[64] A low parameter

[63]The optimal mix between acquisition and retention spending is the subject of a wide literature in marketing (for instance, see Reinartz et al. (2005); Ovchinnikov et al. (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.

[64]Bigio and La'o (2016) show in particular how the constraint can be micro-founded in a limited commitment setting.

κ 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

$$\frac{\kappa}{\gamma} < \frac{1}{\rho} \tag{7}$$

Equation 8 states that all other things equal, a firm is more likely to be liquidity-constrained when the product market is frictional (high γ). 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 ρ). Writing $\xi = \min(1/\rho, \kappa/\gamma)$, it follows immediately that at the optimum, the number of customers x^* is given by

$$x^* = \left(\frac{a\xi}{c}\right)^{\frac{1}{\rho-1}} \tag{8}$$

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 κ), investment in customer capital will increase more in the presence of high financing or informational frictions. In particular, investment in customer capital is not be affected by the shock if the firm is not liquidity constrained ex ante (*ie*, $\kappa/\gamma \geq 1/\rho$).

Chapter 4

Sales managers, poaching and network transmission in international markets

This chapter is co-authored with Bérengére Patault (CREST-École polytechnique)

Abstract

This paper investigates the role of managers' networks for the acquisition of buyers in international markets. Buyers accumulation abroad is a crucial component of exporters growth: sales to new buyers explain at least 47% of firms' exports growth rate heterogeneity in the medium run. Yet, the mechanisms behind buyer accumulation are vastly unknown. We explore in this paper one action firms can undertake to accumulate buyers: investing in connected managers. We leverage sales managers' job-to-job transitions to explore whether managers bring their former clients to their new firm. Thanks to a staggered adoption design, we find that recruiting a manager knowing a particular buyer increases the firm's probability to match with this buyer by 0.14 percentage points. We then study the origin firm of the manager and uncover the existence of small business stealing effects. Overall, our results emphasize the very specific role of sales managers in overcoming the information frictions which preclude firms from expanding abroad.

JEL Classification: M3, F14, L2, F16, L25
Keywords: Firms dynamics, Firms organization, International Trade, Managers

How do firms meet buyers in international markets? The ability to acquire buyers is crucial for firms expansion abroad. Yet, heightened geographical and cultural distances exacerbate search and make it harder for firms to meet and match with potential buyers abroad, (Rauch, 2001; Allen, 2014; Arkolakis, 2010). Firms managers lack information and face contracting and trust issues when canvassing potential buyers. Regular contacts through face-to-face communication and in-person inter-firm business meetings are determinant to build buyer-seller relationships, (Startz, 2016; Cai and Szeidl, 2017; Cristea, 2011). Even though these relationships are developed within the firm boundary, they happen at the personal level. In this paper, we study whether this personal relationship capital can be transmitted across firm when managers move firms and the consequences for firms. More precisely, we examine the role of managers' networks of contacts in easing customer accumulation and business stealing in international markets.

We show that managers have buyer-specific knowledge and, when moving, help their recruiting firms expand their customer base within the network of trade relationships they develop in their previous firm. We also show some evidence of business stealing as the the previous firm losses its former clients. To do so, we use a unique combination of two French datasets in which we can observe network transmissions through managers' job-to-job mobility. French linked employer-employee data - *DADS Postes* - allows us to track worker movements across firms, and provides very detailed occupational information on workers, notably the manager status. We combine this dataset with detailed firm-to-firm trade data in which we observe all non-domestic buyers of French exporters in the European Union. The two datasets allow us to keep track of managers' business networks, *i.e* the set of buyers that their firms export to. We can then study whether when recruited by a new firm, a manager transmits its business network. Our main contribution is to show that managers transmit their network when moving firms and ease buyer acquisition abroad. We find that following the recruitment of a manager with contacts abroad, the probability to start exporting to these buyers increases by 16%. Our results indicate that recruiting a sales managers with export experience can be seen as a buyer-specific investment.

The starting point of our analysis consists in acknowledging that buyer acquisition is crucial for exporters' growth. We extend the decomposition of exports developed by Bernard et al. (2009) to a firm-to-firm framework and decompose exporters growth into different margins for different time horizons. We find that in the short run, *ie* looking at one-year growth, the most important source of heterogeneity in exporters growth

is the intensive margin. It explains 37% of the variance of export growth across firms. Nonetheless, when looking at medium-run growth, *i.e* three to five-year growth rate, the most prominent source of heterogeneity is the buyer margin. This result reveals that buyers acquisition and sales to new buyers are central for exporters' growth. This finding contrasts with the literature which has mostly emphasized the importance of the product margin or the intensive margin of exports.

[Insert Figure A.1 here]

Even though essential for understanding exporters' growth, very little is known on how firms invest in the acquisition of their customer base. As a suggestive evidence, we document the correlation between firms customer base expansion and their recruitment of managers and particularly sales managers. We focus on sales managers as they are the managers who are mostlt travelling and canvassing potential buyers, establishing personal relationships with their contacts abroad. We find that an increase in the number of sales managers is correlated with exporter' expansion on international markets through buyer acquisition. Specifically, we use the panel dimension of the data and show that the correlation between the number of sales managers and the buyer margin is strong and significant even controlling for time-invariant heterogeneity and productivity shocks (value-added per worker). Hiring sales and marketing managers is associated with more growth at the buyer margin. Importantly, these correlations are specific to sales managers: other managers are not associated with the buyer margin. Moreover, all the effect on the buyer margin is driven by buyers acquisition while no significant correlation is found on customer retention. These facts are in line with the *informative view* of marketing: recruiting a salesman reduces information frictions faced by buyers in international markets. By contrast, the intensive margin of exports is not significantly affected by the recruitment of sales managers, which suggests that the effect of marketing on customers preferences and perception, the *persuasive view* of marketing, is less pronounced in international markets.

We test whether managers transmit their business network when moving firms within an event-study design. More precisely, we identify the effect of recruiting a sales manager with a previous experience with a particular buyer on the probability, for the recruiting firm, to match with this buyer. To do so, we exploit the disaggregated nature of our data by creating, within a destination, all pairs of French firms $\times$ potential buyers. We identify the effect of the manager recruitment by comparing *for a given firm and buyer pair*, time

periods before and after the recruitment of a manager connected to the buyer, controlling for firm-level and buyer-level shocks. Our specification captures the effect of recruiting a connected manager as it circumvents endogeneity issues as it controls for time varying-heterogeneity across firms and buyers. First, by introducing firm $\times$ year fixed effects, we control for firm shocks contemporaneous to the recruitment year. Second, with firm $\times$ year fixed effects, we control for potential correlation between buyers growth and managers network. Finally, firms likely poach managers in firms close to them in terms of product, sector or geography. As a result, poaching firms are also more likely to match with the buyers of the firms from which they recruited their manager. In order to mitigate this concern, we include buyer $\times$ firm fixed effects to control for the average propensity that French firm and buyer meet.

We find that recruiting a manager in year t knowing buyer b increases the probability in $t + 3$ to export to that buyer by 0.3 percentage points. In terms of magnitude, this is a sizeable effects as it is equivalent to a 16% increase of the average baseline probability to match. Most of this network transmission effect is driven by sales managers: when an other manager moves across firms, we cannot detect any significant effect on network transmission. The effect is only found significant for managers, blue-collar worker moves do not affect the probability to match with connected buyers. Moreover, the effect is driven by managers' moves between two firms belonging to the same sector of activity. Symmetrically, we evaluate whether, the firm from which the manager was poached has a higher probability to cease exporting to its buyers. We show that the probability to lose the buyer in year $t + 1$ increases by 5.3 percentage points when a manager moved to a destination firm which acquired the buyer. This result suggests that in aggregate, network transmission might be a zero-sum game as there is some business stealing effect of managers mobility. It also implies that relationship capital is a rival good which benefits to the firm employing it.

We then quantify whether this network transmission mechanism is a prominent part of sales managers effect on firms ability to attract customers. Namely, we quantify the magnitude of the two mechanisms through which sales managers help firms acquire new buyers. First, sales managers may help firms increase their customer base because they have a general skill in buyers' acquisition, and second they help firm expand within their business network by transmitting specific information on the buyers they are connected to. Namely, we decompose the effect of recruiting a salesman between two components: the effect on the acquisition of buyers within the salesman's business network and on buyers outside her network.

We show that the associated increase in the firm's portfolio of buyers is mostly driven by the salesman's own portfolio of clients, which she drew from her previous firm. Firms which have recruited a sales managers sell 8% more to their new buyers than firms which did not recruit. The effect is entirely driven by the transactions realized with new buyers within the business network of the sales managers. This result suggests that sales managers have some buyer-specific knowledge which they bring with them when moving from a firm to another. Their knowledge of the market helps firms overcome part of the information cost that precludes them from expanding abroad. This result is in line with the business literature emphasizing the importance of face-to-face relationship and business meeting in the international trade.

Eventually, we develop a simple statistical trade model to quantify structurally the influence of managers network on firms portfolio of buyers. In this simple framework largely inspired from Armenter and Koren (2014), firm-to-firm trade flows are modelled by balls thrown by exporting firms into bins which represent their international buyers. The number of balls thrown determines the value of exports and the expected number of buyers. On the opposite, the size of the bins determines the relative probability to match with certain buyers. We assume that managers general knowledge in buyer acquisition and managers effects on firms productivity affect the number of balls thrown. Namely, they affect the expected number of buyers reached conditionally on a certain distribution of bin size. Managers business network and specific knowledge about buyers affect the size of the bins and increase the probability to match with some buyers conditionally on the number of balls thrown. This simple model delivers predictions about the change in the number of buyers reached after recruiting a manager, and which buyer should be reached first. As we observe the empirical counterparts of these moments, we are able to estimate by GMM the parameters governing the effect of general knowledge of managers and the effect of specific knowledge.

Our results relate to the literature on the large role of managers on firms' and exporters' performance. Most of this literature focuses on the effect of better management practices (Bloom et al., 2013, 2018) and of the knowledge transmitted by managers (Mion et al., 2016; Mion and Opromolla, 2014; Meinen et al., 2018). By contrast our paper emphasizes the importance of managers' networks. Our contribution is closely related to the nascent literature on managerial networks. Cai and Szeidl (2017) show, in an randomized control trial, that the exogenous network expansion generated by regular business meetings between managers increases firms' productivity and customer base. Fafchamps and Quinn (2016) reveal the role of managers' network

in information diffusion across firms. These papers focus on experimental approaches. By contrast, we use a comprehensive dataset and show that managers networks of relationships contribute to explain the large heterogeneity in French firms performance and number of buyers (Syverson, 2011; Bernard et al., 2018). Moreover, we show that firms actively invest in expanding their business network by recruiting well-connected sales managers.

Our results are also related to the literature studying the effects of social networks on the labor market. This literature emphasizes that well-connected individuals obtain better labor market outcomes thanks to referrals, (Bayer et al., 2008; Montgomery, 1991). Social networks thus play an important role in inequality as it affects how workers sort into firms and access the labor market. In a related, but different vein, we argue that firms also value hiring managers with business networks different to their own. By hiring managers with disjoint networks, the firm can expand its pool of potential clients.

Our results also resonate with the trade literature studying the effects of search, information and trust frictions in production networks and international trade. Bernard et al. (2019) study the effect of a reduction in search and information costs on the Japanese production network. They find that following the opening of high-speed rail trail, firms match with better potential suppliers and increase their productivity. In a development context, Startz (2016) quantifies welfare gains from eliminating search frictions for appropriate suppliers by Nigerian retailers. Other studies have indirectly shown the presence of information frictions from geographic price dispersion of an homogeneous good. They find that better information technology reduces price wedges (Allen, 2014; Steinwender, 2014). In this literature, levers to reduce search and information frictions focus on infrastructures and information technology. Our paper provides another strategy adopted by firms to reduce search frictions: hiring well-connected sales managers. Our work indicates that labor market frictions can also affect exporters behaviour by limiting their ability to recruit the optimal network.

Additionally, our paper is related to the literature on exporters and firms' dynamics. Looking at how exporters grow, Fitzgerald et al. (2016) show that conditional on survival and controlling for supply shocks, exporters' growth is driven by an increase in quantities exported rather than an increase in the unit values of exported goods. Our decomposition of exporters' growth patterns points in the same direction: there is little role for the intensive margin when looking at medium and long-run exporters' growth. Nevertheless their finding is uninformative about whether exporters grow through selling more to their current buyers

or through acquiring new buyers. By contrast, our results show that, in the medium run, buyer acquisition is more central to exporters growth than an increase of sales within the buyer portfolio. Moreover, our paper contributes to the firms dynamics literature by emphasizing the importance of endogenous demand accumulation for firms' growth (Piveteau, 2016; Fitzgerald et al., 2016). We find that firms actively invest in buyers accumulation through the recruitment of sales managers and the subsequent access to their business networks.

The rest of the paper is organized as follows. Section 4.1 uses our novel firm-level exports growth decomposition to uncover the crucial role of buyer accumulation in exporters growth. Section 4.2 presents the data and spells out how we define both sales managers and buyer margin. In section 4.3 we unveil one of the determinant of buyer accumulation: the recruitment of sales managers. Section 4.4 explains how sales managers help the firm get access to new buyers and enhances the effect of sales managers network of buyers on firms' buyer accumulation. Section 4.5 quantifies whether sales managers are more effective in bringing buyers within or outside of their network. Section 4.6 concludes.

4.1 Motivating Fact: buyer accumulation is crucial to grow

We investigate the contribution of buyers acquisition in exporters growth. To do so, we decompose firm-level export growth (at various horizons) into four net margins as illustrated in equation (4.1).

$$\Delta Exports_{ft} = \Delta Products_{ft} + \Delta Customer\ Base_{ft} + \Delta Product \times Buyer_{ft} + \Delta Intensive\ Margin \tag{4.1}$$

First, the net product margin encompasses sales on new products with continuing buyers minus sales on dropped products for buyers still in the seller's portfolio. The second margin is the buyer margin. It captures the export growth related to the evolution of the customer base (added and dropped buyers) within a stable portfolio of products. New and dropped customers are identified by comparing the portfolio of customers at the beginning and at the end of the period of interest.[1] It is our main margin of interest. The third margin concerns a simultaneous addition or dropping of a buyer-product pair. When a firm adds or drops simultaneously a product and a buyer to its portfolio we add its sale to this margin. The fourth and

[1] An alternative definition of a new buyer could be to look at all the buyers the firm has ever interacted with.

final margin is the evolution of sales for buyers and products which are present in the firm's portfolio at the period's beginning and end. Note that we abstract from the country margin as its comes down to adding a new buyer in a new destination.

In all of our analysis, we choose to refer to the exporter growth rate awith the growth rate used in Davis and Haltiwanger (1992) as it is conveniently bounded.[2]

We quantify the contribution of each margin of exports displayed in equation (4.1) in explaining the heterogeneity of firm-level export growth (at various horizons). We highlight a novel fact about exporter growth conditional on survival: while the intensive margin matters in the short-term, the buyer margin is the main contributor to exporter growth heterogeneity in the medium and long-term. As the decomposition of exporters growth is linear, the estimated β reflects the variance of exporters growth which is explained by each margin.[3] We control for year fixed effects in order to control for specific time shocks.

Figure A.1 displays the decomposition of exporters growth conditional on survival into the different margins described above.[4] The decomposition reveals starkly different patterns across different time horizons. The buyer margin explains 35 % of 1-year exporter growth heterogeneity, 44% for 3-year exporter growth heterogeneity and 49% of 7-year export growth variance. Adding the buyer×product margin increases these figures to 56% for 1-year growth, and to 83% for 7-year growth. The intensive margin contributes to the bulk of short-term growth variance as it explains 37% of 1-year growth variance, but it becomes secondary for medium and long-run growth (23% over 3-year horizons and 13% for 7-year growth variance).

[Insert Table 4.1 here]

[2] In all the following analysis, we will refer to the following margins of exports:

$$\frac{2\times\Delta Exports_{ft}}{(Exports_{ft-1}+Exports_{ft})} = \underbrace{\frac{2\times\Delta Products_{ft}}{(Exports_{ft-1}+Exports_{ft})}}_{\text{Product margin}} + \underbrace{\frac{2\times\Delta Customer\ Base_{ft}}{(Exports_{ft-1}+Exports_{ft})}}_{\text{Buyer margin}} + \underbrace{\frac{2\times\Delta Product\times Buyer_{ft}}{(Exports_{ft-1}+Exports_{ft})}}_{\text{Buyer×product margin}} + \underbrace{\frac{2\times\Delta Intensive\ Margin_{ft}}{(Exports_{ft-1}+Exports_{ft})}}_{\text{Intensive margin}}$$

[3] We run the following regression

$$\Delta Margin_{ft} = \beta\Delta Exports_{ft} + \delta_t + \epsilon_{ft} \tag{4.2}$$

[4] Products are defined at the 8-digit level in a harmonized nomenclature and growth rates above the 99th percentile are replaced as missing.

Importantly, the different contributions for short term and long term export growth are not driven by composition effects related to the survival of exporters. In Panel A of Table 4.1, each line exhibits the decomposition of exporter growth within a given time horizon. The declining importance of the intensive margin and the rising relevance of the buyer margin are still present when we restrict our analysis on exporters observed in the data at least 5 years. In panel B, we test whether our finding is still valid within a destination. Within a destination, the intensive margin is a more important source of heterogeneity in exporters' growth, yet, the growing and prominent relevance of the buyer margin is still at play.

Strikingly, the pure product margin contributes very little to explaining exporters growth heterogeneity. It indicates that firms do not grow by adding products to their current portfolio of buyers but rather either extend their portfolio of buyers or add new products in order to reach new buyers. In the medium and long run, this second mechanism seems to be important in explaining exporter growth heterogeneity as its explanatory power is higher than the intensive margin. Panel C of Table 4.1 presents similar decomposition but with an alternative definition of a product defined at the 2-digit level. This broader definition of a product reduces a lot the contribution of the product margin, suggesting that firms introduce products that are similar to their previous products in order to grow.

4.2 Data

We use firm-level data from three different sources: the French customs (firm-to-firm export transactions), the French fiscal administration (balance sheet and Profit & Loss statements) and the French National Institute of Statistics (matched employer-employee data). A unique firm identifier allows us to merge the different datasets.

4.2.1 Firm to firm trade data

We conduct the empirical analysis using a detailed firm-to-firm export dataset covering the universe of French firms and their exports to EU destinations. The data are provided by the French Customs and cover all transactions involving a French exporter and an importing firm located in the European Union, over 1995-2017. We focus on the 2009-2015 period and on the manufacturing sector.

For each transaction, the dataset records the identity of the exporting firm (its SIREN identifier), the identification number of the importer (an anonymized version of its VAT code), the date of the transaction (month and year), the product category (at the 8-digit level of the combined nomenclature) and the value of the shipment. Data cleaning and product harmonization across time are described in Bergounhon et al. (2018). One issue with this data concerns small exporters whose total exports in the European Union in a given year are below a threshold. They are not required to declare the product category of exported goods. We implement the methodologies described in Bergounhon et al. (2018) to recover part of the unfilled product category.[5]

Over the period 2009-2015, our data contain 18,504 firms and 704,234 buyers, see Table 4.2. The number of observed buyers is much higher than the number of French exporting firms as French firms can have numerous distinct buyers in the European Union. In 2014, on average exporters have 45.5 buyers and the median exporter has 17 buyers as presented in Table 4.3.

4.2.2 Tax data

We merge customs data to tax data (*FARE* data) thanks to the firm identifier. Tax data include both balance-sheet and profit and loss statements. In particular it contains detailed information about firms' expenditures and revenues, as well as their main sector of activity. As we focus on exports, we restrict our analysis to the manufacturing sector.[6]

4.2.3 Matched employer-employee dataset

We then merge customs data to a matched Employer-Employee dataset (*DADS Postes*). This dataset contains for each employee the establishments and firms for which she worked in during the calendar year, the numbers of hours she worked, her wage and her occupation. French matched Employer-Employee data provide information on the worker's occupation at the 4-digit level. This allows us to identify sales managers as well as R&D workers. More precisely, we define as a sales and marketing worker any worker whose occupation

[5]Transactions with missing nc8 represent less than 1% of aggregate trade and about 85% of missing nc8 concern one-shot exporters. One shot exporters are not in our scope of our analysis as we focus on exporters dynamics and buyer acquisition.

[6]More specifically, we consider firms whose main activity is within the section C of the NAF classification, the first two figures of the code being between 10 and 33.

title contains one of the following keywords: 'advertising', 'clientele', 'communication', 'commercial', 'marketing', 'merchant', 'sale', 'seller'.[7] In a similar fashion, R&D workers comprise workers with one of these keywords: 'development', 'innovation', 'research', 'researcher', 'study'.[8]

To identify managers within the firm we rely on the hierarchical level of workers displayed in their PCS-ESE occupation classification code. In the manufacturing sector, the PCS-ESE classification has 5 hierarchical levels. Managers have occupational levels 2 to 4. Middle-level managers have hierarchical level 4 and high level managers have hierarchical level 2 and 3, they correspond respectively to the company director, managers and highly-qualified positions.[9] This definition of managers is based on the literature using the same data sources (Caliendo et al., 2015; Spanos, 2016).

Labels of the PCS-ESE codes of sales managers, the number of workers associated and their average wages are presented in Table 4.4. The main sales occupation in terms of employment is "Commercial managers of small and medium-sized enterprises (excluding retail trade)" and the second most important is "Other commercial sales professionals (except sales force technicians)". Table 4.6 presents descriptive statistics about managers and sales managers in our data for 2014. While 7°% of exporters employ at least one sales managers, on average exporters have 47 managers and 10 of them are sales managers. These figures are substantially lower for non-exporter, only 26% of them hire a sale manager and on average the employ 2 sales managers. Yet, these average numbers hide a substantial heterogeneity across firms: the median firm hires two sales manager. Sales managers represent 7% of total employment while non-sales managers represent 25% of total employment. Note that this high figure takes into account middle-range managers.

Another important feature of the French Employer-Employee data is that workers have a unique identifier for two consecutive years. This allows to observe workers' transitions between two firms.[10] However, as the worker identifier is unique only for two consecutive years, it is not possible to keep track of all the past experiences of workers in previous firms. As a result, we can only identify the experience and knowledge of

[7]In French: clientéle, communication, commercial, commercant, marketing, publicité, vente, vendeur

[8]In French: recherche, innovation, étude, developpement, chercheur. Alternatively, we also use a definition of R&D workers based on occupation codes '34', '38' and '47'.

[9]Caliendo et al. (2015) defines hierarchy 2 as "firm owners receiving a wage which includes the CEO or firm director", hierarchy 3 as "senior staff or top management positions which includes chief financial officers, heads of human resources, and logistics and purchasing managers" and hierarchy 4 as "employees at the supervisor level which includes quality control technicians, technical, accounting, and sales supervisors"

[10]We identify such transition only if the worker is inactive less than two years between the two jobs as we can follow a worker only for two consecutive years.

a worker one year before the year of interest. In other words, our dataset of managers moves is constructed by detecting managers moves within different 2-year panel datasets, in which the panel identifier is the worker.

We define a sales manager move between from firm f to firm f' in year t if we observe firm f' recruiting a manager in year t which was a sales manager in year $t-1$ or year t in firm f.[11] Every year, about a third of firms in our sample hire a sales manager and 5% of sales managers move from one firm to another. This figure is in line with job-to-job mobility in France, Picart (2014). Table 4.5 displays the average business network of recruited managers. The median recruited managers comes from an exporting firm with a few buyers in European Union. On average recruited managers have more than 50 buyers in their business networks.

4.2.4 Final sample

Our final sample includes exporters in the manufacturing sector over the period 2009-2015. Manufacturing firms which never export during the entirety of the period are therefore left out of the analysis.[12] Table 4.7 presents descriptive statistics about firms in our final sample. On average they employ 153 workers, their median turnover is 9 million euros while their average turnover is 51 million euros. The median value of exports in EU is 998 thousands euros, and firms serve on average 9 destinations.

4.3 Preliminary analysis: sales managers help firms acquire new buyers

In this first descriptive section we explore the empirical relationship between sales managers recruitment and exporters growth. Sales managers may help firms grow through different trade margins : the intensive, the product or the buyer margins. We find that the recruitment of sales managers affects significantly the buyer margin. This first result motivates our willingness to investigate better the mechanisms through which they help firms acquire new buyers.

[11] We do not constrain the worker of being a sales managers in the recruiting firm as well. Our results are robust to this restriction, and in practise few managers change their management area while changing firms.

[12] One caveat of our approach is that we may under-estimate the buyer margin because we leave out any entry/exit of firms into exporting.

4.3.1 Empirical strategy

Our goal is to detect the effect of an increase in the number of sales managers, controlling for total firm's employment, on the different export growth margins - namely total exports growth, product margin, buyer margin, buyer × product margin and intensive margin. Even though we interpret these first regressions as suggestive evidence we discuss briefly here the identification.

First, our results are robust to unobserved firm-specific differences correlated with both the increase in the number of sales managers and the different growth margins. We remove all unobserved time-invariant firm-specific differences by including firm fixed effects δ_f. Second, endogeneity may stem from time-varying economic conditions of sector s of firm f. To mitigate this issue, we include sector × year fixed effects $\zeta_{s(f)t}$, where $s(f)$ denotes the sector at the 3-digit level of firm f. In a similar fashion, we control for local labor markets shocks through the inclusion of commuting zones × year fixed effects $\psi_{e(f)t}$, where $e(f)$ denotes the commuting zone in which firm f is located. Additionally, our specifications may suffer from reverse causality as the growth in exports may lead to an increase or decrease in the number of sales managers. We control for part of reverse causality concerns by using lagged values of the number of sales managers. Finally, other unobserved time-varying firm-specific heterogeneity could bias the OLS estimates. We tackle this issue by including proxies of firms' time-varying performances and productivity. We include as control in the specification the firm's lagged value added, value added per worker and total employment.

Bringing together the different elements of the identification strategy, our estimation equation for each margin is:

$$\begin{aligned}\Delta Margin_{ft} = \beta Sales\ managers_{ft-1} + \kappa_1 Employment_{ft-1} + \kappa_2 Value\ added_{ft-1} \\ + \kappa_3 Value\ added\ per\ worker_{ft-1} + \delta_f + \gamma_t + \zeta_{s(f)t} + \psi_{e(f)t} + \epsilon_{ft}\end{aligned} \tag{4.3}$$

where $Sales\ managers_{ft-1}$ is the log of the number of sales managers[13] in firm f in year $t-1$, $Employment_{ft-1}$ the log of the total employment in firm f and year $t-1$, $Value\ added_{ft-1}$ the log of the value added of firm

[13]More specifically we use the log of 1 plus the number of sales managers in order not to take out of the sample firms with no sales manager. As a robustness, we use the inverse hyperbolic sine formulation, instead of the $log(1+x)$. None of our results are changed.

f in year $t-1$, *Value added per worker*$_{ft-1}$ the log of the value added per worker of firm f in year $t-1$, and $\Delta Margin_{ft}$ the Haltiwanger growth rates[14] of the given margin for firm f between $t-1$ and t.

The parameter of interest is β. It is the effect of a one percent increase in the number of sales managers on the variation of the margin - for instance the buyer margin. However, because we control for firm fixed effects δ_f, this coefficient is identified through adjustments in the number of sales managers at the firm level (beyond adjustment at sectoral and community zone levels) by comparison to the average number of sales managers across years from firm f.

4.3.2 Results

Main results Table 4.8 displays the results of the estimation of equation (4.3) for each margin. Each column presents a specific margin of interest: column (1) exhibits the results for total export growth, column (2) the buyer margin growth, column (3) the product margin growth, column (4) the buyer × product margin growth and column (5) the intensive margin. An increase in the lag number of sales managers by 1%, holding constant the total employment of the firm, increases total export 1-year growth rate by 0.011 percentage points. Put otherwise, as on average firms in our sample hire six sale managers, an increase in one sale manager, increases the growth rate of exports by 0.19 percentage points. The effect of sales managers on exports growth comes entirely from an effect on the buyer margin, as displayed in column (2) : adding one manager increases buyer margin growth by 0.08 percentage points for the average firm. The effect is significant at the 5% level. By contrast, we find no effect on the other margins. This is consistent with the fact that firms hire sales managers in order to increase their buyer margin. Both the lagged value of the firm's total employment and value added have negative effects on the export growth rate. This is consistent with the fact that large firms grow less rapidly than small firms.

[Insert Table 4.8 here]

Acquisition versus retaining As shown in Table 4.8 increasing the number of sales and marketing managers affects exports only through the buyer margin. This finding suggests that in international markets,

[14]For each margin, the Haltiwanger growth rate is computed as follows: $\frac{2\times\Delta Margin}{(Exports_{ft-1}+Exports_{ft})}$

marketing mostly works through a reduction in search frictions and enhancing firms visibility while its effects on consumer preferences are not significant. In this last case we should have found a significant effect of sales managers on the intensive margin of exports. We investigate further this idea by decomposing the effect of sales managers on the net buyer margin between an effect on consumer acquisition and an effect on consumer retention. Table 4.10 columns (2) and (3) displays the result. The effect of sales managers on exporters growth in international markets is entirely driven by consumer acquisition. Recruiting managers specialized in sales and marketing helps accessing new buyers but does not affect consumers preference as it does not increase sales to current consumers and barely affects consumer retention. This finding reinforces the idea that international markets are highly frictional and that reaching new buyers is costly for firms.

[Insert Table 4.10 here]

4.4 Do managers transmit their network of buyers to firms?

We established in section 4.3 that investing in marketing and advertising managers helps the firm grow internationally only through the buyer margin, *ie* through the acquisition of new buyers. However, the reason why managers help acquire new buyers is not clear yet, as two eventualities ensue: Do sales managers help firms increase their customer base because they have a general skill in buyers' acquisition? Or do they transmit specific information on the buyers they are connected to? In this section, we investigate the specificity of managers knowledge and quantify for the first time the effect of buyer-specific managerial expertise on firms performance. To that end, we exploit sales managers movements across firms and define the business network of a recruited manager as the portfolio of buyers of her previous firm in the European Union.

We perform an event-study at the firm $\times$ buyer level in which we analyze the specific role of managers when they move across firms: even when controlling for a wide range of fixed effects, we do see that sales managers transmit their network of buyers to their new firm. Altogether our results show that sales managers have buyer-specific expertise - or network - that they transmit to their employer when moving.

4.4.1 Staggered adoption design

Empirical strategy The goal of our empirical strategy is to detect a potential causal effect of managers network on the ability of firms to accumulate new buyers on international markets. We investigate this question by looking at sales managers movements across firms: we use a staggered adoption design in which we exploit the timing of managers movements to infer their causal effects on the recruiting firms.

Our unit of analysis is the French firm × buyer, and we say that a unit is treated if the French firm recruited a manager knowing the buyer the year before, ie if a 'network move' happened.

First, we form, for each EU country, pairs of French firms × potential international buyers. We follow Lenoir et al. (2019) to define potential buyers for each French firm.[15] Second, we select pairs of French firm × international buyer for which at least one 'network move' occurs in the period [2009,2015]. We make this empirical choice in order to reduce the dimensionality of the dataset, and provide in section 4.4.4 robustness results for Finland where control units are introduced. All those French firm × buyer pairs are therefore treated, but at different years, thus providing us with a staggered adoption framework. Third, we restrict ourselves to pairs for which no match has been formed at the beginning of the period of interest, *ie* in 2007. This enables us to study the effect of movements of connected managers on the probability to meet new buyers, and not on the probability to sell to a buyer. Focusing on new matches is important in order not to capture a reverse causality effect by which selling to a customer increases the probability to recruit a manager knowing that customer.

Formally, we estimate for firm f, buyer b and year t:

$$\mathbb{1}(Exports_{fbt} > 0) = \sum_{\substack{d=-3 \\ d\neq -1}}^{d=3} \beta_d \mathbb{1}_{\{t=t_{0fb}+d\}} + \gamma_{bt} + \gamma_{ft} + \gamma_{bf} + \epsilon_{fbt} \tag{4.4}$$

where $\mathbb{1}(Exports_{fbt} > 0)$ is a dummy equal to one if firm f accumulates buyer b in year t. t_{0fb} denotes

[15] A buyer is a potential buyer for a given firm if during the period [2005,2017] it imported at least one potential product of the French firm. A potential product is a product (defined at the hs4 level) exported by at least one French firm in the same sector of the firm of interest.

the year of the 'network move' - ie the year when firm f recruits a manager knowing buyer b - and d indexes time-to-recruitment (negative before recruitment and positive after). γ_{bt}, γ_{ft} and γ_{fb} are respectively buyer $\times$ year, firm $\times$ year fixed effects and firm $\times$ buyer fixed effects. ϵ_{fbt} is an error term. We bin the endpoints at $d = -3$ and $d = 3$. The main coefficients of interest are the different β_d.

Identification assumption The identifying assumption is that, conditional on recruiting a manager in the period knowing buyer b, the timing of recruitment is unrelated to the outcome. Including leads in our specification in equation 4.4 enables us to examine patterns in outcomes in the years leading up to the recruitment.

Thanks to firm $\times$ year fixed effects, identification stems from the comparison of firm-buyer matches *for a given firm and year* across buyers, ie between buyers connected to the recruited manager and buyers unconnected. However, the difference, for a given firm and year, across buyers may likely stem from buyer's characteristics. Some buyers may have positive demand shocks, and thus be likely to increase their overall imports in Europe. As a result, French firms would increase their exports toward such buyer and French marketing managers knowing such buyer would be more numerous, thus biasing the results upward. To allay such endogeneity concern, we add buyer $\times$ year fixed effects, which ensures that the difference across buyers does not stem from buyer characteristics, either time-invariant or time-varying. Overall, the inclusion of buyer $\times$ year and firm $\times$ year fixed effects guarantees that the estimate is not biased by the presence of either unobserved buyer time-varying characteristics nor unobserved firm time-varying characteristics.

However, firms likely recruit from firms close to them in terms of product, sector or geography. It is therefore probable that even before the manager movement, a firm recruiting a manager knowing buyer b had a higher probability to export to buyer b than another firm. In order to mitigate this concern, we thus include buyer $\times$ firm fixed effects to control for the average propensity that a French firm and a buyer meet. Not accounting for buyer $\times$ firm fixed effects would amount to state that firms recruitment is random. After the inclusion of such fixed effects, the variation we exploit is *within* a given French firm $\times$ buyer pair *across time*.

One potential remaining caveat is the existence of other actions undertaken by the firm the same year of the manager recruitment that would increase the probability of acquiring the buyer. Such omitted variables,

such as marketing expenditures, business meetings etc, may bias upward the effect of managers network. However, if no pre-trend is apparent - ie if the estimated $\widehat{\beta}_d$ for d negative are not significantly difference from zero - then it limits the plausibility of such omitted variables. Indeed, such actions undertaken by the firm would have to be undertaken the exact same year of the recruitment, and not before, in order not to show up in the pre-trend but to bias the estimate for year t.

4.4.2 Results

Managers We start by estimating equation 4.4 for manager moves. Figure A.2 plots the estimated β_d, for d $\in [-3; 3]$. Recruiting a manager in year t knowing buyer b has a significant and positive effect on the probability to match with that buyer in the years after the movement. The effect materializes as soon as the first year of the manager in her new firm (see coefficient in year t), but the effect gradually increases over the years. The total cumulated effect 3 years after the move is 0.00329: it means that recruiting a manager in year t knowing buyer b increases the probability in $t + 3$ to export to that buyer by 0.3 percentage points relative to the year just before the move, which corresponds to an increase by 34% as compared to the baseline probability to match. Importantly, it is apparent when looking at $\widehat{\beta}_{d=-3}$ and $\widehat{\beta}_{d=-2}$ that there is no pre-trend before the manager movement. Neither coefficient is significant, even at the 10% level.

[Insert Figure A.2 here]

Sales managers A natural question is whether sales managers have a specific role in network transmission. To answer this question, we estimate equation 4.4 separately for sales managers movements, and for other managements movements.[16] Figure A.3 highlights the differential effect of manager movements across firms whether the manager was a sales manager in the firm of origin, or an 'other manager', where other managers are administration, production or R&D managers.[17] It is apparent from the Figure that most of the network transmission effect is driven by sales managers: when an other manager moves across firms, we cannot detect any significant effect on network transmission.

[16]The only change as compared to the main specification is that now control units are introduced: every pair of French firm × buyer in our sample have at least one 'network move' in the period, but not necessarily one network move due to a sales manager move.

[17]More specifically: a manager movement is a sales manager movement if the recruited worker was a sales manager in her firm of origin, and a manager - whatever its type - in her firm of destination.

[Insert Figure A.3 here]

Sector-specific knowledge The ability of a sales manager to bring her network of buyers with her is likely to depend on the sectoral proximity between the current and previous manager's firm. The network effect may not be a completely manager-specific capital but a capital that she can value in some specific sectors. We thus now estimate separately the effect of recruiting a sales manager from a firm in the same sector and the effect of recruiting a sales manager from a firm of a different sector. We display the results in Figure A.4. The effect of recruitment on buyers acquisition is much stronger when managers come from the similar sector as the firm of interest.

[Insert Figure A.4 here]

All in all, our results indicate that sales managers help firms acquire new buyers mostly through the transmission of their business network: they help firms to identify potential buyers and reduce search frictions. This result is in line with Cai and Szeidl (2017) which highlight the importance of business networks in firms performance and growth.

4.4.3 Business stealing

So far we have established that a manager who changes firms brings its network of buyers to her destination firm. However, in order to draw welfare implications, one needs to evaluate whether network transmission is a zero-sum game, ie there is business stealing, or not. The buyer acquired by the manager's destination firm may indeed be 'stolen' from the origin firm. In this sub-section, we examine whether business stealing occurs by focusing on managers' firms of origin and their probability to lose the buyer subsequent to a 'network move'.

The empirical strategy differs from the main specification in that we do not need to form potential pairs of French firms $\times$ buyer, but rather look at existing pairs and whether the match is destroyed the year after the manager movement. More specifically, we categorize a 'network move' for a firm f and buyer b the fact

that a manager moved from firm f to a firm f' that acquires buyer b the year of the manager movement. We then examine the effect of such network move on the probability of firm f to lose this buyer b in year $t+1$.

Table 4.11 exhibits the results. We display our main specification in column (2): the probability to lose the buyer in year $t+1$ increases by 5.3 percentage points when a manager moved from the firm to a destination firm which acquired the buyer. In column (4) we move away from the pure extensive margin and study the effect of such manager movement on the growth of exports to the buyer. Such a manager move decreases the exports growth to this given buyer by 18 percentage points. Interestingly, we find that the results are not significant, and even reversed, when firm × buyer fixed effects are not included in the regression.

[Insert Table 4.11 here]

4.4.4 Robustness checks

As mentioned above, our main specification only considers pairs of French firms × buyer for which at least one manager move occurred in the period [2010,2015]. In order to validate our results, we form all potential pairs of French exporting firms and European buyers, irrespective of whether the French firm × buyer pair has a 'network move' during the period. In other words, we include some control pairs in our analysis. To decrease the dimensionality of the dataset, we restrict the following question to a particular European country: Finland. This empirical strategy improves the estimation of the buyer × year fixed effects - because for each buyer a wider range of French firms are included, which renders the estimation of buyer-specific time trends more credible - , but has the drawbacks of both worsening the estimation of the firm × year fixed effects - because only the tendency to acquire buyers in Finland is used for a given French firm - increasing the dimensionality of the data.

We display in Figure A.5 the results of the estimation of equation 4.4 for Finland. The difference with the main specification is the inclusion of control units, which in theory are not identifying the coefficients of interest, but which do change the estimation of the fixed effects. The results are qualitatively unchanged as compared to our main specification figure - ie as compared to Figure A.2. The estimated coefficients are

somewhat larger, which may be attributable to either the focus on Finland or to the change in specification.

[Insert Figure A.5 here]

4.5 Are sales managers hired only for their network?

The previous section allowed us to enhance the causal effect of managers networks on firm's buyer acquisition. This effect is very micro in the sense that it does not permit to quantify the firm-level effect of managers networks. In this section, we zoom out and provide a firm-level analysis in which we assess for each firm the number of buyers accumulated within the hired manager network and outside the hired manager network. This classification enables to decompose the effect of manager recruitment on buyers acquisition into a 'within-network' and a 'outside-network' effect. Such a decomposition is important to assess whether sales managers are effective primarily thanks to their network, or if their general export knowledge matters. It thus amounts to answer the question: are sales managers hired only for their network? In a second step, we aim at quantifying the costs and benefits of hiring a connected manager, as well as the willingness of firms to pay for a network.

4.5.1 Do sales managers only transmit their network?

In this subsection, we decompose a firm's new buyers into buyers 'within network' and 'outside network' in order to assess whether sales managers helps the firm grow only through their network, or through the acquisition of other customers.

Empirical strategy

We study the effect of hiring at least one sales manager on the number of new buyers acquired by estimating equation 4.5. We then differentiate the effect of recruiting a manager depending on whether the buyer belongs to the recruited sales manager(s)' business network Ω_{ft} by estimating equations 4.6 and 4.7. Note that, for

firms which did not recruit any sales manager, $\Omega_{ft} = \emptyset$.

$$\#\,New\ buyers_{ft} = \alpha_1 + \beta_1 \mathbb{1}(R_{ft}) + \kappa X_{ft} + \delta_f + \zeta_{s(f)t} + \psi_{e(f)t} + \epsilon_{ft} \tag{4.5}$$

$$\#\,New\ buyers_{ft} \in \Omega_{ft} = \alpha_2 + \beta_2 \mathbb{1}(R_{ft}) + \kappa X_{ft} + \delta_f + \zeta_{s(f)t} + \psi_{e(f)t} + \epsilon_{ft} \tag{4.6}$$

$$\#\,New\ buyers_{ft} \notin \Omega_{ft} = \alpha_3 + \beta_3 \mathbb{1}(R_{ft}) + \kappa X_{ft} + \delta_f + \zeta_{s(f)t} + \psi_{e(f)t} + \epsilon_{ft} \tag{4.7}$$

where $\mathbb{1}(R_{ft})$ equals one if firm f recruits at least one sales manager in year t, $\#\,New\ buyers_{ft}$ is the number of new buyers acquired by firm f in year t, $\#\,New\ buyers_{ft} \in \Omega_{ft}$ is the number of new buyers coming from the newly hired manager's network, $\#\,New\ buyers_{ft} \notin \Omega_{ft}$ is the number of new buyers coming from outside the newly hired manager's network. Importantly, for firms which did not recruit, all buyers acquired come from outside the business network by construction. X_{ft} is a set of controls including the log of the total employment of the firm f in year t, the log of its value added and the log of its value added per worker. We include sector $\times$ year fixed effects $\zeta_{s(f)t}$, commuting zone $\times$ year fixed effects $\psi_{e(f)t}$ as well as firm fixed effects δ_f.

With such a decomposition β_1 captures the overall effect of recruiting at least one manager on the number of buyers acquired, *ie*:

$$\beta_1 = \mathbb{E}\left[\#\,New\ buyers_{ft} | \mathbb{1}(R_{ft}) = 1, \delta_f, \zeta_{s(f)t}, \psi_{e(f)t}\right] - \mathbb{E}[\#\,New\ buyers_{ft} | \mathbb{1}(R_{ft}) = 0, \delta_f, \zeta_{s(f)t}, \psi_{e(f)t}\Big]$$

This coefficient is estimated by comparing the number of new buyers between firms that have recruited a sales manager and those which have not.

β_2 captures the additional buyers acquired within the business network of the recruited manager(s) conditional on having recruited , *ie*:

$$\beta_2 = \mathbb{E}[\#\,New\ buyers \in \Omega_{ft} | \mathbb{1}(R_{ft}) = 1, \delta_f, \zeta_{s(f)t}, \psi_{e(f)t}]$$

β_3 captures the effect of recruiting a sale manager on the number of new buyers that do not belong to the business network(s) of the recruited sales manager(s). It is identified by comparing the number of new

buyers outside the business networks of firms which recruited, with the total number of new buyers[18] for firms that did not recruit, *ie*:

$$\beta_3 = \mathbb{E}[\#\ New\ buyers \notin \Omega_{ft} | \mathbb{1}(R_{ft}) = 1, \delta_f, \zeta_{s(f)t}, \psi_{e(f)t}] - \mathbb{E}[\#\ New\ buyers | \mathbb{1}(R_{ft}) = 0, \delta_f, \zeta_{s(f)t}, \psi_{e(f)t}]$$

Therefore, given the properties of the linear model, the following decomposition holds: $\beta_1 = \beta_2 + \beta_3$. We seek to assess the share of the effect of recruiting a manager that is coming from the buyers acquisition in the managers business network. One should also note that by construction, β_2 is always non-negative. Only the signs of β_1 and β_3 can therefore be commented on. The magnitude of interest is therefore $\frac{\beta_2}{\beta_3}$, which documents how large the effect of recruitment on buyers within the newly-hired manager's network is as compared to the effect on buyers outside such network.

Results

Main results Table 4.12 displays the results. Column (1) displays the regression of the number of new buyers on a dummy equal to one if the firm recruits a sales manager in year t. We find that recruiting at least one sales manager leads to a non-significant gain of 0.237 new buyers. Columns (2) and (3) present the decomposition of the aforementioned effect into 'within-network' buyers and 'outside network' buyers. Column (2) indicates that on average firms which recruit at least one sales manager have 0.260 additional buyers within the manager's network the same year. This figure is significant at the 1% level. However, recruiting a sales manager has a negative and non-significant effect on the number of new buyers acquired outside the network (see column (3)). Importantly, comparing the different regressions allows us to estimate that the increase in the number of new buyers attributed to the recruitment of a sales manager entirely comes from the recruited manager's network.

[Insert Table 4.12 here]

For robustness, we present in Table 4.13 the estimation of the effect of a sales manager recruitment on the exports to new buyers, by decomposing exports to new buyers into: exports to new buyers within network,

[18] By definition, firms which did not recruit meet buyers outside the business network of their non-recruited managers.

and exports to new buyers outside network. This specification is less convenient than the main specification because the decomposition of coefficients does not hold anymore when using logs. However, it enables to confirm the positive and significant effect of sales manager recruitment on both the exports to new buyers and the exports to new buyers within network. Exports to new buyers outside the managers' network are unaffected by the recruitment of the manager. Such results are consistent with both Table 4.8 and Table 4.12: recruiting a sales manager increases significantly the exports toward new buyers.

[Insert Table 4.13 here]

However, this striking result should not be over-interpreted. There can be some substitution effects which amplify the discrepancy between the effects found on buyers within the business network and outside the business network. Newly recruited managers might dedicate all their time to canvass buyers within their business network such that they do not prospect for buyers outside their networks. This would lead to over-estimate the effect found on buyers with the manager network. Even though this mechanism was at play, it still reflects the importance of sales managers' network in their activity.

Sector-specific knowledge The effect of the newly-hired manager may depend on the sector of origin of this manager. We perform the same estimation as before but by distinguishing sales managers coming from the same 3-digit sector and a sales managers coming a different sector. Table 4.14 exhibits the results. Column (1) shows that recruiting a sales manager from the same 3-digit sector has a significant effect - at the 5% level - on the number of buyers acquired while recruiting a sales manager from a different 3-digit sector has no significant effect. Moreover, the effect of recruitment on the acquisition of buyers within the network is also much stronger when the newly-hired manager come from the similar 3-digit sector: the effect is 4.2 times larger in the latter case. These results are consistent with the fact that sales managers are less likely to both bring new customers and bring their network's customers to their employer if their new employer is from a different sector than their former employer.

[Insert Table 4.14 here]

Market-specific knowledge Mion and Opromolla (2014) and Mion et al. (2016) show that managers transmit destination-specific knowledge when they change jobs. They find that recruiting managers increases

the probability of their new firm to enter the destinations for which they had experience. Our results so far highlight one channel through which this happens: the reduction of search frictions through the transmission of business networks. More precisely, our results characterize one destination-specific knowledge that managers transmit when they move from one firm to another: their contacts. In order to quantify the importance of managers buyer-specific knowledge versus country-specific knowledge, we further decompose buyers 'within-network' and buyers 'outside-network' into: buyers 'within-network' in newly entered market, buyers 'within-network' in existing markets, buyers 'outside-network' in newly entered market and buyers 'outside-network' in existing markets. We regress each of this number of buyers on our recruitment dummy and exhibit the results in Table 4.15. Comparing columns (1) and (2) shows that manager recruitment has a much stronger effect on within-network buyers in existing countries. In other words, recruiting managers helps the firms acquire buyers especially in countries where the firm is already present. As a result, the effect of managers expertise on market acquisition unveiled by Mion and Opromolla (2014) seems to be a lower bound of the actual effect of managers on total buyers acquisition. Taking into account the buyer margin, and not only the country margin, is therefore crucial to quantify the importance of managers knowledge for exporters.

[Insert Table 4.15 here]

Wages and knowledge Managers network favors buyer acquisition. We adopt an alternative approach to test this assumption. More precisely, we look at the wages of the recruited managers. If firms value managers network, we should find higher wages for managers with a higher number of relevant contacts. In order to test this mechanism, we regress the wage of the recruited manager on the number of buyers within its network. We control for its previous wage to partially take into account managers unobserved characteristics. As in specification 4.5 we include a firm of origin fixed effects δ_f, sector $\times$ year fixed effects $\zeta_{s(f)t}$ and commuting zone $\times$ year fixed effects $\psi_{e(f)t}$. This last control captures local market shocks which may drive wage changes. Additionally, in robustness, we include fixed effects related to the firm of origin δ'_f.[19]

[19]When more than one manager move from firm f' to firm f in year t, we averaged their wages in both firms

$$Wage_{sft} = \alpha_1 + Wage_{sf't-1} + \beta_1 \# \, Buyers_{sf't-1} + \kappa X_{ft} + \delta'_f + \delta_f + \zeta_{s(f)t} + \psi_{e(f)t} + \epsilon_{ft} \tag{4.8}$$

Results are presented in Table 4.16. Managers with a larger business network benefited from a higher wage increase when moving from one firm to another, column 1 and 2. In column 2, we control for firm of origin fixed effects. They control for a potential correlation between the number of buyers of the firm of origin and its time-invariant unobserved characteristics such as management practises or good on-the-job training. Such characteristics could be valued by recruiting firms and lead to higher wages. Similarly, in this constrained estimation, we find a significant effect of the number of buyers on managers new wages. We further test whether this effect is driven by any type of business network or a relevant network. We add a dummy if the two firms operate in the same sector of activity and we also include the interaction between this dummy and the previous firm's number of buyers. Our results indicate that poached sales managers with larger business network are offered higher wages only if they come from a firm operating the same sector of activity.

[Insert Table 4.16 here]

4.6 Conclusion

In this paper, we investigate the role of marketing and advertising managers on buyer accumulation. We empirically confirm that an increase in the number of sales managers is correlated with exporters' expansion on international markets through buyer acquisition. We throw further light on the mechanisms at play and highlight the crucial role of managers business networks. Managers have buyer-specific expertise - or network - that they transmit to their employer when moving. Their knowledge of the market and potential customers helps firms overcome part of the information cost that precludes firms from expanding abroad.

Our work complements the literature studying the effects of search and information frictions on trade and production network. This literature emphasizes the role of infrastructures and information technology to overcome such frictions (Bernard et al., 2019; Startz, 2016; Allen, 2014; Steinwender, 2014). By contrast, we emphasize the role of job transitions in information and contacts diffusion across firms. As a consequence,

our results imply that labor market frictions can affect exporters behaviour by limiting their ability to recruit the managers and access their network. Such labor market frictions could in turn have an effect on the allocation in the production network.

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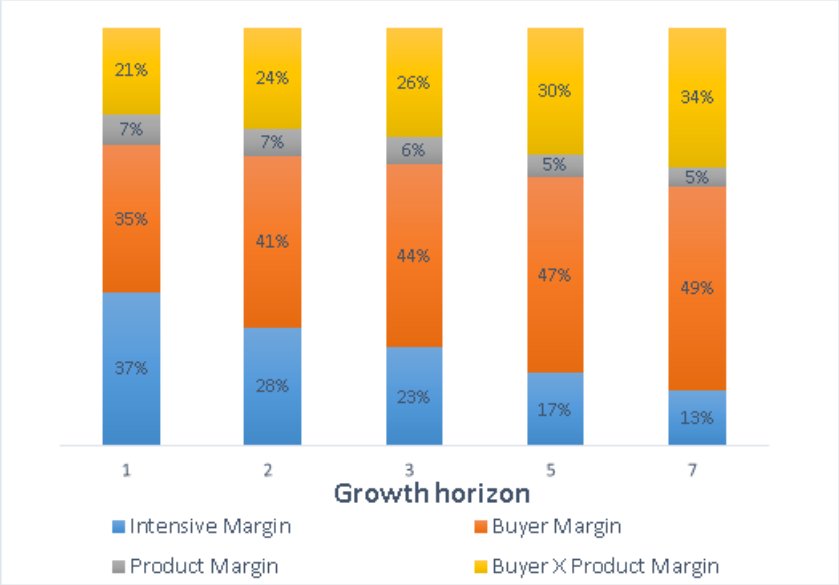
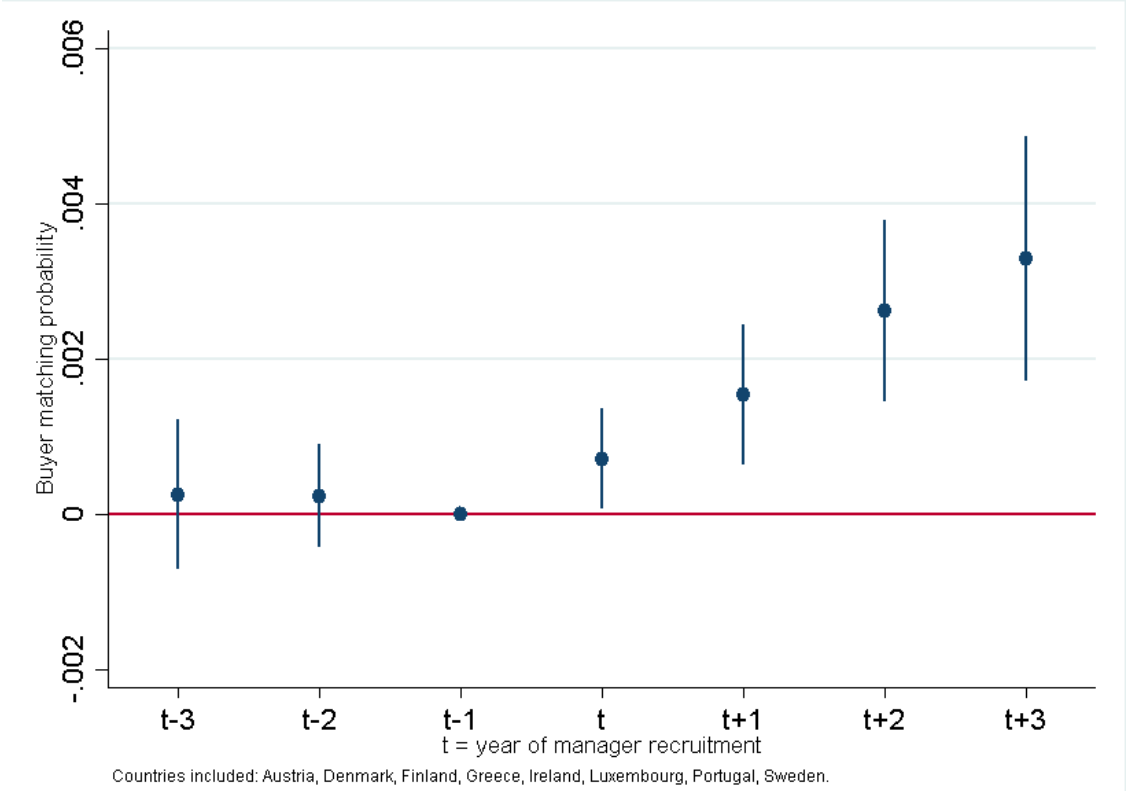
Figure A.1 – Exporter growth heterogeneity and exports margin



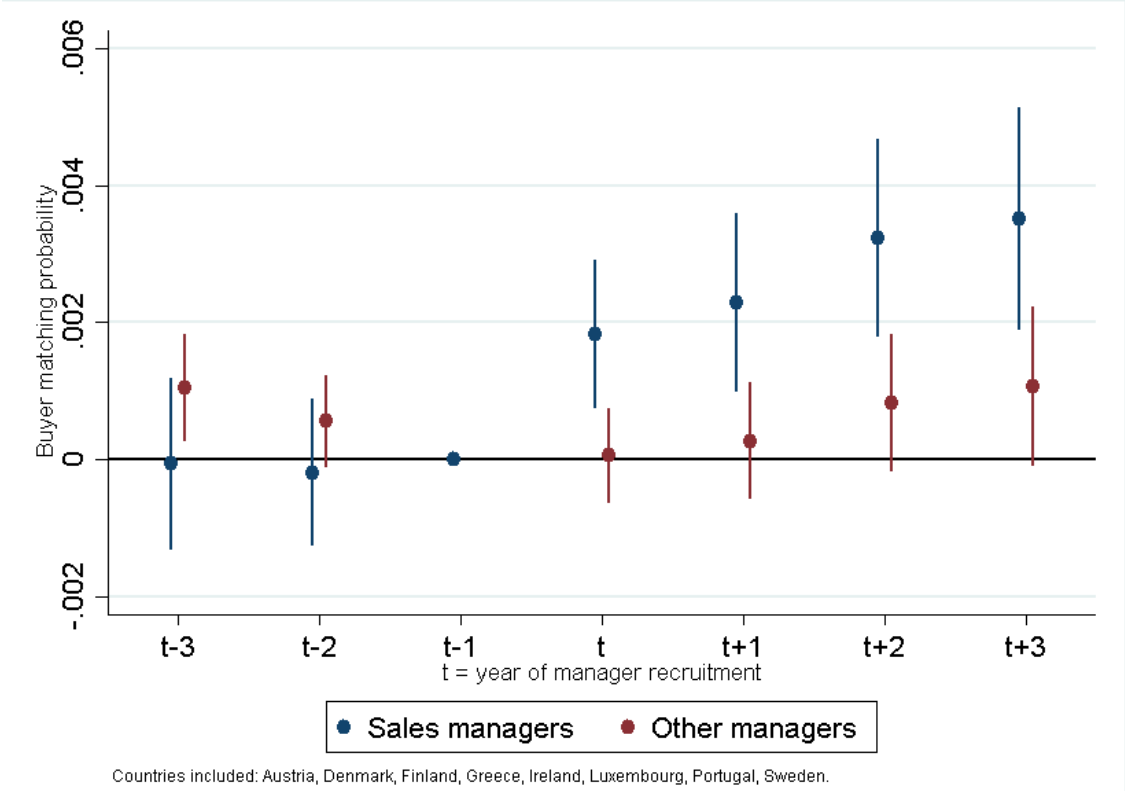
Notes: All customs transactions within EU, 1995-2017.

Figure A.2 – Managers who move across firms do transmit their contacts



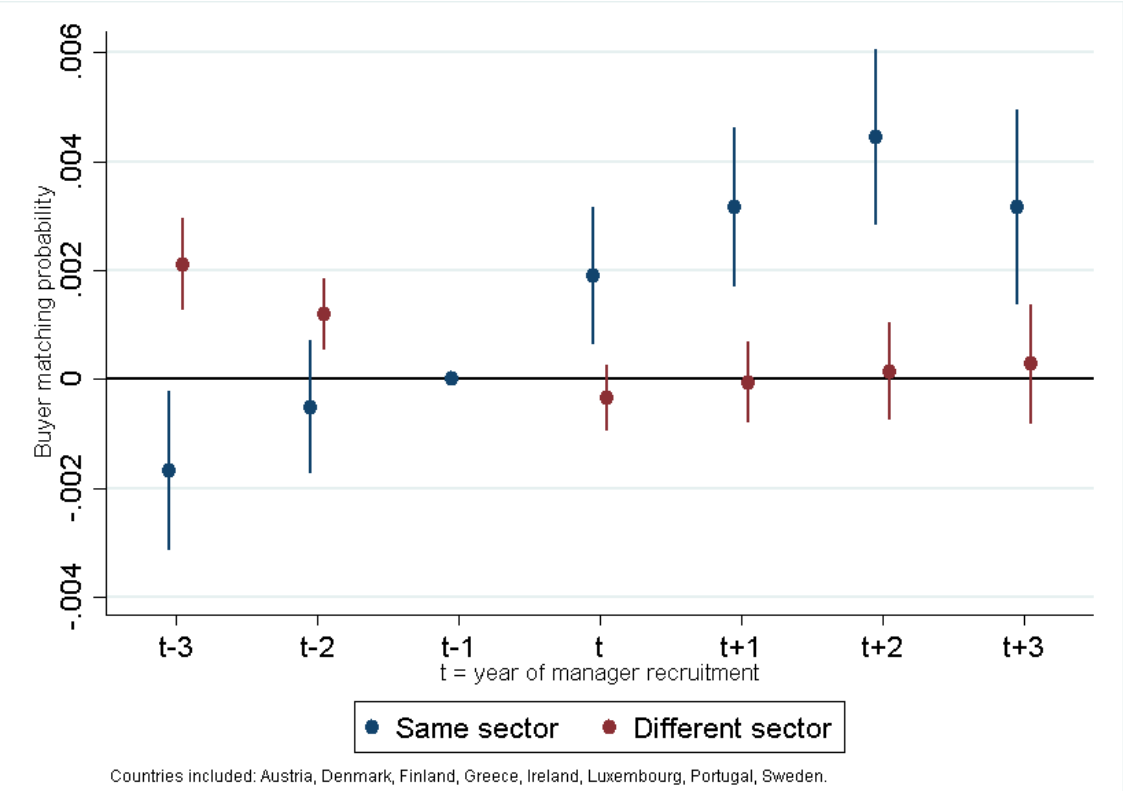
Notes: the graph displays estimated coefficients from an event-study (estimation of equation 4.4). The period of analysis is [2007,2017]. The outcome variable is the dummy 'French firm f sells to the buyer b in year t', and the regressor is the dummy 'firm f recruited a manager knowing buyer b in year t'. We restrict the sample to all pairs of French firms × international buyers for which: (i) there has never been a match at the beginning of the period, (ii) there is one 'network move' (treatment) during the period. The unit of analysis is the firm × buyer pair, and all units included in the analysis are treated at least once. 95% Confidence intervals are displayed. Standard errors are clustered at the firm × buyer level.

Figure A.3 – Sales managers have a specific role of network transmission



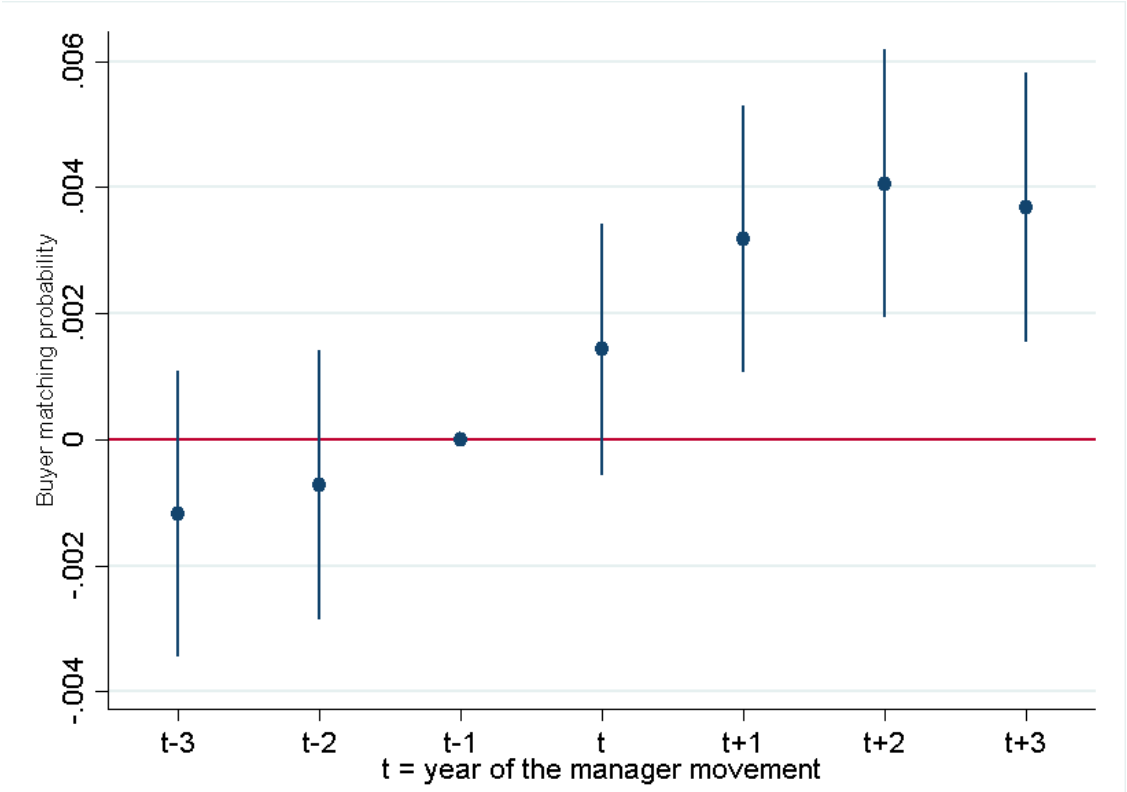
Notes: the graph displays estimated coefficients from an event-study. The period of analysis is [2007,2017]. The outcome variable is the dummy 'French firm f sells to the buyer b in year t' and the regressor is the dummy 'firm f recruited a sales manager knowing buyer b in year t'. We restrict the sample to all pairs of French firms × international buyers for which: (i) there has never been a match at the beginning of the period, (ii) there is one 'network move' (treatment) during the period. The unit of analysis is the firm × buyer pair, and all units included in the analysis are treated at least once. Firm × year, buyer × year and firm × buyer fixed effects are included. 95% confidence intervals are displayed. Standard errors are clustered at the firm × buyer level.

Figure A.4 – Sectoral expertise matters for network transmission



Notes: the graph displays estimated coefficients from an event-study. The period of analysis is [2007,2017]. The outcome variable is the dummy 'French firm f sells to the buyer b in year t' and the regressor is the dummy 'firm f recruited a manager knowing buyer b in year t'. We differentiate the effect for managers coming from a firm in the same sector than the firm of destination, and the effect for managers coming from a firm in a different sector than the firm of destination. We restrict the sample to all pairs of French firms × international buyers for which: (i) there has never been a match at the beginning of the period, (ii) there is one 'network move' (treatment) during the period. The unit of analysis is the firm × buyer pair, and all units included in the analysis are treated at least once. Firm × year, buyer × year and firm × buyer fixed effects are included. 95% confidence intervals are displayed. Standard errors are clustered at the firm × buyer level.

Figure A.5 – Robustness 1: effect of manager movements in Finland



Notes: the graph displays estimated coefficients from an event-study. The period of analysis is [2007,2017]. The outcome variable is the dummy 'French firm f sells to the buyer b in year t'. The sample includes all pairs of French firms × Finnish buyers, irrespective of whether these units received treatment (ie a 'network move') during the period or not. Firm × year, buyer × year and firm × buyer fixed effects are included. 95% confidence intervals are displayed. Standard errors are clustered at the firm × buyer level.

Table 4.1 – Variance decomposition of firm-level exporters' growth rate

	Intensive Margin	Buyer Margin	Product Margin	Buyer X Product Margin
	Panel A : Present at least 5 years			
1	37%	36%	7%	20%
2	29%	41%	6%	23%
3	24%	44%	6%	25%
4	21%	46%	6%	27%
5	17%	47%	5%	30%
6	16%	49%	5%	30%
7+	14%	50%	5%	32%
	Panel B : Alternative level of aggregation, exports within a destination			
1	44%	28%	12%	17%
2	35%	33%	11%	21%
3	30%	36%	10%	24%
4	26%	38%	10%	26%
5	23%	40%	9%	28%
6	21%	41%	9%	30%
7+	18%	42%	8%	32%
	Panel C : Alternative measure of product, HS2			
1	41%	47%	3%	9%
2	33%	55%	2%	10%
3	28%	59%	2%	11%
4	24%	62%	2%	12%
5	21%	65%	2%	13%
6	19%	67%	2%	13%
7+	16%	69%	2%	14%

Notes: All exports transaction within European Union, customs dataset restricted on observation with recorded NC8 (1995-2017), Bergounhon et al. (2018). Variance decomposition of exporters growth rate (Haltiwanger growth rate) conditional on survival, Davis et al. (1998). Product margin is defined at the 8-digit level in an harmonized nomenclature.

Table 4.2 – Number of observations

	# Firm	# Buyer	# Firm × Buyer
All	18,504	704,234	1,444,346
2014	9,818	283,137	484,273

Notes: Sample merged with match employer-employee data 2009-2015, customs data set restricted on observation with recorded NC8.

Table 4.3 – Number of buyers by experience in international markets

	Mean	p10	p25	p50	p75	p90
			# of buyers			
Full sample	45,5	2	6	17	45	104
1-year maturity	18,3	1	1	3	10	35
2-year maturity	28,2	1	2	7	22	60
3-year maturity	30,6	1	3	9	25	65
5+ maturity	47,7	2	7	19	48	109
8+ maturity	49,3	3	7	20	50	113

Notes: Sample merged with match employer-employee data 2009-2015, customs data set restricted on observation with recorded NC8.

Table 4.4 – Description of Sales occupations

Occupation label	Number of observations	Average wage	Average hourly wage
Commercial managers of small and medium-sized enterprises (excluding retail trade)	15 994	66 361	38
Other commercial sales professionals (except sales force technicians)	8 814	36 944	21
Business executives of large enterprises (excluding retail trade)	7 778	76 363	45
Commercial technicians and technical sales , representatives for final goods for firms	5 270	40 619	24
Commercial and technical sales technicians, capital goods representatives, intermediate goods, inter-industry trade (excluding informatics)	4 435	41 959	24
Product managers, commercial buyers and other marketing executives	4 111	64 532	37
Engineers and Technical Sales Professionals in Professional Mechanical Equipment	3 946	59 366	33
Commercial and technical sales technicians, representatives in services to companies or professionals (excluding banks, insurance, IT)	3 831	51 422	29
Engineers and technical sales staff in professional electrical or electronic equipment	3 186	64 628	36
Engineers and technical sales staff in the processing industries (intermediate goods)	2 429	62 509	47
Commercial and technical sales technicians, representatives to private individuals (excluding banks, IT, insurance)	1 022	21 026	21
Managers in the operation of retail stores	776	59 167	34
Control of the operation of sales outlets	574	39 434	23
Commercial entertainers in sales stores, merchandisers	486	32 360	21
Engineers and technical sales staff in information technology and telecommunications	393	66 760	36
Small sales managers (employees)	343	36 758	21
Traders, semployee of their firm	228	50 410	28
Commercial and Technical Sales Technicians, Computer Representatives	169	34 894	21
Real estate executives	146	84 656	49
Master of restoration: room and service	51	32 842	21
Engineers and technical sales staff in construction works	46	58 212	34
Master of restoration: kitchen / production	45	38 129	23
Hotel and restaurant managers	17	56 579	34

Notes: Sample merged with match employer-employee data 2009-2015, customs data set restricted on observation with recorded NC8.

Table 4.5 – Managers moves and network

	Managers' network in their previous firm				
Year	Mean	Min	Median	p90	Max
2010	43.6	0	3	100	3,665
2011	58.8	0	4	137	4,473
2012	62.1	0	5	141	5,188
2013	56.9	0	3	133	5,748
2014	65.3	0	1	153	6,006
2015	60.3	0	1	141	3,958

Notes: Customs data merged with match employer-employee data 2009-2015, restricted to wholesale and manufacturing sectors.

Table 4.6 – Sample Description, Number of observations

	mean	p50	min	max	sd	count
			Non exporters			
# of sales managers >0	26%	0	0	1	0.44	71,265
Nb of sales managers	1.9	0	0	1863	17.8	71,265
Nb of other managers	8.7	1	0	15515	104.51	71,265
Gross wage sales managers	71,997	60,946	1	2,050,967	50,370	89,845
			Exporters in EU			
# of sales managers >0	70%	1	0	1	0.44	9,818
Nb of sales managers	10.4	2	0	1863	46.6	9,818
Nb of other managers	46.9	11	0	15515	275.19	9,818
Share of sales managers (employment)	6.9%	3.4%	0	1	0.10	9,818
Share of other managers (employment)	25.3%	23%	0	1	0.15	9,818
Gross wage sales managers	75,870	63,793	1	2,050,967	53,576	72,038

Notes: Sample merged with match employer-employee data 2009-2015, customs data set restricted on observation with recorded NC8, restricted to year 2014.

Table 4.7 – Summary statistics main variables

	count	mean	min	p50	p75	p95	sd
Employment$_{ft}$	77859	153	1	44	114	507	845
Turnover$_{ft}$	77289	51278	0	9008	26418	163382	421821
Exports EU$_{ft}$(in thousand euros)	77859	12619	0	998	4082	37822	159366
Share turnover in EU$_{ft}$	77004	2	0	0	0	1	184
Wage bill$_{ft}$	77290	5682	0	1434	3791	19096	24265
Value Added$_{ft}$	77292	12371	-747883	2600	7249	41017	77030
Net Income$_{ft}$	77293	1390	-2256079	159	757	6316	23843
			Exporters characteristics				
#Buyers EU$_{ft}$	77859	45	1	17	45	171	121
#destinations EU$_{ft}$	77859	9	1	7	13	21	6
Maturity in EU	77859	15	1	17	19	23	6
			Exporters margins				
1-y export growth rate$_{ft}$	56932	0.01	-1.00	0.01	0.11	0.49	0.28
1-y product margin growth rate$_{ft}$	56932	-0.00	-1.00	0.00	0.00	0.04	0.08
1-y buyer margin growth rate$_{ft}$	56932	0.01	-1.00	0.00	0.03	0.22	0.15
1-y buyer $\times$ *product margin growth rate*$_{ft}$	56932	0.00	-1.00	0.00	0.00	0.04	0.12
1-y continuing margin growth rate$_{ft}$	56932	-0.00	-1.00	0.00	0.08	0.29	0.19

Notes: Sample merged with match employer-employee data 2009-2015, customs data set restricted on observation with recorded NC8.

Table 4.8 – Effect of the number of sales managers on the various 1-year export growth margins

	(1) 1-y export growth rate	(2) 1-y buyer margin growth	(3) 1-y product margin growth	(4) 1-y buyer × product margin growth	(5) 1-y continuing margin growth
Log # Sales managers$_{t-1}$	0.011***	0.005**	0.001	0.002	0.003
	(0.004)	(0.002)	(0.001)	(0.002)	(0.003)
Log Value added$_{t-1}$	-0.013	0.005	0.002	0.002	-0.012
	(0.013)	(0.007)	(0.003)	(0.004)	(0.009)
Log total employment$_{t-1}$	-0.055***	-0.018**	-0.004	-0.003	-0.030***
	(0.010)	(0.005)	(0.003)	(0.003)	(0.008)
Log VA/worker$_{t-1}$	-0.024*	- 0.000	-0.001	-0.002	0.021**
	(0.013)	(0.007)	(0.003)	(0.003)	(0.009)
Firm FE	Yes	Yes	Yes	Yes	Yes
Sector × Year FE	Yes	Yes	Yes	Yes	Yes
CZ × Year FE	Yes	Yes	Yes	Yes	Yes
Obs	50,663	50,663	50,663	50,663	50,663
R2	0.259	0.258	0.252	0.254	0.266

Notes: Standard errors are clustered at the firm-level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%. Log # Sales managers denotes the log of the number of sales managers in plus 1. The dependent variables are Haltiwanger growth rates of the different export margins, where export margins are computed thanks to an application of Bernard et al. (2009) decomposition's to a firm-to-firm framework. Then for each margin we compute 1-y margin growth as $\frac{2\times\Delta Margin\ of\ interest}{(Exports_{ft-1}+Exports_{ft})}$

Table 4.9 – Effect of the number of R&D managers on the various 1-year export growth margins

	(1) 1-y export growth rate	(2) 1-y product margin growth	(3) 1-y buyer margin growth	(4) 1-y buyer × product margin growth	(5) 1-y continuing margin growth
Log # R&D managers$_{t-1}$	-0.001	0.000	0.001	-0.001	- 0.002
	(0.005)	(0.001)	(0.003)	(0.002)	(0.003)
Log Value added$_{t-1}$	-0.012	0.002	-0.005	0.003	-0.012
	(0.013)	(0.003)	(0.007)	(0.004)	(0.009)
Log total employment$_{t-1}$	-0.050***	-0.004	-0.016 ***	-0.001	-0.028***
	(0.010)	(0.003)	(0.005)	(0.003)	(0.008)
Log VA/worker$_{t-1}$	- 0.025*	- 0.001	- 0.000	-0.002	-0.021
	(0.013)	(0.003)	(0.007)	(0.004)	(0.009)
Firm FE	Yes	Yes	Yes	Yes	Yes
Sector × Year FE	Yes	Yes	Yes	Yes	Yes
CZ × Year FE	Yes	Yes	Yes	Yes	Yes
Obs	50663	50663	50663	50663	50663
R2	0.259	0.252	0.258	0.254	0.266

Notes: Standard errors are clustered at the firm-level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%. Log # R&D managers denotes the log of the number of R&D managers in plus 1. The dependent variables are Haltiwanger growth rates of the The dependent variables are Haltiwanger growth rates of the different export margins, where export margins are computed thanks to an application of Bernard et al. (2009) decomposition's to a firm-to-firm framework. Then for each margin we compute 1-y margin growth as $\frac{2\times\Delta Margin\ of\ interest}{(Exports_{ft-1}+Exports_{ft})}$.

Table 4.10 – Acquiring versus retaining buyers: effect of number of managers on buyer gains and losses

	1-y buyer margin (1)	1-y buyer margin gains (2)	1-y buyer × margin losses (3)	Δ # Buyers margin (4)
Log # Sales managers$_{t-1}$	0.005**	0.004**	-0.001	0.632
	(0.002)	(0.002)	(0.001)	(0.351)
Log Value added$_{t-1}$	-0.005	-0.017***	-0.012***	0.291
	(0.007)	(0.005)	(0.004)	(1.085)
Log total employment$_{t-1}$	-0.018***	-0.015***	0.003	-2.266 ***
	(0.005)	(0.004)	(0.003)	(0.862)
Log VA/worker$_{t-1}$	- 0.000	0.008*	0.008*	-0.844
	(0.007)	(0.005)	(0.005)	(1.198)
Firm FE	Yes	Yes	Yes	Yes
Sector × Year FE	Yes	Yes	Yes	Yes
CZ × Year FE	Yes	Yes	Yes	Yes
Obs	50663	50663	50663	50663
R2	0.258	0.455	0.450	0.386

Notes: Standard errors are clustered at the firm-level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%. The dependent variables are Haltiwanger growth rates of the different export margins, where export margins are computed thanks to an application of Bernard et al. (2009) decomposition's to a firm-to-firm framework. Then for each margin we compute 1-y margin growth as $\frac{2\times\Delta Margin\ of\ interest}{(Exports_{ft-1}+Exports_{ft})}$.

Table 4.11 – Sales managers who move steal away some customers

	Dummy buyer lost in $t+1$		Growth of exports to buyer in $t+1$	
	(1)	(2)	(3)	(4)
$\mathbb{1}$(Manager moved to a firm acquiring buyer b in t)	-0.0252***	0.0532***	0.0216	-0.180***
	(0.00834)	(0.00556)	(0.0171)	(0.0136)
Firm × Year FE	Yes	Yes	Yes	Yes
Buyer × Year FE	Yes	Yes	Yes	Yes
Buyer × Firm FE	No	Yes	No	Yes
Obs	5,086,227	4,193,764	4,193,764	4,193,764
R2	0.427	0.678	0.474	0.677
Adj R2	0.258	0.393	0.320	0.392
Mean outcome	0.242	0.242	0.132	0.132

Notes: 95% confidence intervals are displayed. Standard errors are clustered at the firm × buyer.

Table 4.12 – Sales managers transmit their buyers' network when moving from firm-to-firm

	(1) # new buyers	(2) # new buyers within network	(3) # new buyers outside network
$\mathbb{1}$(Sales manager recruited$_t$)	0.237	0.260***	-0.0233
	(0.211)	(0.0208)	(0.211)
Log Employment$_{ft}$	-0.663	-0.0247	-0.638
	(0.460)	(0.0162)	(0.456)
Log Value added$_{ft-1}$	3.294***	0.0366	3.257***
	(0.749)	(0.0346)	(0.742)
Log VA/worker$_{ft-1}$	-3.055***	-0.0102	-3.045***
	(0.733)	(0.0250)	(0.729)
Firm FE	Yes	Yes	Yes
Sector × Year FE	Yes	Yes	Yes
CZ × Year FE	Yes	Yes	Yes
Obs	42727	42727	42727
R2	0.892	0.352	0.892

Notes: Standard errors are clustered at the firm-level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%. Column (1) displays the regression of the number of new buyers acquired by the firm in year t on the dummy equal to one if the firm recruited at least one sales manager in year t. Column (2) displays the regression of the number of new buyers within the managers' network in year t on the dummy equal to one if the firm recruited at least one sales manager in year t. Column (3) displays the regression of the number of new buyers outside managers' network in year t on the dummy equal to one if the firm recruited at least one sales manager in year t. For a given firm, within network buyers are defined as buyers that a manager recruited by the firm brought from her previous firm. For a given firm, outside network buyers are defined both as buyers that a manager recruited by the firm did not bring from her previous firm and as total buyers acquired for firms which did not recruit any sales manager. Firm fixed-effect, sector × year (3-digit sector) and commuting zone × year fixed effects are included.

Table 4.13 – Sales managers transmit their buyers' network when moving from firm-to-firm: analysis with sales to new buyers

	(1) Log sales to new buyers	(2) Log sales to new buyers within network	(3) Log sales to new buyers outside network
$\mathbb{1}$(Sales manager recruited$_t$)	0.0844*	1.085***	0.0195
	(0.0507)	(0.0458)	(0.0511)
Log Employment$_{ft}$	0.134	-0.0458	0.135
	(0.106)	(0.0530)	(0.107)
Log Value added$_{ft-1}$	0.828***	0.0357	0.829***
	(0.142)	(0.0669)	(0.142)
Log VA/worker$_{ft-1}$	-0.673***	-0.0225	-0.671***
	(0.148)	(0.0652)	(0.148)
Firm FE	Yes	Yes	Yes
Sector × Year FE	Yes	Yes	Yes
CZ × Year FE	Yes	Yes	Yes
Obs	42727	42727	42727
R2	0.638	0.426	0.638

Notes: Standard errors are clustered at the firm-level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%. Column (1) displays the regression of the log of sales to new buyers acquired by the firm in year t on the dummy equal to one if the firm recruited at least one sales manager in year t. Column (2) displays the regression of the log of sales to new buyers within the managers' network in year t on the dummy equal to one if the firm recruited at least one sales manager in year t. Column (3) displays the regression of the log of sales to new buyers outside managers' network in year t on the dummy equal to one if the firm recruited at least one sales manager in year t. For a given firm, within network buyers are defined as buyers that a manager recruited by the firm brought from her previous firm. For a given firm, outside network buyers are defined both as buyers that a manager recruited by the firm did not bring from her previous firm and as total buyers acquired for firms which did not recruit any sales manager. Firm fixed-effect, sector × year (3-digit sector) and commuting zone × year fixed effects are included.

Table 4.14 – Transmission of buyers' network according to manager's previous sector

	(1) # new buyers	(2) # new buyers within network	(3) # new buyers outside network
$\mathbb{1}$(Sales manager recruited from same 3-digit sector$_t$)	0.997**	0.737***	0.260
	(0.446)	(0.0965)	(0.432)
$\mathbb{1}$(Sales manager recruited from different 3-digit sector$_t$)	0.0997	0.174***	-0.0745
	(0.214)	(0.0167)	(0.214)
Log Employment$_{ft}$	-0.661	-0.0237	-0.638
	(0.458)	(0.0149)	(0.455)
Log Value added$_{ft-1}$	3.295***	0.0372	3.257***
	(0.748)	(0.0339)	(0.742)
Log VA/worker$_{ft-1}$	-3.054***	-0.00997	-3.045***
	(0.733)	(0.0243)	(0.728)
Firm FE	Yes	Yes	Yes
Sector × Year FE	Yes	Yes	Yes
CZ × Year FE	Yes	Yes	Yes
Obs	42727	42727	42727
R2	0.892	0.362	0.892

Notes: Standard errors are clustered at the firm-level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%. Column (1) displays the regression of the number of new buyers acquired by the firm in year t on the dummy equal to one if the firm recruited at least one sales manager in year t. Column (2) displays the regression of the number of new buyers within the managers' network in year t on the dummy equal to one if the firm recruited at least one sales manager in year t. Column (3) displays the regression of the number of new buyers outside managers' network in year t on the dummy equal to one if the firm recruited at least one sales manager in year t. For a given firm, within network buyers are defined as buyers that a manager recruited by the firm brought from her previous firm. For a given firm, outside network buyers are defined both as buyers that a manager recruited by the firm did not bring from her previous firm and as total buyers acquired for firms which did not recruit any sales manager. Firm fixed-effect, sector × year (3-digit sector) and commuting zone × year fixed effects are included.

Table 4.15 – Transmission of buyers' network according to new versus existing countries

	Within network buyers		Outside network buyers	
	(1)	(2)	(3)	(4)
	# new buyers within network existing countries	# new buyers within network new countries	# new buyers outside network existing countries	# new buyers outside network new countries
$\mathbb{1}$(Sales manager recruited$_t$)	0.240***	0.0206***	-0.00499	-0.0183
	(0.0204)	(0.00260)	(0.206)	(0.0268)
Log Employment$_{ft}$	-0.0194	-0.00523	-0.560	-0.0783
	(0.0137)	(0.00418)	(0.441)	(0.0561)
Log Value added$_{ft-1}$	0.0335	0.0030471	3.325***	-0.0679
	(0.0337)	(0.00429)	(0.726)	(0.0929)
Log VA/worker$_{ft-1}$	-0.00773	-0.00242	-2.988***	-0.0562
	(0.0237)	(0.00419)	(0.708)	(0.101)
Firm FE	Yes	Yes	Yes	Yes
Sector × Year FE	Yes	Yes	Yes	Yes
CZ × Year FE	Yes	Yes	Yes	Yes
Obs	42727	42727	42727	42727
R2	0.349	0.295	0.896	0.356

Notes: Standard errors are clustered at the firm-level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%. Column (1) displays the regression of the number of new buyers and within the managers' network in countries to which the firm already exported,acquired by the firm in year t on the dummy equal to one if the firm recruited at least one sales manager in year t. Column (2) displays the regression of the number of new buyers, within the managers' network and in countries where the firm did not already export on the dummy equal to one if the firm recruited at least one sales manager in year t. Column (3) displays the regression of the number of new buyers outside managers' network and in countries to which the firm already exported on the dummy equal to one if the firm recruited at least one sales manager in year t. Column (3) displays the regression of the number of new buyers outside managers' network and in countries to which the firm did already export on the dummy equal to one if the firm recruited at least one sales manager in year t. For a given firm, within network buyers are defined as buyers that a manager recruited by the firm brought from her previous firm. For a given firm, outside network buyers are defined both as buyers that a manager recruited by the firm did not bring from her previous firm and as total buyers acquired for firms which did not recruit any sales manager. Firm fixed-effect, sector × year (3-digit sector) and commuting zone × year fixed effects are included.

Table 4.16 – Transmission of Managers network and wages of managers

	Log $Wage_{sft}$		
	(1)	(2)	(3)
Log # $Buyers_{sf't-1}$	0.011**	0.059*	-0.007
	(0.005)	(0.032)	(0.010)
Log $Wage_{sf't-1}$	0.344***	0.384***	0.344***
	(0.008)	(0.012)	(0.008)
$\mathbb{1}$(Same sector)$_{ff't}$			0.024
			(0.025)
$\mathbb{1}$(Same sector)$_{ff't}$ × # $Buyers_{sf't-1}$			0.005**
			(0.000)
Controls	Yes	Yes	Yes
Firm f FE	Yes	Yes	Yes
Firm f' FE	No	Yes	No
Sector × Year FE	Yes	Yes	Yes
CZ × Year FE	Yes	Yes	Yes
Obs	8751	5559	8751
R2	0.676	0.824	0.677

Notes: Standard errors are clustered at the firm-level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%. Control variables are Log Employment$_{ft}$, Log Value added$_{ft-1}$ and Log VA/worker$_{ft-1}$.

Chapitre 5

Résumé substantiel

Cette thèse étudie la rencontre et l'appariement entre les entreprises françaises et leurs acheteurs sur les marchés internationaux. La constitution d'un portefeuille d'acheteurs à l'étranger est une composante cruciale de la croissance des exportateurs : les ventes vers de nouveaux acheteurs expliquent près de 50% des différences de taux de croissance à l'export entre les entreprises françaises à moyen terme. Pourtant, sur les marchés internationaux, l'éloignement géographique et les différences culturelles et institutionelles exacerbent les difficultés qu'ont les entreprise à trouver des acheteurs potentiels, Rauch (2001), Allen (2014) et Arkolakis (2010). Cette thèse étudie et quantifie le rôle des obstacles informationnels et des obstacles financiers auxquels les entreprises sont confrontées lorsqu'elles démarchent des acheteurs à l'étrangers.

Cette thèse s'appuie sur des données exhaustives détaillant l'ensemble des exportations intracommunautaires françaises sur les vingt dernières années. En particulier pour chaque transaction, l'entreprise française exportatrice est identifée, le produit et le montant de la transaction ainsi que l'achateur par son numéro de TVA introcommunautaire.

Le premier chapitre examine comment les frictions de recherche sur les marchés internationaux des biens peuvent fausser la concurrence entre entreprises à productivité hétérogène. Il introduit des frictions de recherche bilatérales entre acheteurs et vendeurs dans un modèle de commerce ricardien. Les frictions de recherche empêchent les acheteurs d'identifier les vendeurs les plus productifs, et entrainent des distorsions de concurrence profitables aux entreprises les moins productives. Les frictions de recherche auxquelles sont confrontés les exportateurs français au niveau du produit et de la destination sont estimées par GMM à partir

du modèle structurel. Elles sont plus sévères dans les pays grands et lointains et pour les produits différenciés. Dans un exercice contrefactuel, nous montrons que la réduction du niveau des frictions de recherche conduit à une amélioration de l'efficacité du processus de sélection des entreprises exportatrices : les exportateurs les moins productifs sont exclus du marché alors que la probabilité d'exporter et la valeur des exportations augmentent au sommet de la distribution de la productivité.

Le deuxième chapitre étudie le rôle des contraintes de liquidité dans la construction d'une base de clientèle à l'étranger. Nous profitons d'une réforme qui plafonne les délais de paiement à soixante jours des transactions commerciales des entreprises françaises comme un choc exogène sur l'accès à la liquidité. Nous montrons qu'une diminution de trois jours des délais de paiement sur le marché intérieur augmente la croissance des exportations individuelles de 1,5 point de pourcentage. La croissance des exportations est entièrement tirée par l'expansion de la clientèle : les effets de la politique sur les ventes aux clients existants sont nuls. Les entreprises n'attirent pas de nouveaux clients en réduisant leurs prix. Au contraire, conformément à l'idée que l'assouplissement des contraintes de liquidité a aidé les entreprises à financer les coûts d'acquisition des clients, nous constatons que les effets se sont concentrés sur les exportations de produits différenciés et les exportations vers des clients qui ne faisaient pas déjà affaire avec des fournisseurs français. De plus, l'assouplissement des contraintes de liquidité incite les entreprises à augmenter leurs dépenses de marketing.

Le dernier chapitre étudie l'importance du réseau et des contacts des managers dans l'expansion des entreprisesà l'export. Pour augmenter leurs ventes dans une destination, certaines entreprises recrutent des commerciaux qui connaissent déjà le marché et ont des contacts avec de nombreux clients potentiels. Nous testons tirons parti des transitions d'emploi à emploi des managers et commerciaux pour déterminer s'ils transmettent leurs anciens clients à leur nouvelle entreprise. Grâce à un modèle de staggered adoption, nous constatons que le recrutement d'un manager connaissant un acheteur augmente de 0,14 point de pourcentage la probabilité de l'entreprise de s'apparier à cet acheteur. Les baisses de ventes des entreprises dont sont partis les managers étant limitées, nos résultats indiquent que les transitions de managers entre entreprise permettent la diffusion de contacts et d'informations qui sont bénéfiques aux exportations agrégées. Le réseau des managers est donc important pour surmonter les frictions informationnelles qui empêchent les entreprises de se développer à l'étranger.

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Titre : Réseau de clients sur les marchés internationaux

Mots clés : Commerce international, finance d'entreprise, management, politiques publiques

Résumé : Cette thèse étudie la rencontre et l'appariement entre les entreprises françaises et leurs acheteurs sur les marchés internationaux. La constitution d'un portefeuille d'acheteurs à l'étranger est une composante cruciale de la croissance des exportateurs: les ventes vers de nouveaux acheteurs expliquent près de 50% des différences de taux de croissance à l'export entre les entreprises françaises à moyen terme. Pourtant, sur les marchés internationaux, l'éloignement géographique, les différences culturelles et institutionelles exacerbent les difficultés qu'ont les entreprise à trouver leurs acheteurs potentiels, Rauch (2001), Allen (2014) et Arkolakis (2010). Cette thèse étudie et quantifie l'effet des obstacles informationnels et contraintes financières auxquels les entreprises sont confrontées lorsqu'elles démarchent des acheteurs à l'étrangers.

Cette thèse s'appuie sur des données exhaustives détaillant l'ensemble des exportations intracommunautaires françaises sur les vingt dernières années. En particulier, pour chaque transaction, l'entreprise française exportatrice, le produit et le montant de la transaction ainsi que l'acheteur par son numéro de TVA introcommunautaire sont identifiés.

Le premier chapitre examine comment les frictions de recherche sur les marchés internationaux des biens peuvent fausser la concurrence entre entreprises à productivité hétérogène. Le deuxième chapitre étudie le rôle des contraintes de liquidité dans la construction d'une base de clientèle à l'étranger. Le dernier chapitre étudie l'importance du réseau et des contacts des managers dans l'expansion des entreprises à l'international.

Title : Searching for buyers in international markets

Keywords : International trade, corporate finance, management, politiques publiques

Abstract : This thesis studies how firms meet and match with their potential buyers in international markets. Buyers accumulation abroad is a crucial component of exporters growth: sales to new buyers explain almost 50% of firms' export growth rate heterogeneity in the medium run. Yet, in international markets, heightened geographical and cultural distances exacerbate search and information frictions making it harder for firms to match with potential buyers. This thesis investigates the role of search, financial, and network barriers faced by firms willing to match with buyers abroad.

To investigate these questions this thesis relies on a unique data set covering the universe of intra-EU trade relationships of French firms in which buyers of French firms are identified. More precisely, for each transaction, the exporting firm, the product and value of the flow, and the European buyer through its European VAT number are recorded.

The first chapter explores how search frictions in international good markets distort competition between firms of heterogeneous productivity. The second chapter studies the role of liquidity constraints in preventing firms from expanding their customer base. The last chapter investigates the role of managers' networks for the acquisition of buyers in international markets.

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