Building a Customer Base under Liquidity Constraints*

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Abstract

In the presence of liquidity constraints, firms face a trade-off between financing the working capital needs generated by existing customers and investing in the expansion of the customer base. We test for this idea and its implications by relying on the combination of a quasi-natural experiment and unique customer-level data sets. Exploiting an exogenous variation in legal payment terms between French firms, we study how the export behavior of firms reacts to a change in the rate of payment collection in the domestic market. The results show that long payment periods from French customers do represent an impediment to the international development of liquidity-constrained firms: a 3-days decrease in days of sales outstanding (DSO) is found to raise the growth of firm exports by 1.2 percentage points and to increase (decrease) the probability of exiting (entering) a country by 8% (3%). Importantly, the vast majority of the growth in exports is found to come from an increase in the number of customers in the market. Price strategies do not seem to be driving the acquisition of customers. Our results strongly support the view that liquidity constrained firms under-invest in the formation of a customer base.

JEL codes: *F14, G31.*

Key words: *liquidity constraints, customer capital, trade credit, IV estimation.*

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1 Introduction

There is ample evidence that financing frictions limit the expansion of firms by constraining the adjustment of inputs such as capital (Chaney, Sraer and Thesmar (2012)) or labor (Chodorow-Reich (2013)). Using a unique customer-supplier data set, we show in a quasi-experimental setting that financial constraints also limit firm growth on the *demand* side. Specifically, our results indicate that in response to a positive liquidity shock, firms increase the scope of their activity by expanding their customer base. By contrast, the volume of sales realized with existing customers is found to react much less to the shock. This result implies that financing frictions limit the expansion of liquidity-constrained firms mostly by reducing their capacity to acquire new customers, a fact that is to our knowledge new to the literature.

By uncovering a causal link between financing capacity and customer accumulation, our paper resonates with the recent literature emphasizing the role of demand factors in the determination of firm size.[1] Most recently, Hottman, Redding and Weinstein (2016) have shown using barcode data that 50 to 75 % of the large heterogeneity in firm size seems to be explained by variations in demand, while less than 20% appears to be driven by differences in technical efficiency. While suggesting an important role for demand, this line of research has remained largely silent on why some firms are able to attract more customers than others with comparable levels of productivity. Our results provide a new answer to this question by showing that differences in the stock of customers (or "customer capital"; see Gourio and Rudanko (2014)) can be traced back to the presence of financing frictions.

There are three main reasons for which financially constrained firms might under-invest in customer capital. First, considerable resources in marketing to acquire and retain customers, marketing expenditures by US firms representing between 2 and 8% percent of GDP (Arkolakis, 2010). Firms might then be attracting customers by lowering markups, putting shallow-pocketed firms at a disadvantage with regard to their competitors (Chevalier and Scharfstein, 1996). A last explanation is that trade relationships naturally induces a temporal gap between the payment of inputs and cash inflows. The capacity to take on additional customers might consequently be determined by the ability of the firm to finance working capital.[2][3]

We focus in our analysis on the acquisition of customers in foreign markets. This choice is motivated by the observation that most of the constraints on the acquisition of customers listed above are likely to be particularly binding in the context of international trade. Export

[1] This area of research has in particular explored the role of demand variation on industry dynamics (Foster, Haltiwanger and Syverson, 2008, 2016; Dinlersoz and Yorukoglu, 2012), the size distribution of firms (Hottman, Redding and Weinstein, 2016; Arkolakis, 2016), the relation between Tobin's q and investment (Gourio and Rudanko, 2014) and the dynamics of growth in export markets (Drozd and Nosal, 2012; Fitzgerald, Haller and Yedid-Levi, 2016)

[2] This is particularly true when, as Demir and Javorcik (2018) show in the context of Turkish exporters, firms compete not only through prices but also through the provision of trade credit.

[3] Lins, Servaes and Tufano (2010) show in this line that CFOs use credit lines as a way to secure access to liquidity to preserve the possibility to exploit future business opportunities. This type of financing solutions might however constitute viable liquidity substitute only for relatively large, unconstrained firms (Sufi, 2007)

transactions are indeed structurally more dependent on working capital than domestic transactions. On the basis of survey evidence, Schmidt-Eisenlohr (2013) finds that in 78% of export transactions, the importer pays after reception of the product such that shipping time comes in addition to the payment periods. As of consequence, exports transaction require more working capital and are more sensitive to financing constraints (Feenstra, Li and Yu, 2014). Moreover, specific information and search frictions related to geographical and cultural distances make the matching with customers particularly difficult in export markets (Rauch, 1999).

Last but not least, our focus on exports allows us to exploit high-quality, extensive data sets recording the identity of all EU-based clients of French exporters. We are therefore able to keep jointly track of the evolution of the number of customers and of sales by customer (the data set being recorded at the level of the 8-digits product code), something that is notoriously difficult to realize for domestic transactions.[4]

Our identification strategy is based on a exogenous and large variation in payment terms triggered by a 2009 French law (the "policy"). The policy introduced a cap on the payment terms authorized in transactions contracted under the French trade code. This resulted in a large decrease in the average period of payment collection for firms operating in France; by contrast, the average period of payment collection decreased much less during the same period for firms realizing most of their sales in export markets as international transactions were not directly affected by the policy: more details are given in section 2.1. As a consequence of the policy, payment periods as measured by days of sales outstanding (DSO) decreased by around 15 days between 2007 and 2009 in the manufacturing and wholesale sectors.

Previous research has shown that large payment periods by customers expose financially constrained firms to liquidity risk. Using an early implementation in the trucking sector of the policy that we exploit, Barrot (2016) shows in a difference-in-difference setting that following the increase in the rate of payment collection, the probability of corporate defaults and liquidations significantly decreased compared to the control group.

In the face of high liquidity risk, firms exposed to long payment periods from clients choose to preserve internal funding by cutting back capital expenditures (Murfin and Njoroge, 2015) or limiting new hirings (Barrot and Nanda, 2016). Consistently with the literature, our results indicate that firms that experienced a decrease in days of sales outstanding drew significantly less on their credit lines. This suggests that firms have been able to shift from expensive sources of funding towards internal liquidity to finance the expansion of their customer base.

While providing a unique quasi-experimental setting, this policy is particularly challenging to empirically analyze since (1) it provides no natural control group to which the econometrician might refer, (2) the treatment may not be randomly assigned since being subject to high payment periods is likely to be related to export activity and (3) the implementation of the law overlaps with the beginning of the global financial crisis that disproportionately affected international

[4]Some exceptions nonetheless exist: Barrot and Sauvagnat (2016) for US listed firms or Dhyne, Magerman and Rubínová (2015) for the universe of Belgian firms.

trade (Eaton et al., 2016).

We tackle these identification issues by building an econometric framework based on several steps. The absence of control group (1) is overcome by using the sixty-days rule defined by the law as a source of variation in the firm-level exposure to the policy prior to its enactment. Firms that were already compliant with the 60-days rule should in theory be left unaffected by the policy; by contrast, firms that were experiencing periods of payment collection higher than 60 days should benefit from a positive liquidity shock. We then address the concern that the position to the sixty-days threshold might be non-random (2) using the observation that payment terms tend to stay relatively homogeneous within a product market (Ng, Smith and Smith, 1999). This allows us to rely on a simple "shift-share" strategy (Bartik, 1991): firms present in product markets where days of sales outstanding were more distant to the sixty-days limit prior to the policy should have experienced a larger positive liquidity shock after its enactment.

Exploiting rich fiscal and survey data sets on French firms provided by the French statistical institute (Insee), we estimate the rate of payment collection as the firm-level ratio of accounts receivable over sales multiplied by 365. Our measure of the exposure of the firm to the policy is then computed as the sales-weighted average sectoral distance to the sixty-days threshold in the different sectors in which the firm operates. As an example, assume that prior to the policy, it took on average 80 days for a firm selling household appliances to get paid, and 65 days for a firm that produces luminaries. The corresponding distances to the sixty-days threshold are 20 and 5 days. A firm whose sales are equally divided between household appliances and luminaries will therefore be attributed a distance of 12.5 days to the threshold. This measure is used as an instrument for the actual variation in the rate of payment collection. The first stage estimate suggests that the instrument is a strong predictor of the correction induced by the policy, each additional days of sales outstanding above the sixty-days threshold being associated with a subsequent 0.1 day decrease in payment periods.

To address the potentially confounding role of the financial crisis (3), we exploit the granularity of our data set by introducing country-year fixed effects. The estimates of the effect of the variation in payment periods on the evolution of sales are therefore based on the comparison between firms that are differently affected by the policy *in a given market*. This procedure first allows to control for the presence of country-level shocks that could affect export activity. Importantly, it also eliminates the influence of composition effects that might arise if the firms the most exposed to the policy were exporting in the countries the most hit by the crisis (Paravisini et al., 2014). Additionally, we rely on the panel dimension of our data set to remove time-unvarying unobservable characteristics through the introduction of firm fixed effects.

Our results show that a decrease in days of sales outstanding by three days in France (a sample standard deviation) raises the growth rate of exports by 1.2 percentage points. The vast majority of the effect is found to come from an expansion of the customer base of the firm. We further show that this positive liquidity shocks also affected the extensive margin of exports, as

a 3-days decrease in days of sales outstanding is found to raise the probability of entering a new country by 0.1 percentage points (a 3% increase compared to the unconditional probability) and to decrease the probability to exit by 1.1 pp (a 8% decrease).

The estimates suggest that the effects of payment periods on export growth are economically large. There are two main reasons for this. First, as Barrot and Nanda (2016) explain, seemingly benign changes in the rate of payment collection can lead to important differences in terms of available cash. Take for example the case of firm with total turnover of 12 millions euros (the sample average): a 3-days decrease in days of sales outstanding imply a *permanent* increase in cash of 99,000 euros (= $3/365 \times 12$ millions).

Economic shocks tend moreover to be amplified and propagated over time by financing frictions. Profitability shocks affect firm's equity level, which combined with financing constraints will impact future financing capacity.[5]. A relaxation of financing constraints through a reduction of liquidity risk should therefore allow firms to grow faster on the short term and ultimately to become unconstrained on the long run (Clementi and Hopenhayn, 2006).

A battery of robustness checks is performed to ensure the validity of our results. We do not find any evidence of a significant link between our measure of treatment intensity and the variation of exports prior to the policy, the effects actually kicking in right at the moment of the implementation of the policy. Moreover, since firms are clients as well as suppliers, it could be objected that the effects of the policy on the asset and liability sides may actually offset each other. This would lead our analysis to capture only one dimension of the impact. We address this issue by computing the rate of payment collection in net terms (days of sales outstanding minus days payable outstanding). As both DSO and DPO are expected to converge towards sixty days, the policy tends to mechanically reduce the difference between the two. Our results are qualitatively unchanged in this alternative identification strategy.

We then characterize further the way financing frictions limit investment in customer capital by assessing the effects of the policy on prices (as proxied by unit values). Two competing theories are tested. In the presence of search frictions and/or habit formation, firms could attract customers by temporarily lowering prices. In doing so, firms effectively sacrifice present profits in return for future ones. Based on this insight, Chevalier and Scharfstein (1996) posit that liquidity-constrained firms should under-invest in the acquisition of customers as they discount more future cash-flows. Accordingly, they show that financially constrained supermarkets raise more their prices during economic recessions.[6] A recent literature suggests on the other hand that firms might be mainly investing in the acquisition of customers through *non-price* actions (*e.g.*, marketing, favorable payment terms). Using micro data on Irish exporters, Fitzgerald, Haller and Yedid-Levi (2016) observe that while prices stay unchanged, export quantities

[5]For instance, Almeida, Carvalho and Kim (2017) exploit seasonal variation in profitability to show that working capital constraints can lead to magnify the effects of idiosyncratic shocks.

[6]Gilchrist et al. (2017) recently reexamined this theory in the context of the 2008 financial crisis and showed using Compustat data that liquidity-constrained firms were responsible for the lack in deflationary pressures following the large decrease in demand.

substantially increase with time spent in a market: based on a structural model, they estimate that 20 to 30% of firm cash flows are devoted to non-price investments in the customer base.[7]

We find no impact of the decrease in payment periods on prices (as measured by unit values). This result holds even for homogeneous goods for which measurement error in prices is lower and for which pricing strategies are likely to be more effective. Combined with the positive effect on the expansion of the customer base, our results support the hypothesis that investment in customer capital are mainly made in the form of non-price actions. Our work therefore contribute to the literature by providing first causal evidence of the way the customer base is built and how its dynamics are shaped by financing constraints.

This paper is closely related to Barrot (2016) who analyzes a 2006 policy implementing the sixty-days cap on payment terms in the French trucking sector. However, while Barrot focuses on the effects of the rate of payment collection at the extensive margin (exit and entry rates), we analyze the implications of the provision of trade credit on a little-studied margin a firm expansion, namely the expansion of the customer base. This focus allows us to gain significant understanding of the role of working capital constraints by highlighting the existence of an arbitrage between retaining existing clients and expanding the set of customers. Taken together, our results suggest that the presence of liquidity constraints significantly drags down the expansion of the customer base of liquidity-constrained firms.

Our work also falls within the range of the wide literature devoted to the study of the role of financial factors in shaping the entry and the expansion in export markets. In seminal contributions, Manova (2013) and Chaney (2016) argue that in presence of financing constraints, export market activity is determined not only by profit considerations as in Mélitz (2003) but also by whether firms are able to sustain the liquidity needs required by international transactions.[8] Using the crisis as an exogeneous shock on the supply of bank credit, Paravisini et al. (2014) show that credit constraints significantly affect the intensive margin of exports but not the extensive one (entry and exit from export markets). Their results imply that credit constraints raises the variable cost of exporting. By contrast, our results indicate that liquidity constraints limit the ability of the firm to pay the costs of expanding their customer base (what Arkolakis (2010) calls the "penetration costs"). Moreover, this paper adds to the international trade literature by highlighting a spillover between the provision of trade credit in the domestic market and international activity.

The idea that capital structure might affect the ability of firms to gain market shares is not new to the finance literature. Phillips (1995); Chevalier (1995); Kovenock and Phillips (1997); Campello (2003) and Frésard (2010); Boutin et al. (2013) have respectively shown that leverage and cash holdings are two important determinants of prices charged and quantities sold in a

[7] Correspondingly, Gourio and Rudanko (2014) estimate on Compustat data that marketing expenditures represent 15 to 30% of cash flows.

[8] See also Caggese and Cuñat (2013), Feenstra, Li and Yu (2014) or Schmidt-Eisenlohr (2013) for theoretical contributions and Amiti and Weinstein (2011), Minetti and Zhu (2011) for empirical ones.

product market. Compared to these studies, we are able to jointly follow unit values, quantities *and* the identity of customers. This enables us to decompose the variation of sales between existing and new customers and therefore to precisely identify how financing constraints limit the acquisition of customers. Our results contrasts with the existing literature by emphasizing the role of non-price strategies in the creation of a customer base.

Section 2 outlines the economic mechanisms that lead the rate of payment collection to have real effects on the expansion of the firm and briefly present the institutional details of the policy. The different data sets and descriptive variables are presented in section 3. Section 4 breaks down the different steps of the identification strategy. The results of the main estimations as well as of various robustness checks are given in section 5. We confront the empirical findings to alternative economic mechanisms in section 6. Section 7 discusses the implications of the results and section 8 concludes.

2 Institutional and theoretical context

2.1 Presentation of the policy

Faced with a general increase in payment delays across European economies, the European Union called on the member countries to revise and reinforce the legal framework pertaining to the respect of contractual payment terms. This resulted in France in 2001 by the introduction of a law setting default payment terms at thirty days after reception of the product. The 30-days limit was however only indicative and was rarely applied in practice. Moreover, while the law allowed firms to demand interest payments to suppliers that did not meet the contractual payment terms, only few firms used this option (ODDP, 2008).

Acknowledging the inefficiencies of the 2001 law, the French government started fostering sectoral negotiations between professional organizations of customers and suppliers. This resulted in 2006 in a policy limiting payment terms to thirty days in the trucking sector. The French government then started working in 2007 with professional organizations on a law capping contractual payment terms in any transaction involving French firms, regardless of the sectors they were operating in. The policy was first voted in 2008 and included in the package of reforms of the "Law on the Modernization of the Economy" (or LME) implemented in 2009.

The policy 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).[9] The strategy of the government to ensure the enforcement of the policy was based on three pillars. First, contractual payment terms exceeding the legal limit are to be reported to public authorities by firms' accounting auditors: penal procedures can be initiated in case of a violation of the contractual limits and may result in a 75,000 euros fine. Second, firms

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

that do not respect their contractual obligations are subject to civil sanctions amounting up to 2 millions euros.[10] Third, the French competition authority conducts audits to check that the law is properly applied: in 2010, more than 1700 firms have been audited, with a follow-up rate (in terms of sanctions and/or further audits) of 30%.

Importantly, the policy solely applied to transactions contracted under the French trade code. Therefore, it did not directly affect exporters as they could circumvent the cap on payment terms by contracting with the importer under the trade code of the foreign counterpart or the CISG (Convention on Contracts for the International Sale of Goods, also known as the Vienna Convention) international trade code.[11]

The legislators were aware that a "one-size-fits-all" approach might be detrimental to the economic activity of some sectors or even impossible to implement in practice. Professional organizations have therefore been consulted on the feasibility of the cap on payment terms introduced by the law. When the 60-days limit was considered as being too restrictive in some sectors, the law allowed firms to deviate temporarily from the rule. In the toy industry where most of the sales are realized in the holiday season, firms had for instance up to 170 days to repay their customers. Conversely, payment terms were restricted to be shorter in sectors involving perishable products. Firms operating in those sectors had however in principle up to three years to comply with the baseline threshold. The complete list of derogations is displayed in appendix A. We discuss how derogations are dealt with in the presentation of the empirical setting.

To illustrate the policy and its implementation, figure 1 displays the evolution of days of sales outstanding between 1999 and 2013 in the manufacturing and wholesale sector (the data sets and the construction of the measures are described in section 3) for firms whose total exports represent less than 10% (blue solid line) and more than 50% (red dashed line) of total sales on average . As is apparent in the graph, the introduction of the policy is correlated with a dramatic decrease in payment periods for firms operating mainly in the domestic market, from around 80 days in 2007 to 63 in 2009.

[Insert figure 1 here]

A few comments are in order here. It is first striking to see that while the rate of payment collection increased for both domestic and exporting firms, the increase was much less pronounced for the latter group. This is in line with the idea that the policy did not directly affect international transactions. Moreover, exporters consistently face longer payment periods than domestic firms, reflecting the fact that since importers tend to pay after reception of the product on average, transportation time comes on top of the payment period of importers.

[10] In 2015, for instance, a major telecom group had to settle a fine of 750 000 euros following several complaints from supplier. See TelecomPaper.com (2015).

[11] See Le Roch and Bricq (2013) for more details (in French)

Second, it is apparent that payment periods stayed above the 60 days threshold on average even after the implementation of the law. This indicates that the enforcement of the policy was imperfect. This observation actually prompted the government to announce harsher sanctions on bad payers in 2015. On the other hand, the sharp decline of payment periods one year before the implementation of the law then shows that the law has largely been anticipated. Professional organizations had indeed been aware of the legislation since they were made part of its preparation. The legislators interpreted the anticipation of the new rules as reflecting important efforts from firms to be ready for the implementation of the policy (ODDP, 2009). French firms are indeed required by the law to publish their general terms and conditions in the first quarter of each year. This document notably details the unit prices and payment conditions that will thereafter serve as basis for commercial negotiations. In order to comply with the policy as of January 2009, firms therefore had to incorporate this rule in advance.

One might suspect eventually that the increase in payment collection might have been caused by the coincident financial crisis. If anything, however, the exacerbation of financial constraints should have lead firms to further delay their payments, not shorten them. In fact, the legislators even expressed their surprise that the policy seemed to be largely successful in spite of the adverse financing circumstances surrounding the time of its enactment (ODDP, 2010). Moreover, payment periods approximately stayed at their 2009 level in 2012 even though the financial conditions had largely returned to normal in the meantime. The persistence of the reduction in client delays then strongly indicates that the observed drop in days of sales outstanding between 2007 and 2009 was not driven by the financial crisis.

2.2 Theoretical analysis

Should payment terms be capped in order to foster the expansion of financially constrained firms? Early theories of trade credit would recommend against it. Given the large costs of trade credit relative to other sources of financing,[12] the corporate finance literature has justified the presence of interfirm lending as an optimal answer to liquidity frictions affecting customers. The different theories based on this idea predict that trade credit flows from large, creditworthy suppliers to small and financially constrained customers. Brennan, Maksimovic and Zechner (1988) posit that trade credit can be used by suppliers to attract cash-poor customers that may attribute a lower reservation price to the product than cash-rich customers. Other theories assume that in the absence of trade credit, (part of) clients would be unable to finance their purchases through bank credit. Suppliers, by comparison, might be willing to fill the void left by banks because of a greater ability to screen customers (Smith, 1987; Biais and Gollier, 1997),

[12]Standard trade credit contracts do not include interest rates. However, in most trade credit agreements, the client can benefit from a discount were she to pay quickly after delivery ("discount period"). Full payment is due after the discount period. This setting defines an implicit interest rate that Ng, Smith and Smith (1999) estimate to be as high as 44% in annualized terms. Note that this does not even include penalties that arise if the client pays later than the maximum authorized delay.

to prevent fund diversion (Burkart and Ellingsen, 2004) or to liquidate intermediate goods in the case of default (Long, Malitz and Ravid, 1993). Consistently with this strand of theories, Garcia-Appendini and Montoriol-Garriga (2013) show that liquidity-rich suppliers increased their provision of trade credit to liquidity-poor customers as a response to the decrease in bank credit supply during the 2008 financial crisis.

This view is however increasingly challenged by recent studies showing that large firms do actually disproportionately benefit from the provision of trade credit by imposing large payment periods to their suppliers (Klapper, Laeven and Rajan, 2012; Murfin and Njoroge, 2015; Fabbri and Klapper, 2016). Anecdotal evidence suggests that the financial gains at stake are massive. For instance, Amazon's ability to consistently generate high free cash flow despite large capital expenditures has been linked to the "excruciatingly long" payment periods it subjects its suppliers (Fox, 2014). In 2015, Procter & Gamble unilaterally extended its payment terms to all its suppliers by 30 days:[13] according to Esty, Mayfield and Lane (2016), the cash balance of the firm nearly doubled as a consequence.

[Insert figure 2 here]

A quick look at the distribution of days of sales outstanding suggests that similar dynamics were at stake in France before the implementation of the policy (see section 3 for a description of the data set and the different measures of payment periods). We use total sales as a proxy for firm size. Figure 2 shows the average days of sales outstanding by size decile. Since size is negatively correlated to the presence of financial constraints (Hadlock and Pierce, 2010), theories of trade credit as an optimal response to liquidity constraints of suppliers would predict a positive relationship between size and payment periods. By contrast, payment periods appear to be monotonically decreasing from 82 to 77 days between the 2nd and the 8th decile. Days of sales outstanding increase again in the last two deciles but remain significantly lower than for small firms.

If the rate of payment collection is primarily determined by the outcome of a negotiation between customers and suppliers, then capping payment terms might actually be beneficial to small firms. Bargaining power is indeed likely to be positively correlated with firm size, which would lead smaller firms to be systematically imposed larger payment periods. Since trade credit provision depletes internal funds,[14] small firms will be more exposed to liquidity shocks. This has important adverse consequences. At the micro level, exposure to liquidity risk has been shown to dampen the expansion of the firm (Clementi and Hopenhayn, 2006). Long payment

[13] As compensation, P&G allowed simultaneously its suppliers to join a new supply chain finance program giving them the ability to receive discounted payments for their receivables in 15 days.

[14] This would not be the case 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. Even though France represents the second market in Europe for factoring after the United Kingdom, the number of customers of such services does not exceed 35,000 firms. High costs or a lack of visibility of this type of solutions are the main obstacles put forward to explain the low penetration of such practices (Garcin and Charpin, 2013)

periods by clients or shorter terms by suppliers may even result in the liquidation of the firm[15]. The generalization of large payment periods therefore protects deep-pocketed incumbents by limiting the pool of new competitors (Barrot, 2016). In this line, capping payment delays could be a way to reduce the gap in terms of exposure to liquidity risk between low and high bargaining power firms.

Restricting the set of feasible contracts might however come at a cost. A regulation of the provision of trade credit provision could first act as an anti-competitive measure. Some recent papers have shown that firms use the provision of trade credit as an alternative competitive device to prices. Singh (2017) and Demir and Javorcik (2018) find that when facing threat of entry by competitors, incumbent firms react by lowering prices and by extending payment terms, with some patterns of substitution between the two strategies. This suggests that a limitation on payment terms might diminish the ability of firms to compete if trade credit provision is not perfectly substitutable with prices.[16] Customers might even decide to terminate trade relationships if suppliers are unable to compensate the requirement of shorter payment periods with lower prices (Breza and Liberman, 2016). In particular, since the law applies only on transactions contracted under the French trade code, the policy could actually incite French firms to turn to foreign suppliers so as to benefit from more advantageous payment terms.

Overall, the effect of capping payment terms on the expansion of the firm will depend on how the gains associated with a lower exposure to liquidity risk weigh against the costs of the potential disruption of existing trade relationships. The determination of the resulting outcome ultimately requires setting up an ex post econometric evaluation, a task that we turn to in the next sections.

3 Description of the data sets

We use firm-level data sets coming respectively from the French customs (firm-to-firm exporting transactions), the French fiscal administration (balance sheet as well as profit and loss statements) and the French National Institute of Statistics (Insee). The different sets of data are merged via a unique firm identifier.

[15]Tighter payment terms from suppliers is one of the main reasons cited for the bankruptcy of Circuit City in 2008 which reportedly caused the loss of more than 30,000 jobs at the time. See for instance Jacobs (2008 November).

[16]There are in fact two main reasons to think that offering trade credit plays a very different economic role than giving price discounts. The first argument is that granting price discounts can backfire against suppliers (Giannetti, Serrano-Velarde and Tarantino, 2017). Buyers with low input prices can steal market shares to their competitors and ultimately reduce the profitability of their suppliers in this market. Granting large payment periods can therefore be a way to accommodate high bargaining power customers while preserving profitable trade relationships with low bargaining firms. Another reason for the imperfect substitutability of trade credit and prices comes from the fact that trade credit amounts to a short-term leasing of the product. In 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 clients (Breza and Liberman, 2016).

3.1 Customs data

The first source of information that we use has been made available to us by the French customs. The data set records any transaction occurring between 2003 and 2012 that involves a French exporter and an importing firm located in the European Union. While goods are perfectly exempt from customs duties when moving across countries within the European Union, French firms selling goods in the EU still have to fill a custom form. These forms are then used to collect value-added taxes from the importing firms.[17]

For each transaction, the data set records the identity of the exporting firm (its SIREN identifier), the identification number of the importer (VAT number), 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. On average, 85% of French exports in value are realized every year by importing firms that were also present the year before, a sign of the good quality of the customer identifier. Given the quality of the information, little cleaning is needed for the data set to be exploited.[18]

In most of the following analysis, the data is aggregated at the level given by the combination of a firm f, a year t and a country m. For a given (f, m, t)-triplet, however, we record exports separately depending if firm f was trading with customer c at both time t and $t-1$ (*stable* customer), if it was not trading with c at time $t-1$ but is at time t (*new* customer), or whether conversely it was trading with c at time $t-1$ but not at t (*lost* customer). Export growth is then computed as :

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

where the subscripts S, N and L respectively denote stable, new and lost customers.

We use here the "mid-point" growth rates suggested by Davis, Haltiwanger and Schuh (1996) as it is conveniently bounded.[19] This decomposition allows to separate the share of the growth of exports that is due to a variation of sales with existing customers ($\Delta Stable\ customers_{f,m,t}$) from the contribution of the evolution of the customer base ($\Delta Customer\ base_{f,m,t}$). Note that we record $\Delta Exports_{f,m,t}$ only when firm f exports in m both at time t and $t-1$ so that the variable

[17] See Lenoir, Martin and Mejean (2016) for another recent use of this data set.

[18] Two small issues are however worth mentioning. It might first happen that the French exporter only plays the role of an intermediate by selling a good that is actually imported from a third country. We discard these trade flows from our data set. In other cases, the importing firm might request the good 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.

[19] Our results are entirely robust to alternatively using either the "classical" growth or the difference in logs.

measures export growth solely when the firm is active in the market in both periods.

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 was exporting (was not exporting) in country m at time $t-1$. To get additional information on the nature of the transactions in each destination, we eventually compute the number of transactions per year for each seller-buyer relationship (exports are reported on a monthly basis to French customs such that there can be at most 12 transactions per year) averaged at the level of the importing country as well as the time since the first entry in the destination.

3.2 *Profitability, capital structure, sales by sector*

The second data set we use comes from BRN-RSI tax returns collected by the French fiscal administration ; see for instance Boutin et al. (2013) for another analysis relying on this source. This data set gives accounting information for the whole universe of French firms in the private economy (excluding the financial and agricultural sectors) between 2003 and 2012. In addition to balance sheet information, a 5-digits sector code (along the NACE, the EU economic activity nomenclature) is provided. As we focus on the effects of the policy on international transactions, we restrict our analysis to firms belonging to the manufacturing and wholesale sectors which constitutes the two main exporting industries. To correct for reporting errors we systematically replace outliers of all variables by missing values.[20]

To identify precisely the different business lines of firms, 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 millions euros (smaller firms are surveyed according to a stratified sample design) and contains the amounts of sales realized by each surveyed firms in each 5-digits sector.[21] The total turnover of the firms included in the sample represents more than 95% of the aggregate turnover corresponding to the field of the survey.

3.3 *Measuring payment periods*

Transaction-level payment information is not reported in our data set.[22] Instead we rely on tax returns to compute a firm-level measure of the time taken to collect payment from clients:

$$Days\ of\ sales\ outstanding_{f,t} = \frac{Accounts\ receivable_{f,t}}{Sales_f} * 365$$

[20] 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

[21] The firm-level sector code available in the tax returns corresponds to the business line in which the firm realizes the majority of its activity.

[22] See Antràs and Foley (2015) for a recent example of such a data set.

The ratio gives the amount of sales that is owed to firm f by its clients; it is multiplied by 365 so as to be readily interpretable in terms of days. $Days\ of\ sales\ outstanding_{f,t}$ can be thought as the average payment period between firm f and its customers for a given fiscal year t.

Symmetrically, it is possible to estimate the average time taken for a firm to pay its suppliers:

$$Days\ payable\ outstanding_f = \frac{Accounts\ payable_f}{Purchases_f} * 365$$

Though we could in principle pick one measure or the other, we focus on days of sales outstanding in most of the analysis. The main reason for this is while we know the type of product or service sold to clients using the EAE survey, we do not know in which sectors the suppliers operate, which makes our identification less precise (see next section). We take however into account the supplier side in robustness checks.

[Insert table 1 here]

Table 1 displays the sectors with the highest and lowest average value of DSO and DPO in 2007. Several patterns emerge from the table. First, highest payment periods appear mostly in heavy industries while lowest ones are observed within food processing firms. This is consistent with the prediction of Long, Malitz and Ravid (1993) that the product durability should be positively correlated with the provision of trade credit. However, there is no direct mapping between the sectoral rank of client and supplier payment periods: in 2007, the correlation between the two is only of 46%. Overall, the ex-ante heterogeneity of trade credit characteristics across sectors is suggestive of a large variability in the exposure to the liquidity shock induced by the policy.

It is eventually important to note that while this measure appears to provide sensible information at the aggregate level, there might be important measurement errors at the firm-level since the computation method implicitly 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.

3.4 Final sample and descriptive statistics

[Insert table 2 here]

As our identification strategy requires the breakdown of sales by sector, our final sample is restricted to firms present in the EAE survey. The description of the construction of the different variables is summarized in panel A of Table 2 and their distributions are presented in panel B. The data set contains 194,949 firm-year observations (approximately 21,700 firms per year) and accounts for approximately 80% of total export to the European Union by manufacturers and wholesalers between 2003 and 2012. Firms belong mostly to the manufacturing sector (69

%) and are on average relatively mature (median age of 20 years). Panel B of table 2 shows moreover that average total assets is around 8.5 millions euros.

[Insert table 3 and table 4 here]

The average firm in our data set exports about 8 millions euros within the EU, is present in 6.9 markets and has 4.9 customers on average per destination within the European Union, as presented in 3. Table 4 shows that the average transaction volume for a new customer-supplier relationship is about 73,000 euros, and that it increases to 440,095 euros after five years of uninterrupted trade. The probability that a customer-supplier relationship is ended declines with the duration of a match: it is 56% the first year and goes down to 32% the fifth year. The number of customers increases with the number of years spent in a market, with about 8.8 customers on average after five years compared to 3.6 in the year of entry.

4 Identification strategy

Several specificities of the reform described in section 2.1 makes it challenging to use for causal inference:

(a): Control group No natural control group emerges as this reform affects all sectors. The trucking sector for which a cap on payment terms had already been implemented is a natural candidate on paper, but trucking firms barely participate to international trade. This problem is all the more acute that the reform took place at the heart of the 2008 financial crisis, which had a large impact on French exports (Bricongne et al., 2012). Should this effect not be properly accounted for, any inference in this period would be subject to the risk of being contaminated by the confounding impact of the crisis.

(b): Unobserved heterogeneity As is shown in the literature, payment terms of a contract likely depend on the bargaining power of the firm which in turn might be correlated with its ability to export. OLS regressions of export patterns on the evolution of payment periods are therefore likely to be biased.

(c): Measurement error Payment periods are only imperfectly observed and are only available at the firm-level (see subsection 3.3). Moreover, the evolution of payment periods is likely to be correlated with exporting activity, potentially aggravating the bias of OLS regressions.

We outline the strategy designed to address these points in the following subsections. The econometric design is based of three main components, namely the exploitation of the heterogeneity in exposure to the reform (subsection 4.1), the introduction of fixed effects at a granular level (4.2) as well as the use of control variables (4.3).

4.1 *Description of the IV strategy*

In the absence of a control group (item (a)), the heterogeneity in exposure to the reform is exploited as a source of identification. The sixty-days rule provides a natural reference point: firms that had to wait 80 days to get paid prior to the reform should in principle have been impacted more than firms which were paid in 65 days on average. Moreover, the reform should have left suppliers that were already paid in less than 60 days virtually unaffected by the rule. A way to formalize this is to define

$$d(DSO,60)_f = \max(0, Days\ of\ sales\ outstanding_f - 60)$$

The introduction of a non-linearity at the threshold through the use of a maximum operator captures the fact that only firms facing payment periods higher than 60 days were exposed to the reform.

As mentioned in item (b) and (c), however, days of sales outstanding are only imperfectly observed and may be correlated to unobservable firm characteristics. We address these concerns by taking a step back and performing the analysis at the sectoral level. While payment conditions vary between sectors, they tend to be relatively homogeneous within a given product market (Ng, Smith and Smith, 1999) such that sectoral measures of payment terms are strongly correlated with firm-level measures. Most trade credit determinants emphasized in the literature are homogeneous at the sector-level.[23] Moreover, firms use the provision of trade credit as a way to compete with each other (Singh, 2017; Demir and Javorcik, 2018), which tend to equalize payment terms within a sector. Consequently, firms that operate in sectors where the distance to the sixty-days threshold was higher on average prior to the reform should therefore have experienced a stronger liquidity shock following the reform.

This idea is implemented through the construction of a "shift-share" variable (Bartik, 1991)[24] defined by

$$\overline{d(DSO,60)}_{f,07} = \sum_s \omega_{f,s,07} \cdot d(DSO,60)_{s,07}$$

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

$$d(DSO,60)_{s,07} = \frac{1}{N_{s,07}} \sum_{g \in \Omega_{s,07}} d(DSO,60)_{g,07}$$

is the average distance to the threshold in sector s taken from the universe $\Omega_{s,07}$ of all firms

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

[24] See Berman, Berthou and Héricourt (2015) for another recent use of this type of strategy in an international trade setting.

making less than 10% of their turnover abroad and operating primarily in sector s.[25] This variable captures the *ex ante* exposure to the reform based on the distance to the 60-days cap in the product markets in which the firm was operating in 2007: its main source of variability comes therefore from the heterogeneity across French firms in their product market portfolios.

[Insert figures 3 and 4 here]

As discussed in Borusyak and Jaravel (2017), two conditions are required for this shift-share variable to be considered as a valid exogenous factor: first, sectoral averages need to be uncorrelated to the individual unobserved characteristics, which will not be the case if for instance some firms are big enough to influence sectoral payment conditions. This concern is however mitigated by the fact that we take a simple average of days of sales outstanding within a sector[26] and that we only keep sectors in which we observe at least 10 firms. The second condition states that the 2007 heterogeneity in product market portfolio should not capture other factors that might affect export patterns. This potential issue is addressed in section 4.3 where the different control variables are defined.

In addition to dealing with the problem of unobserved firm-level heterogeneity (item (b)), this instrumentation strategy has the advantage of limiting potential biases due to the use of an imperfect proxy of payment periods (item (c)). By definition, *Days of sales outstanding*$_f$ compares the amount of sales generated in the whole fiscal year to the amount of receivables recorded at the time of the tax report; payment periods from clients will therefore be overestimated if sales are concentrated at the end of the fiscal year. Taking sectoral averages should in principle mitigate this concern provided that measurement error are not too correlated within a sector. Second, by computing the average value of *Days of sales outstanding*$_f$ 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, eliminating a potential simultaneity between the evolution of the rate of payment collection and export activity.

Note also that the instrument is purposely designed so as not to take into account the derogations introduced by the law (see section 2.1). If the reasons leading to these exceptions are correlated to firms' export market behavior, introducing the exemptions in the computation of $\overline{d(DSO,60)}_{f,07}$ would compromise the validity of the instrument. The first-stage estimation therefore only identifies the change in days of sales outstanding that can be explained by the sixty-days cap, leaving aside the effects of derogations. Put another way, 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 sixty-days rule (*compliers*).

[25] The main sector of activity is observable for all French firms; the average distance is therefore computed using information for over 2 millions companies. Sectors with less than 10 non-exporting firms are discarded.

[26] Our results are broadly unaffected by changes of the definition of $\overline{d(DSO,60)}_{f,07}$ such as using weighted averages in the computation of $d(DSO,60)_{s,07}$ or including exporters in the set $\Omega_{s,07}$.

The computation of the exposure to the reform has not so far exploited the time dimension of the data set. Yet, it is expected that the variation of payment periods should not be affected by the exposure to the reform prior to its implementation. The final definition of the instrument is therefore given by

$$\overline{d(DSO,60)}_{f,t} = 1[t \geq 2007] \cdot \overline{d(DSO,60)}_{f,07}$$

the dummy being chosen to equal one as soon as 2007 to account for a potential anticipation of the reform.

Figures 3 and 4 summarize the main steps of the strategy outlined in this subsection.[27] The x-axis in both graphics gives the value of 2007 days of sales outstanding as measured by

$$\overline{Days\ of\ sales\ outstanding}_{f,07} = \sum_s \omega_{f,s,07} \cdot Days\ of\ sales\ outstanding_{s,07}$$

where $Days\ of\ sales\ outstanding_{s,07}$ is the simple average of DSO in sector s.[28] In figure 3, the y-axis represents the evolution of actual firm-level days of sales outstanding between 2007 and 2009. Firms that were facing payment periods from clients below 60 days in 2007 experienced a small decrease of days of sales outstanding after the implementation of the reform. There is by contrast a large and significant negative correlation between $\overline{Days\ of\ sales\ outstanding}_{f,07}$ and $\Delta Days\ of\ sales\ outstanding_{f,07\text{-}09}$ after the 60-days threshold. This indicates that our estimation method correctly detects the effects of the presence of the sixty-days rule on the variation of payment periods. Furthermore, figure 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 3 is indeed reflective of the implementation of the reform.

4.2 Aggregate shocks and network effects

The identification assumption behind the IV strategy is that factors other than payment periods affecting export outcomes are not correlated to $\overline{d(DSO,60)}_{f,t}$. This condition will however not be met if for instance the financial crisis impacted more firms that were most exposed to the law. In order to disentangle the effects of the 2009 reform from the presence of the financial crisis, we rely on the disaggregated nature of exports data to control for country-year fixed effects (Paravisini et al., 2014). Comparing export outcomes within a country-year removes any country-level shock that hit demand (*e.g.*, household over-indebtedness) or supply (*e.g.*, variation in input prices) in a given market. Instead of comparing total exports variations, the estimations will therefore be based on the comparison of export outcomes in a given country and in a given year between firms that were differently affected by the reform.

[27] 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.

[28] $\overline{Days\ of\ sales\ outstanding}_{f,07}$ is therefore akin to a slightly modified version of $\overline{d(DSO,60)}_{f,07}$ that does not account for the sixty-days rule.

Country-year fixed effects additionally allow to take into account a possible correlation between the exposure to the reform and the presence in some markets. In case exporters mostly 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. Removing average trends at the market level ensures that the estimations are not prone to such bias.

Studying export behavior at the level of the destination market entails however a special attention on inference issues: while the left-hand variable is observed at the level of the combination of a firm f, a country m and date t, the right-hand variables vary only at the firm-year-level such that error terms ϵ_{fmt} will be correlated for a given firm f. We follow the econometric literature on that subject and cluster standard errors to allow for arbitrary patterns of cross-correlation between observations related to the same firm f.

4.3 Control variables and baseline specification

Control variables are included in the main specification to limit the effect of several sources of heterogeneity that might contaminate our estimation. Our main concern here is that the methodology designed to compute $\overline{d(DSO,60)}_{f,t}$ may lead the instrument to inappropriately capture sectoral variations unrelated to payment periods that may affect export activity. For instance, the instrument variable might be positively correlated to the dynamism of the different product markets in which the firm operates. In order to account for this possibility, we introduce in the specification the weighted average of the growth rate of sectoral sales, $\overline{Sales\ growth\ rate}_{ft}$ computed along the same methodology as the instrument. This variable therefore controls for the varying economic conditions that firm f experiences in the different sectors in which it operates.

The portfolio of product and services of the firm could then be endogenously determined by other variables related to export patterns such as productivity or size: we therefore include $log(Total\ Assets)_{f,t-1}$ and $Labor\ productivity_{f,t-1}$ (defined as the ratio value added to the number of employees) in the specification. Conversely, the characteristics of product markets might affect capital structure decisions; the literature emphasizes in particular the role of leverage as a way to deter entry from competitors (see for instance Chevalier (1995)). The heterogeneity in product markets portfolio might therefore be related to firms' financing choices, which in turn could affect export activity. The leverage variable $Long\text{-}term\ debt/TA_{f,t-1}$ (defined as the ratio of debt of more than one year to total assets) is added to the set of control variables to address this potential issue. Lastly, the time dimension of the data set is exploited by including firm fixed effects so as to remove the influence from time-unvarying unobservable firm characteristics (management quality, location...).

Bringing together the different elements of the identification strategy, our baseline equation

is given by the 2SLS estimation of:

$$Y_{f,m,t} = \alpha_f + \gamma_{m,t} + \beta_1 \cdot \Delta Days\ of\ sales\ outstanding_{f,t} + \beta_2 \cdot X_{f,t} + \epsilon_{f,m,t} \quad (2)$$
$$\Delta Days\ of\ sales\ outstanding_{ft} = \delta_f + \eta_{m,t} + \theta_1 \cdot \overline{d(DSO,60)}_{f,t} + \theta_2 \cdot X_{f,t} + \nu_{f,m,t}$$

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 lowering firms' liquidity risk and enhancing their propensity to export ($\beta_1 < 0$).

4.4 Effects of the reform on payment periods

Before presenting the main results, this subsection assesses more formally the effects of the reform on payment periods; we estimate to that end

$$\Delta Days\ of\ sales\ outstanding_{ft} = \mu_f + \rho_t + \pi_1 \cdot \overline{d(DSO,60)}_{f,t} + \pi_2 \cdot X_{f,t} + \xi_{f,t} \quad (3)$$

Note that this step is not formally equivalent to an estimation of the first stage of equation 5.2 since we abstract here from the set of exporting countries in which firm f operates (the regression here is performed at the firm-level).

[Insert table 5 here]

Table 5 displays the results of the different specifications. The coefficient π_1 is significantly negative in all columns: the specifications 1 to 3 indicate that each additional day of distance to the sixty-days threshold is associated with a reduction of 0.10 to 0.15 day of client payment periods per year. The coefficient remains negative even when we allow the relationship between $\Delta Days\ of\ sales\ outstanding_{ft}$ and $\overline{d(DSO,60)}_{f,t}$ to be non-linear (column 4).

The coefficients associated to the control variables give moreover some clues on the economic mechanisms behind the evolution of payment periods. Conditionally on time-invariant characteristics, firms that got bigger or more productive faced larger decreases in days of sales outstanding (column 3). It is in line with the findings of Fabbri and Klapper (2016) that higher bargaining power is associated with more advantageous payment terms. Interestingly, firms that experienced higher sectoral growth in their different business lines tended to increase more their provision of trade credit. This may result from a higher demand for trade credit from clients operating in relatively less performing sectors.

5 Trade credit provision and firm expansion

5.1 Trade credit provision and firm expansion

Table 6 displays the estimated effects of the policy on exports growth ($\Delta Exports_{f,m,t}$) as well on the probability to enter or to exit a country ($Exit_{f,m,t}$ and $Entry_{f,m,t}$). Note that by construction, the size of the estimation sample changes with the dependent variable (see subsection 3.1). Column 1 presents the first stage regression of the $\Delta Exports_{f,m,t}$ analysis: the $\overline{d(DSO,60)}_{f,t}$ coefficient is equal to -0.10, which is within the range of estimates in table 5. Accordingly, the Kleibergen-Paap statistics presented in columns 2 to 4 go in favor of a rejection of the hypothesis of a weak instrument.

[Insert table 6 here]

The 0.043 coefficient for $\Delta Exports_{f,m,t}$ means that a 10-days decrease in days of sales outstanding is estimated to cause an increase of the exports growth rate of 4.3 percentage points. Expressing the economic magnitudes in terms of sample standard deviation, we find that a 3-days decrease in DSO increases the growth rate of exports by 1.2 pp (compared to a sample mean of -1.1%), lowers the propensity to exit a country by 1.1 pp (sample mean: 14.8%) and raises the probability of entry by 0.1 pp (sample mean: 3.7%). As expected, firms operating in booming industries grew relatively more in countries where they were already present and were more (less) likely to enter (exit) a market. Conditionally on time-invariant characteristics, we find size and productivity to be negatively correlated with export growth, probably reflecting the larger expansion capacity of small firms. Leverage seems weakly, if at all, related to export growth.

[Insert table 7 here]

Using equation (1) we decompose the growth of exports $\Delta Exports_{f,m,t}$ into a component capturing the variation of exports with existing customers ($\Delta Stable\ customers_{f,m,t}$) and another one reflecting the evolution of the customer base ($\Delta Customer\ base_{f,m,t}$). Strikingly, the provision of trade credit seems to only affect the acquisition and the retention of customers, the $\Delta Stable\ customers_{f,m,t}$ being statistically insignificant. We then further analyze the factors affecting the evolution of exports by decomposing the part of $\Delta Customer\ base_{f,m,t}$ that is due to the arrival of new customers from the contribution due to the discontinuation of existing trade relationships: we find that approximately two thirds of the effects on $\Delta Customer\ base_{f,m,t}$ is due to an increase in the acquisition of new customers and one third to a higher rate of retention of existing customers.

5.2 *Alternative specifications*

Table 8 estimates the effect of a variation in domestic payment periods on the growth rate of exports using various alternative specifications. In the "Derogations" column, we tweak the definition of the instrument so as to incorporate the deviations to the sixty-days rule introduced by the law. While the sign of the coefficient stays unchanged, the magnitude in absolute value becomes much bigger (-0.284); since the derogations are likely to be endogenously determined, however, we tend to see our baseline coefficient as more representative of the actual elasticity.

[Insert table 8 here]

Interestingly, the OLS regression yields a positive $\Delta Exports_{f,m,t}$ coefficient. This should come as no surprise as payment periods decreased simultaneously to the collapse in exports, leading to a positive correlation between the two. In the fourth column specification, the specification is estimated without country-year fixed effects (only firm and year fixed effects). The estimated coefficient is lower in absolute value (-0.034), meaning that firms exposed to the reform tended to be more present in countries more adversely hit by the crisis. The estimated coefficient in the absence of firm fixed effects is very close to the baseline result but is no longer significantly different from zero.

[Insert table 9 here]

In an influential paper, Bertrand, Duflo and Mullainathan (2004) argue that in presence of serially correlated outcomes, econometric estimations based on panel data with a limited number of individual entities might under-reject the null hypothesis as standard errors are likely to be under-estimated. As a robustness check, they recommend collapsing the data in a "pre" and "post" period and estimating the coefficient of interest on the resulting data set so as to limit the influence of the time dimension.

We accordingly 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 $Y = \Delta Exports$ (first two columns). We can see that the negative and significant relationship between the variation of days of sales outstanding and export growth is still present even when abstracting from country trends.

In a second stage (last two columns), we remove the time dimension of the data by calculating the growth rate of firm total exports between 2006 and 2009. $\Delta Days\ of\ sales\ outstanding$ is defined in this context as the long difference of days of sales outstanding between 2006 and 2009; it is instrumented by $\overline{d(DSO,60)}_{f,06}$. 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 10 here]

In a similar setting, Paravisini et al. (2014) advocates for the use of country-product-time dummies so as to limit the influence of confounding composition effects. The estimated sensitivity of exports to domestic payment periods might indeed reflect that firms exposed to the policy were actually disproportionately exporting products experiencing relatively higher foreign demand. We address this concern by estimating the regressions at the country-product-year level, a product being defined by a 2-digits Combined Nomenclature code.

Table 10 shows that our main conclusions stay unchanged: a fall in payment periods generates higher export growth (the entirety of the effect being driven by an increase in the customer base) and decreases the probability of exiting a market.[29] The magnitudes of the elasticities are much larger than the baseline estimates (-0.185 for instance for the $\Delta Exports_{f,m,t}$ coefficient) which would suggest that the latter might actually be rather conservative. The coefficients in table 10 are however rather imprecisely estimated (the effects being only significative at the 10% level), indicating that this comparison should be made with caution.

5.3 Accounting for both demand and supply of trade credit

[Insert figure 5 here]

We have not so far taken into account the role of the demand of trade credit addressed to suppliers. Since firms are both clients and suppliers, the reduction of the provision of trade credit granted to customers could be entirely offset in terms of liquidity needs by the diminution of supplier payment periods. To tackle this issue, we compare clients payment delays to the time taken by firm f to pay its suppliers, a measure of payment periods in *net terms*:

$$Net\ days\ outstanding_{f,t} = DSO_{f,t} - \frac{Purchases_{f,t}}{Sales_{f,t}} \times DPO_{f,t}$$

The previous identification strategy is not relevant with this measure of payment periods as the distance to the sixty-days rule should no longer predict the effect of the policy. What remains true, however, is that payment periods (whether from clients or to suppliers) should decrease all the more after the policy than they were previously more distant to the sixty-days threshold. This implies that a firm with a positive net days outstanding measure in 2007 should have experienced a decrease in $Net\ days\ outstanding_{f,t}$ after the implementation of the policy as days of sales outstanding should have decreased more than days payable outstanding.

[Insert table 11 and 12 here]

This idea is illustrated by figure 5. In the industrial mechanical engineering sector, payment periods from clients (DSO) far exceeded payment periods to suppliers (DPO) before the reform with net days outstanding of 54 days in 2007. As DSO were much more distant to the sixty-days

[29] The effects on the probability of entry is not estimated as it would require to generate 27 countries $\times$ 98 destination $\simeq$ 2700 possibilities of entry for each firm and each year, resulting in a very large data set.

threshold, they decreased more than DPO. This resulted in net days outstanding of 42 days in 2009. Conversely DPO were higher than DSO for wholesalers of non-specialized food in 2007, leading to net days outstanding of minus 12 days. Net days outstanding in this case increased after the reform, reaching minus 8 days. This mechanism implies that previous imbalances between DSO and DPO are predictive of the sign and the magnitude of the subsequent change in net days outstanding. We formalize this idea by instrumenting Δ*Net days outstanding*$_{f,t}$ by

$$\overline{\textit{Net days outstanding}}_{f,t} = 1[t \geq 2007] \cdot \sum_{s} \omega_{f,s,07} \cdot \overline{\textit{Net days outstanding}}_{s,06}$$

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

Tables 11 and 12 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 client periods is associated to a subsequent decrease of 0.01 day, meaning that the adjustment was much less pronounced in net terms than for client payment periods. We find that as with Δ*Days of sales outstanding*$_{f,t}$, a decrease in net payment delays leads to higher growth of exports and higher (lower) probability of entry (exit).

The magnitudes of the effects are however much larger, reflecting the intuition that a decrease in client payment periods *compared to supplier payment period* is more important for the firm than the sole decrease in days of sales outstanding. Interestingly, we find this time Δ*Stable customers* to be affected by the variation of net days outstanding; the magnitude of the coefficients indicates however that the effect on the customer base remains the main driver of the growth rate of exports, two thirds of the effects being attributable to Δ*Customer base*.

5.4 Placebo and dynamics of the effects

This subsection assesses the distribution of the effects of the policy over time. It serves two main purposes. First, it is important to remove any suspicion that the results might only reflect the presence of pre-existing trends. It could indeed be the case that firms more exposed to the reform were operating in industries that were already expanding prior to the enactment of the law. Second, analyzing the dynamics of the effects after the policy is revealing as it allows to understand whether the provision of trade credit has short- or long-run effects on the expansion of the firm.

[Insert figure 6 here]

A natural way to investigate the dynamics of the effects of the policy is to interact the explanatory variable with time dummies in the baseline regression (equation 5.2). However, the estimation of this specification is not straightforward. A proper identification of this specification

would indeed require to include in the instrument set all the interactions of $\overline{d(DSO,60)}_{f,t}$ with time dummies (see Wooldridge (2010)).

We choose therefore to replicate our estimation on three different subperiods. We follow figure 5 to focus on particular years: the *placebo* period takes place before the policy (2005-2006), the *treatment* period during the observed drop in payment periods (2007-2008) and the *long-term* period after the drop (2009-2010). Including 2009 in the last period has the additional advantage that it allows to test whether the policy was partially or perfectly anticipated. For each subperiod, we include two years before the years of interest and we set the instrument variable systematically to zero for these first 2 years in order to make before/after comparisons.[30]

The coefficients of the different sub-periods along with their 95% confidence intervals are respectively plotted in figure 6. It is first striking that the relation between the variation of days of sales outstanding and $\overline{d(DSO,60)}_{f,07}$ becomes negative and significant only for the 2005-2008 subperiod. Using the exact same methodology before the observed drop in payment periods in France, we find no systematic link between days of sales outstanding and export growth. This finding proves that our main specification does not capture any existing pre-trends. Our results eventually do not point to any long-term effects of the large drop in days of sales outstanding (2007-2010 coefficient). This result excludes in particular the possibility that firms might have benefited only temporarily of the policy by exclusively initiating short-term trade relationships, as this scenario would have resulted in a positive $\Delta Exports_{f,m,t}$ coefficient for the period after the reform.

6 Assessment of the transmission channel of the policy

In this section, we highlight the mechanisms through which the policy affected export growth. We first show how the increase in the rate of payment collection affected firms in other dimensions than exports. Specifically, we look at how firms adjusted their capital structure following the change in payment periods and then test for the presence of substitution patterns between domestic and international trade relationships. In a second step, we show that the estimated effects of the policy on export growth are larger when financial and product market frictions are expected to be more intense.

[30] More precisely, the first period encompasses the years 2003 to 2006. Similarly to our main analysis, we instrument the variation in payment periods by the distance to the sixty-days threshold in 2007. We set the instrument to zero for 2003 and 2004. The second period considers the period 2005 to 2008 and the instrument is set to 0 for years 2005 and 2006. The last period includes the period 2007 to 2010 and the instrument is set to 0 in 2007 and 2008. This last specification aims at measuring the potential long-term effects of the reform after the observed drop in days of sales outstanding.

6.1 *Capital structure adjustments*

We look at the evolution of balance-sheet characteristics induced by the drop in client payment periods with a special emphasis on the financial characteristics related to liquidity constraints (working capital needs, cash and drawn credit lines). The effect of payment periods on long-term debt is also considered.[31] All variables are expressed as a ratio to the lag of total assets. We bring back the analysis to the firm-level; regressions are similar to equation 3 presented in section 4.4 with the financial characteristics mentioned above as dependent variables. The specification includes firm and year fixed effects.

[Insert table 13 here]

The first column of table 13 confirms the mechanical link between working capital needs and the rate of payment collection: firms that experienced a decrease in days of sales outstanding benefited from lower working capital needs. They also exhibit higher cash ratios (column (2)). Interestingly, the coefficient on the cash ratio is very close in absolute value to the credit line coefficient (column (3)) but is of the opposite sign. This indicates suggests a strong pattern of substitution between the two: in reaction to a decrease in payment periods from clients, firms draw less on their credit lines and hold more cash instead. The long-term debt coefficient is negative but significant only at the 10% level, suggesting a weaker link between the rate of payment collection and the leverage ratio.

Overall, the results of table 13 are consistent with the idea that lower payment periods from clients enhanced the access of firms to short-term financing. This goes in support of our interpretation of the sensitivity of exports to the rate of payment collection as reflecting the presence of liquidity constraints hindering the growth of exporters in international markets.

6.2 *Substitution between domestic and international sales*

As mentioned in section 2, restricting the contract set by capping payment terms between French firms might have unintended adverse consequences. In face of lower payment terms, customers might require from their suppliers to be compensated with price discounts or even make them alter their set of suppliers. In particular, since the policy applied only to transactions operated under the French code, French customers might have decided to switch to foreign suppliers so as to benefit from more advantageous payment terms. Following this line of reasoning, the positive observed effect of the decrease in payment periods on export growth may only be the consequence of a substitution from sales to the domestic market to sales in international markets where firms are free to set their payment terms.

[Insert table 14 here]

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

This scenario implies that (i) an exogenous decrease in payment periods from French clients should result in lower domestic sales (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 14. Columns (1) and (2) show that sales on the French territory did not decrease following the fall of payment periods. If anything, the specification with Δ*Net days outstanding*$_{f,t}$ points to a positive effect of the decrease in payment periods of domestic sales, suggesting that the relaxation of liquidity constraints also helped firms expand their activity with French customers.

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 suppliers. This would translate into a negative relationship between the import share and the evolution of payment periods to suppliers (Δ*Days payable outstanding*$_{f,t}$) and a positive relationship with payment periods expressed in net terms (Δ*Net days outstanding*$_{f,t}$). By contrast, we find no statistically significant relationship with the former (column (3)) and a negative and significant relationship with the latter (column (4)). This last result suggests that thanks to an improved short-term financing conditions, firms were able to increase the share of inputs bought in foreign markets. Taken together, these findings indicate that the observed growth in export markets is not the consequence of a substitution between domestic and international sales.

6.3 Heterogeneity of the effects of the reform

We interpret the observed sensitivity of export to payment periods as reflecting the presence of liquidity constraints limiting the ability of firms to invest in the expansion of their customer base. Under this hypothesis, the estimated elasticity should be higher when (i) financial constraints are more intense (ii) it is more costly to acquire customers (iii) firms are structurally more exposed to the policy. These hypotheses are respectively tested in tables 15, 16 and 17.

These tables present the results of the estimation of the effects of the reform on export growth on different sub-samples of firms. Each of the sub-samples is defined by ranking firms or firm-country observations according to a given variable of interest; by construction, firms are reallocated in the different groups every year. Regressors are standardized (*ie*, demeaned and then divided by the standard deviation) separately for each sub-sample so as to make the estimated coefficients directly comparable across groups.

[Insert table 15 here]

Following the literature on the subject,[32] we proxy the intensity of financial constraints by the size of the firm (measured by the volume of total sales) as well as the ratio of cash holdings over assets and long-term debt over assets. We also draw on Bates, Kahle and Stulz (2009) and include the volatility of sales in the analysis, the idea being that firms whose sales are

[32] See for instance Fazzari et al. (1988),Hadlock and Pierce (2010) or Almeida, Campello and Weisbach (2004).

more volatile are more likely to be liquidity constrained (see Clementi and Hopenhayn (2006)). The three first variables are averaged for the period preceding the implementation of the policy (2003-2007). The volatility of sales is computed on the same period and normalized by the average amount of sales.

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. Consistently with table 13, this finding strongly support the idea that the decrease in payment periods affected export growth by easing the access to short-term financing of liquidity-constrained firms.

[Insert table 16 here]

If liquidity frictions limit the ability of firms to expand their set of international customers, then the sensitivity of exports to payment periods should be higher when it is more costly to initiate and to preserve trade relationships. We use several strategies to build proxies of this cost. The first approach draws on the classical insight from labor economics that higher labor market frictions translate into a lower rate of job reallocation (Haltiwanger, Scarpetta and Schweiger, 2014). Adapting this idea in our context, we should expect a lower rate of formation and termination of trade relationships in markets featuring high costs of customer acquisition. Formally, a trade relationship between customer c and supplier s for a given country (m), 2-digits product (p) and year (t) is defined as unstable ($(s,c,m,p,t) \in U$) if it is active at time t ($Exports_{s,c,m,p,t} > 0$) but inactive at time $t-1$ or time $t+1$ ($Exports_{s,c,m,p,t\text{-}1} = 0$ or $Exports_{s,c,m,p,t+1} = 0$). The reallocation rate is then defined as

$$Reallocation_{m,p,t} = \frac{\sum_{(s,c,m,p,t)\in U} Exports_{s,c,m,p,t}}{\sum_{(s,c,m,p,t)} Exports_{s,c,m,p,t}}$$

Country-product pairs (m, p) are then ranked according to the average value of $Reallocation_{m,p,t}$ for the 2004-2011 time period, a low value being associated to high costs of customer acquisition.

The second approach builds on the notion that the propensity of foreign customers to meet with French suppliers will depend on the degree of information available to the former on the French market (Lenoir, Martin and Mejean, 2016).

When information frictions are high, foreign customers will not be aware of the full extent of the menu of prices and products offered by French firms. Expanding the set of customers is consequently more difficult in this case as French firms have to incur higher advertising costs so as to get known by potential clients.

We proxy the level of information frictions by a measure of penetration $Penetration_{m,p,t}$. It is the fraction of exports that are realized with foreign customers that were not previously in contact with any French firms. A higher value of $Penetration_{m,p,t}$ proxies for a greater ability of foreign clients to obtain information on French suppliers.

The last strategy is based on the classification of products established by Rauch (1999). Products are labelled as "homogeneous" if they are traded on an organized exchange (*e.g.*, cereals) or reference priced (*e.g.*, construction materials) and "differentiated" otherwise. Rauch showed that geographical distance as well as informational frictions matter less for firms exporting homogeneous products as the uncertainty over the quality of the goods is lower. Attributing an integer to each of the modality of the Rauch nomenclature, we compute the sales-weighted average of the score for each observation (a higher value being associated to a larger share of differentiated products).

Since the estimations are performed at the firm-country-product-year level, the regressions estimated in table 16 include country-product-year fixed effects as in table 10. The results point to significant effects only in markets featuring a low rate of initiation and termination of trade relationships ("Reallocation rate"), where few foreign customers meet with French firms for the first time each year ("Penetration rate") and for firms selling a higher proportion of differentiated goods ("Rauch"). Taken together, the findings are line with a higher sensitivity of exports to payment periods in presence of greater product market frictions.

[Insert table 17 here]

Table 17 eventually explores the heterogeneity in exposure to the reform. Firms that source their input internationally are first more likely to be more affected by the reform as they should benefit from the decrease in client payment periods while still being granted long payment terms by international suppliers. We test for this idea by sorting firms according to the sales-weighted average of sectoral import shares and find accordingly that the elasticity is significantly different from zero only for firms operating in sectors with high import shares. A potential limit of this analysis, however, is that sectors with a high penetration of imports tend to also be sectors where exports represent a large part of total sales. The absence of effect in column 1 could therefore be attributable to lower expansion opportunities in foreign markets for firms operating in sectors with low import shares.

As firms with low market power are more likely to be hurt by disadvantageous payment terms (Klapper, Laeven and Rajan (2012)), they should benefit more from a regulation restricting long payment terms. To test this hypothesis, we split the sample based on the average market share realized in the domestic market 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 delays, while dominant firms appear largely unaffected.

7 Discussion of the results

7.1 Trade costs and trade finance

The effects of liquidity constraints on the extensive and intensive margins of trade have implications for the structure of costs that exporters are facing and how they interact with financing constraints.

Standard international trade models feature sunk, fixed and variable costs. Firms incur a sunk cost to start exporting in a new destination. For instance, firms have to make upfront expenditures such as prospective studies and market analysis before deciding to serve a destination. Fixed costs represent then all the expenses induced by an active participation to export markets and are therefore paid not only by entrants but also by continuing exporters. They encompass all the fixed expenditures a firm has to make to be able to produce and serve a destination. Variable costs of trade eventually combine all the expenses that proportionally increase with the value and quantity of exports such as transport costs or tariffs.

The significant effects of the policy on the propensity to enter and to exit a market shows that relaxing liquidity constraints helps firms financing the fixed and sunk costs of exports. This result is in line with the previous literature on the relationship between financial constraints and export behavior. Using aggregate data, Manova (2013) found that one third of the trade-specific effect of financial frictions takes place at the extensive margin of trade, suggesting an important effect of financing conditions on firm selection into exports. Conversely, using export-level data on Peruvian firms, Paravisini et al. (2014) concluded that the 2008 bank credit crunch affected exports solely through an effect at the intensive margin. Their results suggest that exporters do not rely on bank credit to cope with sunk and fixed costs of exports. By contrast, our study suggests that firms do rely on internal liquidity to finance these types of costs.

However, the predictions of the canonical models of trade with fixed costs are at odds with various important dimensions of the data, most notably the presence of many small exporters in each exporting destination. This consideration is particularly important for our analysis as we find that the median amount of export in a destination does not exceed 140 k€ (see table 3). Arkolakis (2010) show that standard trade models better match exporting dynamics when fixed costs and sunk costs are replaced with *penetration costs*: in this setting, firms pay for each market a cost that is increasing in the number of customers in the market but that does not vary with the amount of sales realized with each customer. Penetration costs therefore regroup all the costs associated with the acquisition and the retention of customers (*e.g.*, marketing costs, provision of trade credit).

The conceptual framework of penetration costs allows to rationalize the results we find both at the extensive margin and on the evolution of the customer base. First, the effects that we uncover on the dynamics of the customer base are consistent with the idea that the increase in the rate of payment collection helped firms finance the penetration costs needed to reach

additional customers. Then, by extension, this drop affected both the exit and entry rate into destinations through the impact on firms that were close to leaving or entering a new country (marginal firms).

By contrast, our results are not compatible with an effect of the policy on the variable costs of exports since this would have resulted in higher sales for both existing and new customers. In this sense, our study completes the results of Paravisini et al. (2014) with regards to the causal effects of credit supply shocks at the intensive margin of trade. First, this study does no exploit firm-to-firm trade data and can not then decompose the effects of the credit crunch on export growth between the sales to existing customers and the evolution of the customer base. Our results implies that the effect they uncover at the intensive margin may be driven by the latter. Second, our results refine their conclusion that better access to bank credit is observationally equivalent to a reduction in variable trade costs. We find that such equivalence does not hold for internal financing.

That liquidity constraints affect penetration costs rather than variable costs points to a large role of short-term financing conditions on aggregate trade. Indeed, in a recent empirical work, Bernard, Moxnes and Ulltveit-Moe (forthcoming) find that the number of importers (customer extensive margin) is twice as important as average exports per importer (customer intensive margin) in the decomposition of the variation of total country exports. This suggests that the costs of reaching new customers might exert a far higher influence than variable costs on aggregate exports, highlighting the importance of the conditions of access to short-term financing for international trade.

7.2 Do firms attract new customers through lower mark-ups?

In the previous sections, we have shown that the positive liquidity shock induced by the trade credit reform caused liquidity-constrained exporters to grow on international markets through the acquisition of new customers. This finding highlights that attracting new customers is costly and represents an investment for a firm. In this section we investigate whether this investment takes the particular form of a (potentially temporary) decrease in mark-ups.

In a seminal paper, Chevalier and Scharfstein (1995) postulate that the setting of mark-ups is the result of a trade-off between present and future profits: while lower prices decreases current cash-flows, it attracts customers which should result in higher future expected profits. As liquidity-constrained firms value more current profits, they are likely to charge higher mark-ups, resulting in lower investment in the customer base. According to this theory, the reduction in client payment delays leads firms to grow more in international markets by allowing them to charge lower mark-ups.

We study this pricing hypothesis by looking at how product prices reacted to the variation of payment periods. If the reform allowed firms to attract more customers through lower mark-ups, then we should see a decrease in client payment delays to be associated with a fall of the average

price charged in the market. To test for this hypothesis, exports are aggregated at the level of a product p (defined as an 8-digit item of the Combined Nomenclature), a firm f, a country m and a time t. Our proxy for price is given by the ratio of the volume of exports to the quantity of products sold ("unit value").

[Insert table 18 here]

While this measure has been widely used in the international trade literature, its variation is difficult to interpret when there is scope for vertical differentiation as it could reflect either a change in price or in quality (Schott, 2004). To limit the role of measurement error, we restrict the estimation to products categorized as homogeneous in the Rauch classification.

The regression that we estimate is specified as:

$$\Delta Price_{f,p,m,t} = \alpha^P_f + \gamma^P_{m,p} + \rho^P_t + \beta^P_1 \cdot \Delta Days\ of\ sales\ outstanding_{f,t} + \beta^P_2 \cdot X_{f,t} + \epsilon^P_{f,p,m,t}$$

where α^P_f and ρ^P_t denote firm and year fixed-effects and $\rho^P_{m,p}$ is a country-product dummy[33]. The variable $\Delta Days\ of\ sales\ outstanding_{f,t}$ is as usual instrumented by the ex ante exposition to the reform. For the sake of homogeneity, $\Delta Price_{f,p,m,t}$ is measured in "mid-point" growth rates (see subsection 3.1); our results are entirely robust to alternative standard measures of the evolution of prices. The mechanism tested in this subsection predicts a positive and statistically significant β^P_1 coefficient.

Table 18 presents the results of the estimations. We find no significant link between the variation in days of sales outstanding and prices even when focusing on homogeneous products. This rules out the possibility that the variation of payment periods affected the growth of the customer base through lower markups. This finding is all the more convincing that we find sensible results for other determinants of prices : positive productivity shocks are associated with decrease in prices and firms operating in booming sectors tend to increase more their product prices.

Our results suggest that investment in customer capital is not made in the form of a reduction in prices. This indicates that non-price penetration costs must be incurred in order to expand the customer base. They can take multiple forms. These costs could be spent to find and match with customers (*e.g.*, marketing costs, advertisement) or to meet with specific client requirements (*e.g.*, provision of trade credit, product customization).

This finding contributes to the literature on firms dynamics and customer accumulation which has emphasized the prominent role of pricing strategies in the building of a customer base. Gourio and Rudanko (2014) show that when the level of demand is increasing with past levels of demand, young firms have incentives to reduce their prices to attract new customers. However, this theory of customer accumulation is contradicted by the empirical finding of

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

Yedid-Levi et al. (2016) who find that for a given level of productivity, prices do not seem to change over time within an export spell. Our results contributes to this debate by providing first causal evidence of the role of non-price mechanisms in the accumulation of international customers.

8 Conclusion

Long payment periods from domestic customers limits the international expansion of liquidity-constrained firms: an exogenous decrease in client payment periods by three days is found to raise the volume of exports by 1.3 percentage points and to increase (decrease) the probability of exiting (entering) a country by 8% (3%). This suggests more generally that in the presence of liquidity constraints, firms face a trade-off between financing the funding needs generated by the activity with existing customers and incurring penetration costs to acquire new customers.

Further research is however warranted to assess the external validity of our results. The evaluation of other regulations on payment terms such as the Federal Quickpay Initiative in 2011 in the US or the Directive 2011/7/EU that generalizes the limitations of payment terms to all European Union countries could show whether the results still hold with more standard financing conditions. The exploitation of recent data sets featuring firm-to-firm domestic transactions would also be interesting for this topic as it would allow to know whether our results are generalizable to all types of trade relationships.

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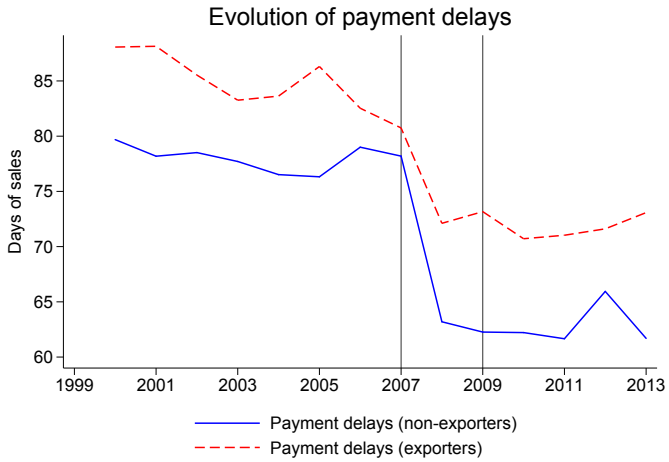
Appendix A Derogations

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

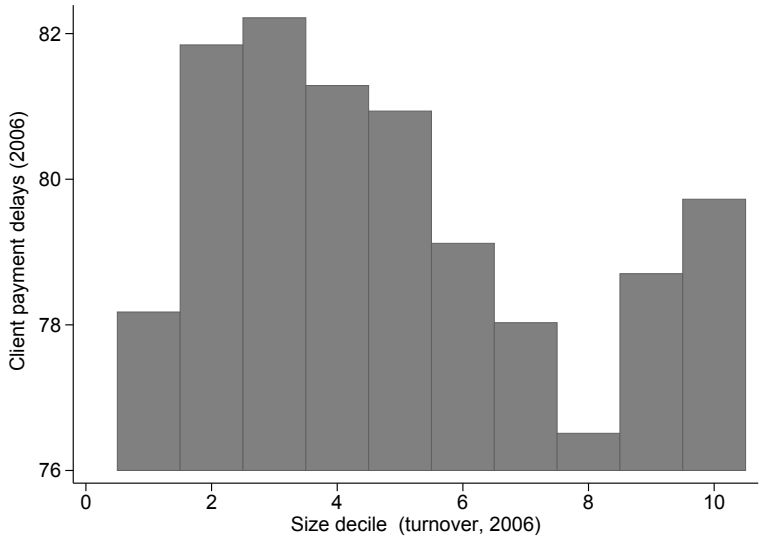
Appendix B Tables and figures

Figure 1: Evolution of days of sales outstanding between 1999 and 2013.



Source: Tax form data. *Field:* manufacturing and wholesale sector.
Interpretation: This graph displays the evolution of days of sales outstanding between 1999 and 2013 in the manufacturing and wholesale trade sectors. Days of sales outstanding are computed as the average ratio of accounts receivable over sales multiplied by 365. The blue solid line gives the evolution of days of sales outstanding for firms whose average share of exports in total sales is below 10%. The red dashed line gives the evolution of days of sales outstanding for firms whose average share of exports in total sales is above 50%.

Figure 2: Days of sales outstanding by firm size (2006)



Source: Tax form data. *Field:* manufacturing and wholesale sector.
Interpretation: This graph displays the average days of sales outstanding by decile of total sales (all values are taken in 2006). Days of sales outstanding are computed as the average ratio of accounts receivable over sales multiplied by 365.

Table 1: Top and bottom 5 sectors for client and supplier payment periods (2007).

$\overline{\textit{Days of sales outstanding}_s}$		$\overline{\textit{Days payable outstanding}_s}$	
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

Source: BRN-RSI tax returns in 2007. *Field:* manufacturing and wholesale sector.
Interpretation: This table displays the NAF 5-digits sectors in the manufacturing and wholesale sector with the highest and lowest values of average days of sales outstanding ($\overline{\textit{Days of sales outstanding}_s}$) and days payable outstanding ($\overline{\textit{Days payable outstanding}_s}$). Days of sales outstanding are computed as the average ratio of accounts receivable over sales multiplied by 365. Days payable outstanding are computed as the average ratio of accounts payable over purchases (multiplied by 365).

Table 2: Description of the data set.

Panel A: Data Definitions	
Export variables	
$\Delta Exports_{fmt}$	Variation of the amount of exports (in mid-point growth rate) of firm f in market m between t and $t-1$ conditionally on firm f being present in m in t and $t-1$. *Source: Customs.*
$\Delta Stable\ customers_{fmt}$	Variation of the amount of exports of firm f realized in market m with customers with which firm f trades in both t and $t-1$ (scaled by the average of total exports in market m between t and $t-1$). *Source: Customs.*
$Entry_{fmt}$	Probability of firm f entering market m at time t conditionally on firm f being not present in m at time $t-1$. *Source: Customs.*
$Exit_{fmt}$	Probability of firm f exiting market m at time t conditionally on firm f being present in m at time $t-1$. *Source: Customs.*
$Lost\ customers_{fmt}$	Exports of firm f realized in market m with customers lost at time $t-1$ (scaled by the average of total exports in market m between t and $t-1$). *Source: Customs.*
$\Delta Customer\ base_{fmt}$	Exports of firm f realized in market m with new customers at time t minus the amount of exports of firm f realized in market m with customers lost at time $t-1$ (scaled by the average of total exports in market m between t and $t-1$). *Source: Customs.*
$New\ customers_{fmt}$	Exports of firm f realized in market m with new customers at time t (scaled by the average of total exports in market m between t and $t-1$). *Source: Customs.*
Firm variables	
$\Delta Days\ of\ sales\ outstanding_{f,t}$	Variation of days of sales outstanding (see section 4.1). *Source: BRN-RSI.*
$\Delta Net\ days\ outstanding_{f,t}$	Variation of net days outstanding (see section 5.3). *Source: BRN-RSI.*
$Age_{f,t}$	Age of the firm. *Source: BRN-RSI.*
$Labor\ productivity_{f,t-1}$	Value added over the number of employees. *Source: BRN-RSI.*
$log(Total\ Assets)_{f,t-1}$	Logarithm of total assets (in thousand euros).*Source: BRN-RSI.*
$log(Turnover)_{f,t-1}$	Logarithm of turnover (in thousand euros). *Source: BRN-RSI.*
$Long\text{-}term\ debt/TA_{f,t}$	Ratio of long-term debt to total assets. *Source: BRN-RSI.*
$\overline{Sales\ growth\ rate}_{f,t}$	Sales-weighted average of sectoral sales growth rates between $t-1$ and t. *Source: EAE, BRN-RSI.*
Instruments	
$\overline{d(DSO,60)}_{f,t}$	Sales-weighted average of the 2007 distance of days of sales outstanding to the 60-days threshold (see section 4.1). *Source: EAE, BRN-RSI.*
$\overline{Net\ days\ outstanding}_{f,t}$	Sales-weighted average of 2007 sectoral net days outstanding (see section 5.3). *Source: EAE, BRN-RSI.*

Panel B: Summary Statistics								
				Percentiles				
	# Obs.	Mean	Std. Dev.	5th	25th	50th	75th	95th
Dependent variables								
$\Delta Exports_{f,m,t}$	875741	-0.01	0.81	-1.51	-0.44	0.00	0.42	1.48
$\Delta Stable\ customers_{f,m,t}$	875741	-0.03	0.62	-1.16	-0.30	0.00	0.26	1.05
$Entry_{f,m,t}$	3901377	0.04	0.20	0.00	0.00	0.00	0.00	0.00
$Exit_{f,m,t}$	1029136	0.15	0.36	0.00	0.00	0.00	0.00	1.00
$\Delta Customer\ base_{f,m,t}$	875741	0.01	0.52	-0.86	-0.02	0.00	0.04	0.97
$New\ customers_{f,m,t}$	875741	0.20	0.41	0.00	0.00	0.00	0.16	1.22
$Lost\ customers_{f,m,t}$	875741	0.18	0.39	0.00	0.00	0.00	0.14	1.14
Independent variables								
$\Delta Days\ of\ sales\ outstanding_{f,t}$	194949	0.20	2.90	-3.74	-0.90	0.06	1.11	4.40
$\Delta Net\ days\ outstanding_{f,t}$	194949	-0.01	2.87	-4.01	-1.08	0.00	1.06	3.98
$Age_{f,t}$	194949	23.34	17.78	3.00	11.00	20.00	33.00	52.00
$Labor\ productivity_{f,t}$	194949	0.07	0.05	0.02	0.04	0.06	0.08	0.15
$log(Total\ assets)_{f,t}$	194949	9.05	1.63	6.87	8.14	8.94	9.91	11.80
$log(Turnover)_{f,t}$	194949	9.40	1.41	7.42	8.48	9.26	10.21	11.92
$LT\ debt/Assets_{f,t}$	194949	0.04	0.06	0.00	0.00	0.01	0.05	0.17
$Sales\ growth\ rate_{f,t}$	194949	0.01	0.14	-0.21	-0.03	0.03	0.07	0.19
Instrument								
$\overline{d(DSO,60)}_{f,t}$	194949	1.97	1.97	0.00	0.00	1.42	3.82	4.99
$\overline{Net\ days\ outstanding}_{f,t}$	194949	7.14	22.47	-25.21	-7.93	5.55	21.96	45.13

Source: BRN-RSI, EAE, Customs data. *Field:* SMEs of the manufacturing and wholesale sector. *Interpretation:* The average value of the logarithm of the total value of assets (in thousand euros) across firm-year observations is 9.05.

Table 3: Export values and number of destinations served.

	Mean	Std. Dev.	P5	P25	P50	P75	P95
$Exports_{f,t}$ (k€)	8,031	45,186	9.05	164.60	773.14	3,290.26	30,173.26
$Exports_{f,m,t}$ (k€)	984.53	8007.50	4.68	41.27	139.73	476.95	3,476.41
$\#Destination_{f,t}$	6.96	5.22	1.00	3.00	6.00	10.00	18.00
$\#Client_{f,m,t}$	4.93	10.10	1.00	1.50	2.50	4.75	15.67

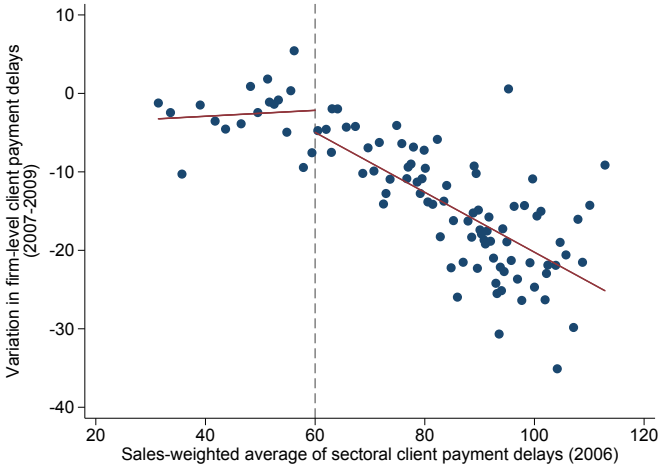
Source: Customs data. *Field:* SMEs of the manufacturing and wholesale sector.
Interpretation: On average over the period 2003-2012, a French firm exports 985 k€ per year and destination, serves 7 destinations and is in contact with 5 buyers within a market.

Table 4: Description of the export dynamics at the customer- and market-level.

Level	#Years after entry:	1	2	3	4	5
Customer	Export value (mean)	73,745	154,203	216,314	271,597	440,095
	Exit rate (%)	56	39	33	29	32
Market	Export value (mean)	495,196	795,472	1,017,846	1,170,753	1,719,273
	Exit rate (%)	28	16	11	9	6
	# customers (mean, UE)	3.55	4.98	5.96	6.71	8.8

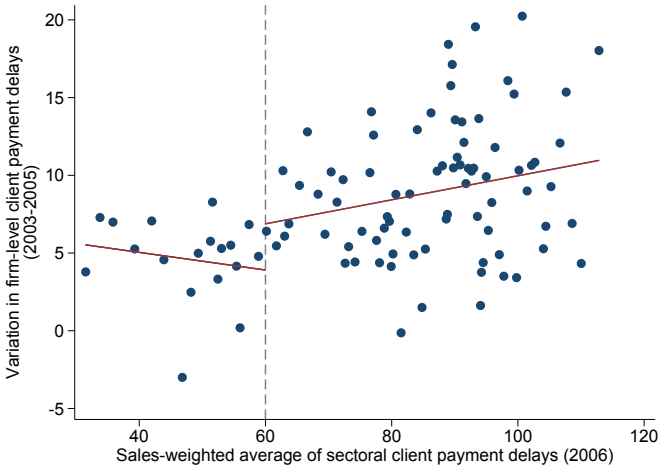
Source: BRN-RSI, EAE, Customs data. *Field:* SMEs of the manufacturing and wholesale sector
Interpretation: The table displays the average export value and exit rate at the customer- and market-level for the five years consecutive to the entry in a destination or to the formation of a new customer-supplier relationship. The last line indicate the evolution of the average number of customers per destination in the five years consecutive to the time of entry.

Figure 3: The effects of the sixty-days rule on payment periods.



Source: Tax form data. *Field:* manufacturing and wholesale sector.
Interpretation: This graph displays the evolution of *Days of sales outstanding*$_{f,t}$ between 2007 and 2009 as a function of $\overline{\textit{Days of sales outstanding}}_{f,2007}$. *Days of sales outstanding*$_{f,t}$ is computed as the firm-level ratio of accounts receivable over sales multiplied by 365. $\overline{\textit{Days of sales outstanding}}_{f,2007}$ is computed as the average of the sectoral means of *Days of sales outstanding*$_{g,2007}$ weighted by the sales of firm f in each sector. The data set is split in 100 percentiles along the x-axis; the ordinate axis represents the average value of the y variable in each percentile.

Figure 4: Placebo test - Evolution of payment periods before the policy.



Source: Tax form data. *Field:* manufacturing and wholesale sector.
Interpretation: This graph displays the evolution of *Days of sales outstanding*$_{f,t}$ between 2003 and 2005 as a function of $\overline{\textit{Days of sales outstanding}}_{f,2007}$. *Days of sales outstanding*$_{f,t}$ is computed as the firm-level ratio of accounts receivable over sales multiplied by 365. $\overline{\textit{Days of sales outstanding}}_{f,2007}$ is computed as the average of the sectoral means of *Days of sales outstanding*$_{g,2007}$ weighted by the sales of firm f in each sector. The data set is split in 100 percentiles along the x-axis; the ordinate axis represents the average value of the y variable in each percentile.

Table 5: Effects of the policy on the rate of payment collection.

	$\Delta Days\ of\ sales\ outstanding_{f,t}$			
	(1)	(2)	(3)	(4)
$\overline{d(Client\ delays,60)}_{f,t}$	−0.117***	−0.097***	−0.152***	−0.463***
	(0.003)	(0.003)	(0.009)	(0.057)
$log(Total\ assets)_{f,t}$		−0.408***	−23.846***	−23.863***
		(0.051)	(0.514)	(0.514)
$\overline{Sales\ growth\ rate}_{f,t}$		22.577***	10.573***	10.606***
		(0.604)	(0.678)	(0.679)
$LT\ debt/Assets_{f,t}$		8.809***	17.965***	18.026***
		(0.969)	(1.957)	(1.957)
$Labor\ productivity_{f,t}$		5.831***	−26.273***	−26.417***
		(1.612)	(3.851)	(3.852)
$\overline{d(Client\ delays,60)}^2_{f,t}$				0.690***
				(0.156)
$\overline{d(Client\ delays,60)}^3_{f,t}$				−0.035***
				(0.011)
Observations	168430	168430	168430	168430
Controls	No	Yes	Yes	Yes
Firm FE	No	No	Yes	Yes
Year FE	No	No	Yes	Yes

The main variables are presented in table 2. Regressions include firm and year fixed-effects. Standard errors are clustered at the firm-level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%.

Table 6: Rate of payment collection and export growth.

	$\Delta Client\ delays_{f,t}$	$\Delta Exports_{f,m,t}$	$Exit_{f,m,t}$	$Entry_{f,m,t}$
$log(Assets)_{f,t-1}$	−2.268***	−0.131***	0.007	0.009***
	(0.070)	(0.040)	(0.019)	(0.003)
$\overline{Sales\ growth\ rate}_{f,t}$	0.663***	0.134***	−0.027***	0.007***
	(0.071)	(0.016)	(0.008)	(0.002)
$LT\ debt/Assets_{f,t-1}$	2.104***	0.091*	−0.036	0.006
	(0.242)	(0.050)	(0.024)	(0.004)
$Labor\ productivity_{f,t-1}$	−1.908***	−0.218***	0.009	−0.005
	(0.426)	(0.069)	(0.035)	(0.007)
$\overline{d(DSO,60)}_{f,t} \times 10$	−0.102***			
	(0.012)			
$\Delta Days\ of\ sales\ outstanding_{f,t} \times 10$		−0.043**	0.035***	−0.004***
		(0.018)	(0.009)	(0.001)
Observations	875741	875741	1029136	3901377
# Firms	19085	19085	20963	22884
Firm FE	Yes	Yes	Yes	Yes
Country-year FE	Yes	Yes	Yes	Yes
Kleibergen-Paap		75.9	82.9	260.0

The main variables are presented in table 2. Regressions include firm and country-year fixed-effects. Standard errors are clustered at the firm-level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%.

Table 7: Rate of payment collection and evolution of the customer base.

	$\Delta Exports_{f,m,t}$	$\Delta Stable\ customer_{f,m,t}$	$\Delta Customer\ base_{f,m,t}$	$New\ customers_{f,m,t}$	$Lost\ customers_{f,m,t-1}$
$\Delta Days\ of\ sales\ outstanding_{f,t} \times 10$	−0.043**	−0.005	−0.038***	−0.025***	0.014*
	(0.018)	(0.012)	(0.011)	(0.008)	(0.008)
$log(Assets)_{f,t-1}$	−0.131***	−0.028	−0.103***	−0.079***	0.023
	(0.040)	(0.028)	(0.024)	(0.018)	(0.017)
$\overline{Sales\ growth\ rate}_{f,t}$	0.134***	0.094***	0.040***	0.024***	−0.016**
	(0.016)	(0.011)	(0.010)	(0.007)	(0.006)
$LT\ debt/Assets_{f,t-1}$	0.091*	0.028	0.063**	0.076***	0.013
	(0.050)	(0.034)	(0.030)	(0.023)	(0.020)
$Labor\ productivity_{f,t-1}$	−0.218***	−0.175***	−0.044	−0.067**	−0.024
	(0.069)	(0.045)	(0.042)	(0.029)	(0.028)
Observations	875741	875741	875741	875741	875741
# Firms	19085	19085	19085	19085	19085
Firm FE	Yes	Yes	Yes	Yes	Yes
Country-year FE	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap	75.9	75.9	75.9	75.9	75.9

The main variables are presented in table 2. Regressions include firm and country-year fixed-effects. Standard errors are clustered at the firm-level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%.

Table 8: Alternative specifications.

	Baseline (1)	Derogations (2)	OLS (3)	No country-year FE (4)	No firm FE (5)
$\Delta Days\ of\ sales\ outstanding_{f,t} \times 10$	−0.043**	−0.284**	0.012***	−0.034**	−0.047
	(0.018)	(0.140)	(0.001)	(0.017)	(0.035)
$log(Assets)_{f,t-1}$	−0.131***	−0.674**	−0.006	−0.108***	0.002
	(0.040)	(0.316)	(0.006)	(0.039)	(0.002)
$\overline{Sales\ growth\ rate}_{f,t}$	0.134***	0.297***	0.096***	0.128***	0.160***
	(0.016)	(0.099)	(0.010)	(0.016)	(0.035)
$LT\ debt/Assets_{f,t-1}$	0.091*	0.595**	−0.025	0.068	0.195***
	(0.050)	(0.300)	(0.031)	(0.049)	(0.039)
$Labor\ productivity_{f,t-1}$	−0.218***	−0.689**	−0.110**	−0.204***	0.271***
	(0.069)	(0.313)	(0.053)	(0.067)	(0.049)
Observations	875741	875741	875741	875741	875741
# Firms	19085	19085	19085	19085	19085
Firm FE	Yes	Yes	Yes	Yes	No
Country-year FE	Yes	Yes	Yes	No	Yes
Year FE	No	No	No	Yes	No
Kleibergen-Paap	75.921	5.333		75.974	24.495

The main variables are presented in table 2. Standard errors are clustered at the firm-level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%.

Table 9: Alternative units of observation I - Firm-year and firm level

	$\Delta Exports$			
Collapsed:	Firm-year		Firm	
	(1)	(2)	(3)	(4)
Δ*Client delays*	−0.103***	−0.104***	−0.038**	−0.065***
	(0.027)	(0.025)	(0.017)	(0.019)
Observations	142164	135592	14026	13365
Firm FE	Yes	Yes	No	No
Year FE	Yes	Yes	No	No
Controls	No	Yes	No	Yes

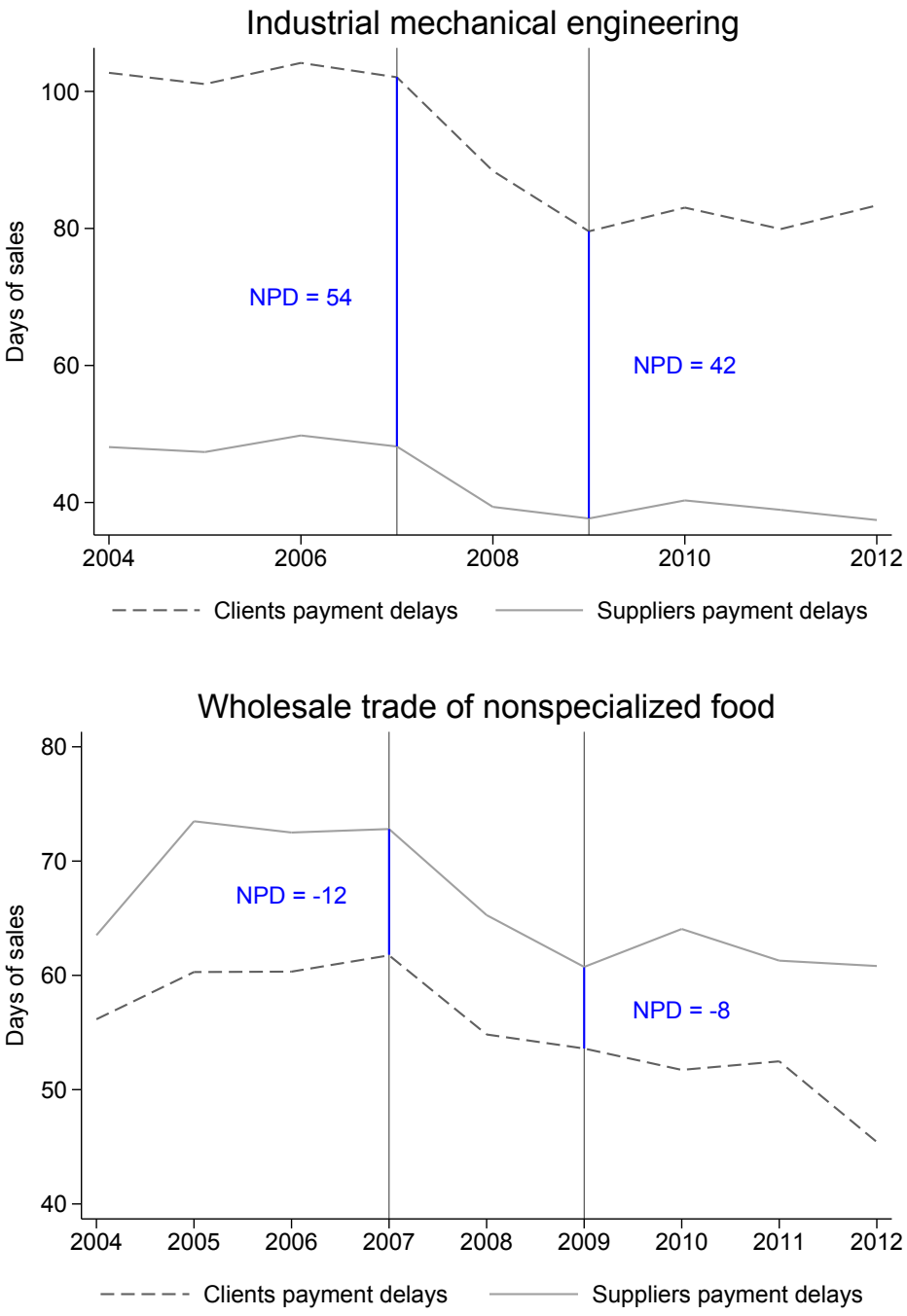
In the first two columns, we sum all the exports at the firm-year level and estimate our baseline specification without the country dimension. Controls are the same as in table 6. In the last two columns, we remove the time dimension of the data by calculating the growth rate of firm total exports between 2006 and 2009. Δ*Days of sales outstanding* is defined in this context as the long difference of days of sales outstanding between 2006 and 2009; it is instrumented by $\overline{d(DSO,60)}_{f,06}$. 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 10: Alternative units of observation II - Product × country

	$\Delta Client\ delays_{f,t}$	$\Delta Exports_{f,m,t}$	$Exit_{f,m,t}$	$\Delta Stable\ customers_{f,m,t}$	$\Delta Customer\ base_{f,m,t}$
$log(Assets)_{f,t-1}$	−1.912***	−0.376**	0.136	−0.175	−0.201**
	(0.098)	(0.191)	(0.102)	(0.110)	(0.099)
$\overline{Sales\ growth\ rate}_{f,t}$	0.304***	0.110***	−0.037	0.075***	0.034*
	(0.090)	(0.038)	(0.023)	(0.021)	(0.020)
$LT\ debt/Assets_{f,t-1}$	1.693***	0.328*	−0.114	0.148	0.180*
	(0.411)	(0.185)	(0.101)	(0.105)	(0.097)
$Labor\ productivity_{f,t-1}$	−0.843	−0.197	−0.015	−0.163*	−0.034
	(0.611)	(0.163)	(0.084)	(0.088)	(0.086)
$\overline{d(DSO,60)}_{f,t} \times 10$	−0.043**				
	(0.019)				
$\Delta Days\ of\ sales\ outstanding_{f,t} \times 10$		−0.185*	0.104*	−0.086	−0.099*
		(0.101)	(0.055)	(0.058)	(0.052)
Observations	2001246	2001246	2609789	2001246	2001246
# Firms	19133	19133	21162	19133	19133
Firm FE	Yes	Yes	Yes	Yes	Yes
Country-Product-Year FE	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap		5.5	5.5	5.5	5.5

The main variables are presented in table 2. A product is defined by a 2-digits Combined Nomenclature (CN) code. Regressions include firm and product-country-year fixed-effects. Standard errors are clustered at the firm-level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%.

Figure 5: Effects of the reform on net days outstanding.



Source: Fiscal data.
Interpretation: This graph displays the evolution of days of sales outstanding and days payable outstanding between 2004 and 2012 in the industrial mechanical engineering and wholesale trade of nonspecialized food. Days of sales outstanding are computed as the average ratio of accounts receivable over sales multiplied by 365. Days payable outstanding are computed as the average ratio of accounts payable over purchases. Net days outstanding are defined as DSO minus DPO. Lower net days outstanding means that DSO decreased more than DPO.

Table 11: Effects of net days outstanding on export growth.

	$\Delta Client\ delays_{f,t}$	$\Delta Exports_{f,m,t}$	$Exit_{f,m,t}$	$Entry_{f,m,t}$
$log(Assets)_{f,t-1}$	−0.004	−0.034	−0.065***	0.016***
	(0.053)	(0.022)	(0.006)	(0.001)
$\overline{Sales\ growth\ rate}_{f,t}$	0.062	0.130***	−0.008	0.007***
	(0.075)	(0.032)	(0.009)	(0.002)
$LT\ debt/Assets_{f,t-1}$	−0.269	−0.099	0.064**	−0.006
	(0.240)	(0.110)	(0.032)	(0.005)
$Labor\ productivity_{f,t-1}$	−2.496***	−1.109**	0.201	−0.046***
	(0.411)	(0.483)	(0.132)	(0.014)
$\overline{Net\ days\ outstanding}_{f,t} \times 10$	−0.019**			
	(0.008)			
$\Delta Net\ days\ outstanding_{f,t} \times 10$		−0.386**	0.100**	−0.016***
		(0.177)	(0.047)	(0.004)
Observations	868872	868872	1020927	3863949
# Firms	18780	18780	20595	22399
Firm FE	Yes	Yes	Yes	Yes
Country-year FE	Yes	Yes	Yes	Yes
Kleibergen-Paap		5.1	6.2	44.6

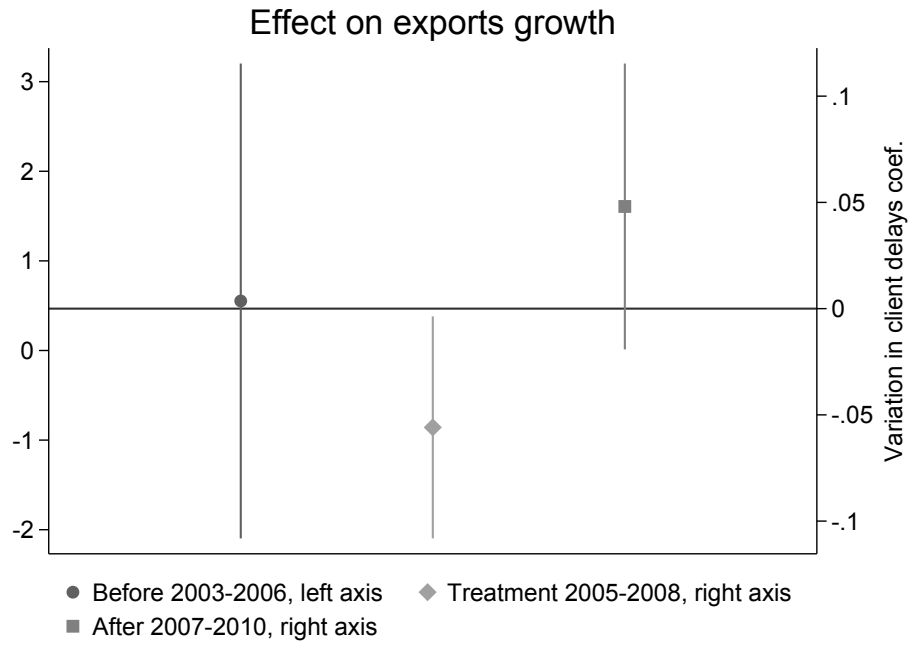
The main variables are presented in table 2. Regressions include firm and country-year fixed-effects. Standard errors are clustered at the firm-leve and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%.

Table 12: Decomposition of the effects of net days outstanding on export growth.

	$\Delta Exports_{f,m,t}$	$\Delta Stable\ customers_{f,m,t}$	$\Delta Customer\ base_{f,m,t}$	$New\ customers_{f,m,t}$	$Lost\ customers_{f,m,t-1}$
$\Delta Net\ days\ outstanding_{f,t} \times 10$	−0.386**	−0.139*	−0.247**	−0.176**	0.072*
	(0.177)	(0.072)	(0.115)	(0.082)	(0.041)
$log(Assets)_{f,t-1}$	−0.034	−0.017**	−0.017	−0.024**	−0.007
	(0.022)	(0.009)	(0.014)	(0.010)	(0.005)
$\overline{Sales\ growth\ rate}_{f,t}$	0.130***	0.100***	0.030	0.018	−0.012*
	(0.032)	(0.014)	(0.021)	(0.015)	(0.007)
$LT\ debt/Assets_{f,t-1}$	−0.099	−0.021	−0.078	−0.020	0.058**
	(0.110)	(0.045)	(0.071)	(0.051)	(0.024)
$Labor\ productivity_{f,t-1}$	−1.109**	−0.519***	−0.590*	−0.461**	0.129
	(0.483)	(0.195)	(0.311)	(0.222)	(0.110)
Observations	868872	868872	868872	868872	868872
# Firms	18780	18780	18780	18780	18780
Firm FE	Yes	Yes	Yes	Yes	Yes
Country-year FE	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap	5.1	5.1	5.1	5.1	5.1

The main variables are presented in table 2. Regressions include firm and country-year fixed-effects. Standard errors are clustered at the firm-level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%.

Figure 6: Dynamics of the effects.



The graph displays the estimated coefficients (with 95% confidence intervals) of the regression of Δ*Days of sales outstanding*$_{f,t}$ on the evolution of days of sales outstanding for different subperiods: 2003-2006, 2005-2008 and 2007-2012. In the first two years of each subperiod, the instrument variable is set to 0. It is equal to $\overline{d(DSO,60)}_{f,07}$ for the two following years. The regression include firm- and country-year fixed effects and controls (log of assets, labor productivity, lagged leverage, average sectoral growth); standard errors are clustered at the firm-level.

Table 13: Rate of payment collection and capital structure.

Dependent variables (scaled by *Total assets*$_{f,t-1}$) :	*Working capital*$_{f,t}$	*Cash*$_{f,t}$	*Credit line*$_{f,t}$	*Long-term credit*$_{f,t}$
Δ*Days sales outstanding*$_{f,t} \times 10$	0.027***	−0.011***	0.011***	−0.003*
	(0.005)	(0.004)	(0.003)	(0.002)
log(Assets)$_{f,t-1}$	0.044***	−0.053***	0.030***	−0.012***
	(0.013)	(0.009)	(0.006)	(0.005)
$\overline{\textit{Sales growth rate}}_{f,t}$	−0.014**	0.016***	−0.009***	0.002
	(0.006)	(0.004)	(0.003)	(0.002)
LT debt/Assets$_{f,t-1}$	−0.087***	−0.059***	−0.011	0.469***
	(0.016)	(0.010)	(0.009)	(0.009)
Labor productivity$_{f,t-1}$	0.236***	0.107***	0.013	−0.006
	(0.028)	(0.017)	(0.012)	(0.008)
Observations	106737	110860	110586	110790
# Firms	16740	16886	16864	16887
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

The main variables are presented in table 2. Regressions include firm and year fixed-effects. Standard errors are clustered at the firm-level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%.

Table 14: Effects of the policy on domestic sales and sourcing strategies.

	$Domestic\ turnover_{f,t}$		$Import\ share_{f,t}$	
	(1)	(2)	(3)	(4)
$\Delta Days\ sales\ outstanding_{f,t} \times 10$	0.009			
	(0.009)			
$log(Assets)_{f,t-1}$	−0.079***	−0.083***	−0.136	0.012***
	(0.023)	(0.012)	(0.108)	(0.004)
$\overline{Sales\ growth\ rate}_{f,t}$	0.126***	0.156***	0.062	0.014***
	(0.013)	(0.017)	(0.040)	(0.005)
$LT\ debt/Assets_{f,t-1}$	0.066**	−0.008	0.101	−0.058***
	(0.031)	(0.055)	(0.104)	(0.018)
$Labor\ productivity_{f,t-1}$	−0.811***	−1.422***	0.157***	−0.019
	(0.058)	(0.184)	(0.040)	(0.066)
$\Delta Net\ days\ outstanding_{f,t} \times 10$		−0.165***		−0.040**
		(0.044)		(0.016)
$\Delta Days\ payable\ outstanding_{f,t} \times 10$			−0.044	
			(0.033)	
Observations	110237	109643	110877	110340
# Firms	16873	16702	16888	16720
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

The main variables are presented in table 2. . Standard errors are clustered at the firm-level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%.

Table 15: Heterogeneity I - Intensity of liquidity constraints

	$\Delta Exports_{f,m,t}$							
	Total sales		Cash/Assets		Debt/Assets		Volatility of sales	
	$\leq P50$ (1)	$\geq P50$ (2)	$\leq P50$ (3)	$\geq P50$ (4)	$\leq P50$ (5)	$\geq P50$ (6)	$\leq P50$ (7)	$\geq P50$ (8)
$\Delta Days\ of\ sales\ outstanding_{f,t} \times 10$	−0.296**	−0.015	−0.098	−0.163***	−0.265***	−0.062	−0.128*	−0.200**
	(0.119)	(0.056)	(0.109)	(0.060)	(0.097)	(0.068)	(0.077)	(0.086)
Observations	412336	412489	409567	409594	416653	416939	406959	407039
# Firms	8819	9097	8543	9310	11620	7887	8228	8196
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap	23.2	66.0	19.0	69.3	29.0	49.6	37.1	35.9

The main variables are presented in table 2. 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 and control variables as in table 6 : $log(Total\ Assets)_{f,07}$, $\overline{Sales\ growth\ rate}_{f,07\text{-}09}$, $LT\ debt/TA_{f,07}$ and $Labor\ productivity_{f,t-1}$. Standard errors are clustered at the firm-level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%.

Table 16: Heterogeneity II - Costs of customer acquisition.

	$\Delta Exports_{f,m,t}$					
	Churning		Penetration		Rauch classification	
	$\leq P50$	$\geq P50$	$\leq P50$	$\geq P50$	Homogeneous	Differentiated
	(1)	(2)	(3)	(4)	(5)	(6)
Δ*Days of sales outstanding*$_{f,t} \times 10$	−0.516**	−0.570	−0.455*	−0.652	−0.188	−0.410*
	(0.258)	(0.423)	(0.239)	(0.457)	(0.544)	(0.232)
Observations	1116857	883029	1126519	873417	378507	1225146
# Firms	17023	16628	17416	16781	8964	15530
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Product-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap	6.6	3.0	6.7	3.0	0.7	5.9

The main variables are presented in table 2. The analysis is at the country × product level, a product being defined by a 2-digits Combined Nomenclature (CN) code. $Churning_{m,p,t}$ is defined for a given country (m), product (p) and year (t) as the ratio of the sum of exports realized in beginning or ending customer-supplier relationships (*ie*, in which the supplier exports to the customer at time t but not at time $t-1$ and/or at time $t+1$) to the sum of all exports to the market at time t. Country-product pairs are then ranked according to the average value of $Churning_{m,p,t}$ for the 2003-2013 time period. $Penetration_{m,p,t}$ is defined as the ratio of the sum of exports realized with customers that were not in contact with any French supplier at time $t-1$ to the sum of all exports to the market at time t. Country-product pairs are then ranked according to the average value of $Penetration_{m,p,t}$ for the 2003-2013 time period. For the last two columns, each 8-digits product is given a number (0: homogeneous, 1: reference priced, 2: differentiated) following the Rauch (1999) classification. For each firm-country-HS2-year observation, the Rauch code is computed as the average of the HS8 Rauch code weighted by exports. Observations are ranked as "Homogeneous" (resp. "Differentiated") if the average Rauch code is below one (resp. superior to one). Regressions include firm and country-product-year fixed-effects and control variables as in table 6 : *log(Total Assets)*$_{f,07}$, *Sales growth rate*$_{f,07\text{-}09}$, *LT debt/TA*$_{f,07}$ and *Labor productivity*$_{f,t-1}$. Standard errors are clustered at the firm-level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%.

Table 17: Heterogeneity III - Exposure to the policy.

	$\Delta Exports_{f,m,t}$			
	Import share (2007)		Market share (2007)	
	$\leq P50$	$\geq P50$	$\leq P50$	$\geq P50$
	(1)	(2)	(3)	(4)
Δ*Days of sales outstanding*$_{f,t} \times 10$	0.000	−0.191***	−0.207**	−0.046
	(0.107)	(0.070)	(0.085)	(0.073)
Observations	189010	686583	426718	426887
# Firms	4367	15532	12589	8256
Firm FE	Yes	Yes	Yes	Yes
Country-year FE	Yes	Yes	Yes	Yes
Kleibergen-Paap	16.6	58.3	42.2	36.7

The main variables are presented in table 2. $\overline{Import\ share}_{s,07}$ is defined as the average import share in sector s in 2007. $\overline{Import\ share}_{f,07}$ is then computed by taking the average of $\overline{Import\ share}_{s,07}$ weighted by the sales of firm f in each sector s. The domestic market share is defined as the ratio of domestic sales realized by the firm in its principal sector of activity over the total sum of domestic sales realized in the sector. Rankings are within destination× year (P50 is the median). Regressions include firm and country-year fixed-effects and control variables as in table 6 : *log(Total Assets)*$_{f,07}$, $\overline{Sales\ growth\ rate}_{f,07\text{-}09}$, *LT debt/TA*$_{f,07}$ and *Labor productivity*$_{f,t-1}$. Standard errors are clustered at the firm-level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%.

Table 18: Rate of payment collection and product prices.

	All products		Homogeneous products
	First stage	$\Delta Price_{f,p,c,t}$	$\Delta Price_{f,p,c,t}$
$\overline{d(DSO,60)}_{f,t} \times 10$	−0.102***		
	(0.029)		
$log(Assets)_{f,t-1}$	−1.572***	−0.049*	−0.055*
	(0.131)	(0.028)	(0.029)
$\overline{Sales\ growth\ rate}_{f,t}$	0.227*	0.029**	0.240***
	(0.138)	(0.013)	(0.029)
$LT\ debt/Assets_{f,t-1}$	1.691***	0.047	−0.036
	(0.522)	(0.042)	(0.058)
$Labor\ productivity_{f,t-1}$	−0.428	−0.086*	−0.245***
	(0.764)	(0.047)	(0.067)
$\Delta Days\ of\ sales\ outstanding_{f,t} \times 10$		−0.025	−0.033
		(0.017)	(0.020)
Observations	4097285	4097285	115484
# Firms	18371	18371	2478
Firm FE	Yes	Yes	Yes
Country-product FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Kleibergen-Paap		12.8	25.1

Prices are computed at the firm (f), country (m), product (p), and time (t) level. A product is defined as a 8-digits Combined Nomenclature (CN) product code. The main variables are presented in table 2. Standard errors are clustered at the sector-time level and are given in parentheses. *, **, and *** denote statistical significance at 10, 5 and 1%. Homogeneous products are defined as goods traded on an organized exchange or reference priced in the Rauch (1999) classification ("Homogeneous").