Building a Customer Base under Liquidity Constraints*

Job Market Paper

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Abstract

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

JEL codes: F14, G31.

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

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1 Introduction

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

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

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

[1] See Gourio and Rudanko (2014) for the asset pricing implications of "customer capital" and Arkolakis (2010) for the magnitude and the economic role of marketing costs.

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

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

[4] The economic literature (e.g., Bagwell (2007)) traditionally distinguishes between the "persuasive" (i.e., altering customers' tastes) and "informative" view of marketing (i.e., informing customers about the existence of the product). We choose instead to rely on the distinction between price competition and informational frictions as it yields sharper predictions on the influence of liquidity constraints on customer acquisition strategies.

Our identification strategy exploits the 2009 enactment of a French law (the "reform") that limited payment terms in trade credit contracts to 60 days.[5,6] While future payment from customers (accounts receivable) represent an important short-term asset of firms, they are not equivalent to cash as they cannot be used costlessly to settle transactions.[7] A reduction in payment periods from customers, therefore, is akin to a reduction of the cost of access to liquidity (Barrot, 2016). Following the reform, firms received payments from customers three days faster on average, leading to a potential permanent increase in cash holdings of up to 9% from the pre-reform mean.[8]

A challenge for the empirical analysis is that the reform took place in the middle of the 2008-2009 financial crisis, during which trade suddenly collapsed (Eaton et al., 2016). A simple regression of sales on payment periods, therefore, is likely to yield a positive coefficient as both variables decreased simultaneously. We rely instead on a treatment intensity approach. The strategy is based on the idea that firms facing longer average payment periods from customers before the reform were likely to benefit more from the 60-day rule. Since confounding variables (e.g., bargaining power) could drive both pre-reform payment periods and investment in the customer base, the identification strategy makes use of the sectoral composition of the existing customer base. Specifically, our "shift-share" instrument for the variation in payment periods is based on the idea that a supplier mostly operating in sectors in which customers tend to pay in more than 60 days on average (high distance to the regulatory threshold) is highly exposed to the reform. In contrast, a supplier facing sectoral payment periods shorter than 60 days (zero distance to the threshold) should be barely affected by the cap on payment terms.[9] The identifying assumption underlying this strategy is that the average distance to the threshold affects firm sales growth only through its impact on the variation in payment periods.

We focus in the analysis on the formation of international supplier-customer relationships. There are three main reasons for this choice. First, the cap on payment terms was not binding for international transactions, as French exporters could choose to switch to the importer's trade code to circumvent the legislation. Focusing on international transactions ensures that the variation in exports reflects the effects of the decrease of payment periods across existing customers and not the cap on payment terms with new customers. Second, firms are more likely to be "atomistic" in international markets given the large pool of international competitors they face. This mitigates the concern that the reduced form

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

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

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

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

[9]This type of strategy is also called a Bartik instrument in reference to Bartik (1991). Adão, Kolesár and Morales (2019) and Borusyak, Hull and Jaravel (2018); Goldsmith-Pinkham, Sorkin and Swift (2018) respectively analyze the challenges to inference and identification in shift-share designs. We discuss these issues extensively in section 4.

coefficient may capture the loss of customers by firms that are unaffected by the reform to firms that benefit from it (business stealing effect). Third, customs data are very rich, and contain in particular both the geographical location and the type of product involved in the transaction at a high level of disaggregation. This type of information is essential for our research question, as it enables us to control for the influence of demand factors in the evolution of firms' customer base.

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

We start by showing that the reform generated a positive liquidity shock for firms. We find that a three-days reduction in payment periods (one sample standard deviation) permanently raises cash holdings scaled by total assets by 5.4% compared to the pre-reform mean, allowing firms to draw less on their credit lines. Moreover, we provide evidence that firms exhibit lower working capital needs after the shock. We find no effects of the reform on domestic sales, which suggests that customers do not ask for lower prices as compensation for the decrease in payment periods. Similarly, the reform does not lead French customers to import a larger fraction of their inputs.[10] Overall, our results suggest that the reform decreased working capital needs with domestic customers while leaving domestic sales unchanged.

We derive three main sets of results. In the first set of results, we show that the reform spurred export growth. Comparing firms exporting in the same country at the same time (country-year fixed effects), we find that being paid three days earlier by domestic customers raises export growth by 1.5 percentage points.[11] By comparison, the annual export growth rate in a country before the shock is 3.7%. The economic magnitude of the effect is sizeable; a one-standard-deviation shock brings the median exporter to the top 5% of the most dynamic firms. We obtain similar results when comparing exports of a given product category (country-product-year fixed effects). At the extensive margin, we find that the positive liquidity shock also leads to higher entry rates in new countries and lower exit rates from existing ones. Taken together, these findings show that comparable firms facing the same demand can grow at different rates in product markets depending on the intensity of liquidity constraints that they face.

We perform a series of tests to check that the increase in export growth is indeed caused by the

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

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

reform. First, we show that the superior export performance of firms more exposed to the reform cannot be explained by a lower degree of vulnerability to the financial crisis.[12] Second, we run pre-reform covariate balance tests and find no evidence of pre-trends in export growth. Third, cross-sectional heterogeneity tests to confirm that the increase in export growth was larger for firms more exposed to the reform such as firms importing a large share of their purchases (as they did not have to pay their foreign suppliers faster) or firms more likely to be liquidity-constrained (e.g, small, cash-poor or highly leveraged). Last, we check whether our results are driven by the choice to focus on the asset side of trade credit. Since firms are customers as well as suppliers, the net effect of the reform is a priori ambiguous. We look in an alternative identification strategy at the effects of the reform on the variation in the difference between payment periods from customers and payment periods to suppliers and the impact of that change on export growth. Our main conclusions remain unchanged.

In the second set of results, we show that the increase in export growth is caused by an investment in the consumer base and not by a change in supply-side factors such as production costs. Using the information on the identity of foreign customers, we find that the reform-induced increase in export growth is entirely driven by the acquisition of new international customers. In contrast, the reform's effects on sales to existing customers is a precisely estimated zero. This finding rules out most supply-side alternative mechanisms as they would predict an increase in the volume of sales to both existing and new customers.[13] Such heterogeneous effects, however, could arise if firms can price discriminate between new and existing customers, e.g. fully pass a decrease in production costs to new customers. Comparing the evolution of prices (as measured by unit values) for the same product across firms differentially exposed to the reform, we find no evidence of differentiated pricing strategies across customers. Lastly, we check that the acquisition of new customers is not due to an increase in firms' production capacity. We find the effects of the reform on exports to be concentrated on firms with high levels of inventoried products over sales, that is firms for which capacity constraints were unlikely to be binding.

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

In the third and last set of results, we show that liquidity constraints primarily affect the formation of the customer base by exacerbating informational frictions. We start by looking at the actions firms take

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

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

to attract new customers following the liquidity shock. We find no effect of the liquidity shock on prices even when focusing on homogeneous products, for which price strategies are likely to be more effective. Although the French accounting system does not identify marketing expenditures separately, we find in contrast that a reduction of payment periods by three days caused firms to increase purchases of external services (which include advertising costs) by 1.3% and the share of intangibles (which include brand value and communication media) in total assets by 3.6%.[14] These findings suggest that liquidity frictions do not limit the ability of firms to compete on prices, but rather to match with new customers through advertising.

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

Related literature. Our work contributes to a vast stream of research in corporate finance that explores the interaction between financing decisions and product market strategies. This paper is especially related to the literature that focuses on access to liquidity on product market outcomes such as price levels (Phillips, 1995; Chevalier, 1995*b*; Chemla and Faure-Grimaud, 2001; Khanna and Tice, 2005; Bau and Matray, 2019), the sensitivity of prices to demand shocks (Chevalier and Scharfstein, 1996; Campello, 2003; Gilchrist et al., 2017; Dou and Ji, 2018) or the ability of firms to build market share (Frésard, 2010; Boutin et al., 2013).[15] This paper contributes in three ways. First, we provide first causal, direct evidence that liquidity frictions limit the ability of firms to finance the formation of new trade relationships. Second, our results emphasize the role of non-price strategies in the creation of a customer base and shed light on the role of informational frictions in the formation of business-to-business trade

[14]Purchases of external services are composed of "outsourcing expenses" (39%) and "other external expenses" (61%) which include advertising costs, travel costs, transportation costs and external R&D costs. Intangibles assets are composed of "concessions, patents and similar brands" (63% of total intangible assets) and "other intangible assets" (37%), which include firms' communication media (e.g., website). It is estimated that the total advertising costs of French manufacturing firms amounted to €18.2 billion in 2005 (Insee, 2007). This suggests that advertising costs represent approximately 11% of total purchases of external services. Assuming that the effect on purchases of external services is completely driven by advertising costs, the 1.3% rise would correspond to a 12% increase in advertising expenditures.

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

relationships. Third, this paper identifies trade credit supply as an important financial driver of product market outcomes. In this respect, this paper contributes to a series of studies looking at the adverse effects of long payment periods on firm growth (Murfin and Njoroge, 2015; Boissay and Gropp, 2013; Barrot, 2016; Barrot and Nanda, 2016) by providing evidence that large working capital needs with existing customers dampen the ability of firms to expand their customer base.

This paper is also connected to a developing stream of the literature that looks at the role of demand factors in shaping firms' size distribution (Hottman, Redding and Weinstein, 2016; Bernard, Moxnes and Saito, 2019), life-cycle growth (Foster, Haltiwanger and Syverson, 2016; Moreira, 2016; Fitzgerald, Haller and Yedid-Levi, 2016; Atkin, Khandelwal and Osman, 2017; Sedláček and Sterk, 2017; Eslava and Haltiwanger, 2019; Maksimovic, Phillips and Yang, 2019), or stock returns (Gourio and Rudanko, 2014; Dou et al., fortcoming). While these studies document a large role for demand factors, they remain largely silent on why some firms are able to attract more customers than others.[16] Existing research that investigates the determinants of the formation of supplier-customer links has so far relied on randomized experiments connecting suppliers and customers in business meetings (Fafchamps and Quinn, 2016; Cai and Szeidl, 2017) or focused on factors that are largely exogenous to the firm such as tax reform (Gadenne, Nandi and Rathelot, 2019) or transportation systems (Duranton, Morrow and Turner, 2014; Donaldson, 2018; Bernard et al., 2019). Therefore, one important contribution of this paper is to shed light on a firm-level determinant of the investment in the customer base, namely the presence of liquidity constraints.

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

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

2 Institutional and theoretical background

2.1 The reform

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

Acknowledging the limitations of the 2001 law, in 2006, the French government enacted a reform capping contractual payment terms in the trucking sector at thirty days (see Barrot (2016) for further details). The cap on payment terms was then extended to any transaction involving French firms, regardless of the sector in which they operated. This extension was part of a broader package of reforms called the "Law on the Modernization of the Economy" (LME) approved by the French assembly in 2008.[17]

Effective January 1, 2009, the reforms prevented firms from agreeing on contractual payment terms exceeding sixty days after receipt of an invoice (or 45 days following the end of the month).[18] The government ensured that the reform was implemented by introducing considerable sanctions for non-complying firms and by urging the French competition authority to conduct regular audits.[19] Some sectors were exempted from the cap on payment terms, as lawmakers were concerned that the reform might have been impractical or detrimental to economic activity. The complete list of derogations is displayed in Appendix II. Importantly, the reform solely applied to transactions contracted under the French trade code. Hence, the cap on payment terms was not binding for international transactions because exporters could choose to contract under the trade code of the foreign customer or the CISG international trade code.[20]

To illustrate the reform and its implementation, Figure 1 displays the evolution of payment periods between 1999 and 2012 (the datasets and construction of the measures are described in section 3). The introduction of the reform is correlated with a sharp decrease in payment periods for firms operating mainly in the domestic market, from approximately 66 days in 2007 to 63 in 2009.

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

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

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

[20]CISG stands for Convention on Contracts for the International Sale of Goods, also known as the Vienna Convention. See Le Roch and Bricq (2013) for further details (in French)

[Insert Figure 1 here]

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

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

2.2 Trade credit provision and liquidity constraints

Would a cap on payment terms mitigate firms' liquidity constraints? Traditional analysis of trade credit would give the opposite prediction. Given the large cost of trade credit, the corporate finance literature has rationalized the presence of interfirm lending as an optimal response to liquidity frictions affecting customers.[21] The different theories based on this idea predict that trade credit flows from large, creditworthy suppliers to small and financially constrained customers.[22] Consistent with this view, Garcia-Appendini and Montoriol-Garriga (2013) show that liquidity-rich suppliers increased their provision of trade credit to liquidity-poor customers during the 2008 financial crisis.[23]

[Insert Figure 2 here]

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

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

[22] By assumption, in the absence of trade credit, customers would be unable to finance their purchases through bank credit. Suppliers may then fill the void left by banks because of the former's greater ability to screen customers (Smith, 1987; Biais and Gollier, 1997), to prevent fund diversion (Burkart and Ellingsen, 2004; Cunat, 2007) or to liquidate intermediate goods (Long, Malitz and Ravid, 1993). Providing trade credit to customers is optimal from a supplier perspective because it allows for an increase in total sales.

[23] See also Restrepo, Sosa and Strahan (forthcoming) for evidence of increased reliance on accounts payable in the face of an adverse shock to short-term bank financing.

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

of new entrants in the industry.[25] Under this view, capping payment terms might be a way to limit the transfer of liquidity from small suppliers to high bargaining power firms through the provision of trade credit.

The analysis of payment periods suggests that the second view prevails in our case. Figure 2 plots the average payment periods from customers faced by firms in 2007 and 2009. Firms are sorted by sales percentiles in their main sector. The distribution of payment periods shows that small firms are disproportionately exposed to long payment periods, which is difficult to reconcile with the first view of trade credit.[26] Moreover, the figure shows that the reform has not led to a homogeneous reduction in payment periods but instead has mainly benefited the smallest companies. We formally test the effect of the reform on access to liquidity in section 5 by estimating how the cap on payment terms affected firms' cash holdings and credit line drawdowns.

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

3 Data and summary statistics

3.1 Data

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

Customs data. We use a French customs dataset that records all transactions occurring between 2002 and 2012 involving a French exporter and an importing firm located in the European Union. For each

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

[26] There is, however, a "third" view of trade credit that is compatible with high bargaining power firms receiving trade credit that would predict a negative effect of the reform. Giannetti, Serrano-Velarde and Tarantino (2017) argue, for instance, that unlike price discounts, offering trade credit does not reduce the marginal cost of the customer. Granting large payment terms, therefore, might be a way for firms to limit the expansion of high bargaining power customers to preserve profitable trade relationships with low bargaining power firms. A last strand of papers posits that trade credit amounts to a short-term leasing of the product (Long, Malitz and Ravid, 1993; Kim and Shin, 2012). In the presence of uncertainty over the quality of the product, trade credit might be an optimal way to incentivize suppliers to satisfy the requirements of their customers. However, both theories predict that the reform should have negative effects on domestic sales, which is not the case in our setting. See section 5.3 for further details.

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

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

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

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

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

Tax return data. The second dataset comes from tax returns collected by the French fiscal administration. This dataset gives accounting information for the universe of French firms in the private sector (excluding the financial and agricultural sectors) between 2002 and 2012. In addition to balance sheet information, a 5-digit sector code (along the NACE, the EU economic activity nomenclature) is provided.

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

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

We restrict the dataset to firms subject to the standard tax regime (firms with sales less than €789,000 are subject to a simplified tax regime, for which fewer variables are available). As we focus on the effects of the reform on international transactions, we also choose to only include firms in the manufacturing and wholesale sectors. This leaves us with approximately 480,000 firms selling in 363 sectors. To correct for reporting errors, we systematically replace outliers of all variables by missing values.[29]

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

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

$Accounts\ receivable_{f,t}$ gives the amount of sales that customers of firm f still have not paid at time t. The ratio is multiplied by 36.5 so that the unit of the variable is ten days. $Payment\ periods_{f,t}$ reflects the average payment period between firm f and its customers for a given fiscal year t. Symmetrically, we estimate the average time taken for a firm to pay its suppliers by computing the ratio of accounts payable to sales and expressing it in days of sales. We focus on payment periods from suppliers in most of the analysis and take the supplier side into account in robustness checks.[30]

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

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

EAE survey. To precisely identify the different sectors in which firms operate, we rely on an extensive yearly survey conducted by the Ministry of Industry (Enquête Annuelle des Entreprises, "EAE"). The survey is exhaustive for French firms with more than 20 employees or whose sales exceed €5 million and records the amounts of sales realized by each surveyed firm in each 5-digit sector.[31] The total turnover of the firms included in the sample represents more than 95% of the aggregate turnover. The survey includes 71,000 firms in 2007.

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

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

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

DADS. We use the French matched employer-employee administrative dataset (*Déclarations Annuelles des Données Sociales*, DADS) to study the evolution of the number of workers and the number of hours worked. Firms are required by law to report every year detailed information about their workers when filing payroll taxes.[32] The employer must report the type of contract, gross and net wages, the number of hours worked and an occupation code for each worker. The French nomenclature of occupations (*Nomenclatures des professions et catégories socio-professionnelles des emplois salariés des employeurs privés et publics*, PCS-ESE) consists of 414 different occupations, including, for instance, 14 occupations related to marketing (e.g., public relations and communication executives).

3.2 Summary statistics

The baseline sample is restricted to firms present in the intersection of the customs, EAE survey and tax return datasets. Detailed summary statistics and descriptions of the construction of the variables are given in A2. The dataset contains approximately 17,000 firms with non-missing values for the main variables of interest. In total, firms in the dataset account for approximately 80% of total exports to the European Union by manufacturers and wholesalers between 2003 and 2012.

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

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

4 Identification strategy

The objective of the empirical analysis is to study how the decrease in payment periods induced by the reform affected the size and composition of the international customer base. A natural starting point, therefore, would be to run an OLS regression of exports on payment periods. Such a specification,

[32] Note that reporting of the occupation code is required for firms that employed at least 20 employees in a given year and optional for firms below the threshold.

however, would deliver biased estimates in our setting because the reform was enacted in the middle of the global 2008 financial crisis. Figure A1 in the Appendix shows that aggregate exports to the European Union decreased by 28% between 2007 and 2009. At the firm level, the average yearly growth rate of exports was equal to -13% during the same period. Since the reduction in payment periods coincided with the collapse of exports, the within-firm correlation between the two variables is likely to be positive.

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

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

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

The ability of firms to acquire new customers and the payment periods that they face with their existing customers, however, may be jointly driven by unobservable characteristics. Firms with high bargaining power, for instance, should face short payment periods and are likely to have a superior ability to negotiate new trade contracts. Hence, the exposure to the reform as measured by distance to the 60-day threshold is likely to be endogenous. We address this concern by exploiting the sectoral composition of the customer base. While payment conditions vary across sectors, they tend to be relatively homogeneous within a given product market (Ng, Smith and Smith, 1999). First, most trade credit determinants emphasized in the literature are homogeneous at the sector level.[33] Second, as firms compete on the provision of trade credit (Singh, 2017; Demir and Javorcik, 2018), payment terms tend to be comparable within sectors. Therefore, a firm whose customers are mostly present in sectors with long pre-reform average payment periods should be highly exposed to the reform.

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

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

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

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

using the EAE survey) and

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

is the average distance to the threshold in sector s taken from the universe $\Omega_{s,07}$ of firms making less than 10% of their sales abroad and operating primarily in sector s.[34] This variable captures the *ex ante* exposure to the reform based on the 2007 distance to the 60-day threshold in the sectors of firm f's customers.

In addition to addressing the problem of unobserved firm-level heterogeneity, this instrumentation strategy has the advantage of limiting potential measurement error bias caused by the use of an imperfect proxy for payment periods (see subsection 3.1). In particular, by computing the average value of $\textit{Payment periods}_f$ on the population of firms making less than 10% of their turnover abroad, we ensure that the exogenous variation induced by the reform is based on factors originating mostly from the domestic market.[35] This removes any potential mechanical link between the evolution of the rate of payment collection and export activity. The construction of the instrument, moreover, intentionally ignores the derogations introduced by the law (see section 2.1). Indeed, these exceptions might have been implemented because of some unobservable factors that could be related to export performance. Introducing the derogation in the computation of $\overline{\textit{Distance to 60-day rule}}_{f,07}$ would in that case compromise the validity of the instrument.[36]

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

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

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

$$\begin{aligned} Y_{f,m,t} &= \alpha_f + \gamma_{m,t} + \beta_1 \cdot \Delta \textit{Payment periods}_{f,t} + \beta_X \cdot X_{f,t} + \epsilon_{f,m,t} \\ \Delta \textit{Payment periods}_{f,t} &= \delta_f + \eta_{m,t} + \theta_1 \cdot \overline{\textit{Distance to 60-day rule}}_{f,t} + \theta_2 \cdot X_{f,t} + \nu_{f,m,t} \end{aligned} \tag{2}$$

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

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

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

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

enhancing their propensity to export ($\beta_1 < 0$).

As discussed in Borusyak, Hull and Jaravel (2018), two conditions are required for the shift-share variable to be considered a valid exogenous factor. First, sectoral averages need to be uncorrelated with individual unobserved characteristics. This will not be the case if, for instance, some firms are large enough to influence sectoral payment conditions. However, this concern is mitigated by the fact that we take a simple average of payment periods within a sector and that we retain only sectors in which we observe at least ten firms (a sector contains on average 1003 firms).[37]

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

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

The second threat to identification is that the exposure to the law may capture differential trends in export dynamics unrelated to the enactment of the reform. We directly test for the presence of differential trends using covariate balance tests in subsection 6.1. Moreover, throughout the analysis, we control for several observable variables that could affect the ability of firms to acquire new international customers. Because of its "shift-share" design, the instrument may inappropriately capture sectoral variations that are unrelated to payment periods but that affect export activity. For instance, the instrumental variable (IV) may correlate with the dynamism of the different downstream sectors in which the firm operates. We introduce in the specification the average growth rate of sectoral sales ($\overline{Sales\ growth\ rate}_{f,t}$) weighted by the firm-level sectoral shares of sales. This variable, therefore, controls for the time-varying economic conditions that firm f experiences in the different sectors in which it operates. We also account for the role of size and productivity, two important determinants of exports, by including $log(Total\ Assets)_{f,t-1}$

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

and *Labor productivity*$_{f,t-1}$ (defined as the ratio of value added to the number of employees) in the set of control variables. Finally, the presence in some specific downstream sectors may be related to firms' financing choices, which in turn could affect export activity. We control for *Long-term debt/TA*$_{f,t-1}$ (defined as the ratio of debt of more than one year to total assets) to address this potential issue.

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

5 Effects of the reform on access to liquidity

5.1 Payment periods

Figures 3a and 3b provide a graphical representation of the relationship between the instrument and the variation in payment periods.[38] The x-axis in both graphics is constructed as follows:

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

where $Payment\ periods_{s,07}$ is the simple average of payment periods in sector s. $\overline{Payment\ periods}_{f,07}$ is therefore akin to a slightly modified version of the instrument that does not account for the 60-day rule. In Figure 3a, the y-axis represents the evolution of firm-level payment periods between 2007 and 2009. Firms exposed to payment periods from customers shorter than 60 days in 2007 experienced only a small decrease in payment periods after the implementation of the reform. In contrast, there is a large and significant negative correlation between $\overline{Payment\ periods}_{f,07}$ and $\Delta Payment\ periods_{f,07\text{-}09}$ when average pre-reform payment periods exceed 60 days. This indicates that our estimation method correctly detects the effects of the 60-day rule on the variation in payment periods. Furthermore, Figure 3b shows that there is no obvious correlation between the instrument and the evolution of payment periods between 2003 and 2005, which suggests that the pattern shown in Figure 3a indeed reflects the effects of the implementation of the reform.

[Insert Figures 3a and 3b here]

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

$$\Delta Payment\ periods_{ft} = \mu_f + \rho_t + \pi_1 \cdot \overline{Distance\ to\ 60\text{-}day\ rule}_{f,t} + \pi_X \cdot X_{f,t} + \xi_{f,t} \tag{3}$$

Note that this step is not formally equivalent to an estimation of the first stage of equation 2 since

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

we abstract here from the set of exporting countries in which firm f operates (the regression here is performed at the firm level and not at the firm-country-year level).

[Insert Table 1 here]

Table 1 displays the results of the different specifications. The coefficient π_1 is negative and significant at the 1% level in all columns. Specifications 1 to 3 indicate that each additional day of distance to the 60-day threshold is associated with a reduction of 0.091 to 0.115 days of customer payment periods per year.

5.2 Capital structure

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

[Insert Table 2 here]

The F-stats reported at the bottom of Table 2 are well above the recommended value of 10 (Stock and Yogo, 2005), which in line with Table 1, suggests that the instrument is not weak. Column 1 confirms that firms that experience a decrease in payment periods benefit from lower working capital needs. The economic magnitude is large, as the coefficient indicates that a three-day reduction in payment periods (one sample standard deviation) lowers working capital needs scaled by total assets by 3.8% relative to the pre-reform mean. Firms more exposed to the reform also exhibit higher cash ratios after the enactment of the law (column 2). Interestingly, the coefficient on the cash ratio is very close in absolute value to the credit line coefficient (column 3) but of the opposite sign. This suggests that the decrease in payment periods raises firms' cash holdings, which enables them to draw less on their credit lines. We find no effect of the reform on long-term debt (column 4), which is consistent with the idea that the decrease in payment periods reduces short-term liquidity needs but leaves long-term financing needs unaffected.[40] Overall, the results in Table 2 support the hypothesis that the reduction of payment periods from customers mitigated liquidity constraints.

Figure 4 illustrates the dynamics of the effects of the reform on cash holdings. We compare cash holdings over time across firms below and above the median of the distance to the 60-day threshold in 2007 by interacting a dummy $1(\textit{Distance to 60-day rule} > \textit{Median})_f$ with time and regressing the share

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

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

of cash holdings in total assets on the interacted variable. The regression includes controls and firm and time fixed effects. The year 2007 is taken as the baseline. We find no evidence of pre-trends in cash holdings. Instead, cash holdings begin to increase for firms exposed to the reform in 2008, continue to grow in 2009, and remain stable thereafter. The pattern is consistent with the idea that the reform was partially anticipated and that the reduction in payment periods permanently increased cash holdings (see section 2.1).

5.3 Domestic sales

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

We explore this hypothesis in this subsection. This scenario implies that (i) an exogenous decrease in payment periods from French customers should result in lower domestic sales and (ii) an exogenous decrease in payment periods to French suppliers should result in higher import shares (defined as the ratio of imports to total purchases). We test this joint hypothesis in Table 3.

[Insert Table 3 here]

The regressions of domestic sales on the variation in payment periods (first part of the hypothesis) yield a positive but not significant coefficient, which suggests that the reform did not have much impact on domestic sales (columns 1 and 2). The second part of the hypothesis states that when facing an exogenous decrease in payment periods to domestic suppliers, firms chose to rely relatively more on foreign firms to source their inputs. This would generate a negative relationship between the import share and the evolution of payment periods to suppliers.[41] We find no evidence of a statistically significant link between the two variables (columns 3 and 4). The F-stats are rather low, however, which suggests that the coefficients may be imprecisely estimated.

Taken together, these findings indicate that the reform did not have a clear, negative impact on sales in the domestic market. This may be explained by the fact that professional organizations representing both

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

suppliers and customers in the same sector of activity were allowed to ask for a three-year derogation of the 60-day rule (see Appendix II for the list of sectors). Firms present in sectors in which the reform could have severely disrupted domestic trade relationships (e.g., sectors with highly seasonal activity such as the toy industry) are likely to have benefited from a derogation, which may have limited the adverse effects of the reform on domestic sales.

6 Building a customer base under liquidity constraints

6.1 Export growth

Table 4 displays the results of the estimation of the effects of the reform on export growth (Panel A) and on exit and entry dummies (Panel B and C).[42] In each panel, the first column reports the estimates of the OLS regression of equation 2 without controls, and the next two columns display the results of the 2SLS specification without and with controls. All regressions include firm and country-year fixed effects.

[Insert Table 4 here]

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

The sign of the coefficient is reversed when we compare export dynamics across firms differentially exposed to the reform using the 2SLS specification. The results in column 2 imply that larger reform-induced decreases in payment periods lead firms to grow more in countries in which they are already exporting (Panel A), to exit countries less often (Panel B), and to expand more rapidly in new countries (Panel C). Importantly, the estimated coefficient hardly changes when we introduce control variables, which suggests a limited role for omitted variables in our estimations. Expressing the economic magnitudes in terms of sample standard deviation, we find that a three-day decrease in payment periods increases the growth rate of exports by 1.5 pp (compared to a pre-reform mean of 3.7%), lowers the propensity to exit a country by 1.2 pp (14.3%) and raises the probability of entry by 0.1 pp (3.9%). In other words, a one-standard-deviation shock brings the median exporter into the top 5% of the most dynamic exporters.

[Insert Figure 5 here]

[42] Note that by construction, the size of the estimation sample changes with the dependent variable (see subsection 3.1).

Figure 5 breaks down the effects of the variation in payment periods on export growth over time.[43] This exercise serves three main purposes. First, it is important to remove any concern that our results may be driven by pre-existing trends in export growth. Second, the positive impact of the variation in payment periods on export growth could be explained by better export performance among firms more exposed to the reform during the crisis. For instance, firms more exposed to the reform may offer products for which demand decreased less during the trade collapse. Examining the relative performance of firms during the financial crisis enables us to test this hypothesis. Third, analyzing the dynamics of the effects after the reform is informative because it allows us to understand how firms react to a permanent shock to cash holdings. As in Figure 4, we compare the evolution of exports over time across firms below and above the median of the distance to the 60-day threshold in 2007 by regressing exports on the dummy $1(Distance\ to\ 60\text{-}day\ rule > Median)_f$ interacted with time. The regression includes controls and country-year and firm fixed effects.

[Insert Table 5 here]

The figure highlights two important findings. First, firms more exposed to the reform did not experience higher export growth before the reform, which rules out the hypothesis of the presence of differential pre-trends. Second, the effects of the reform on exports become clearly positive in 2010-2011 and disappear in 2012. This result indicates in particular that firms more exposed to the reform did not export more in 2008-2009, which clearly shows that our results cannot be explained by better performance during the financial crisis among firms more distant to the 60-day threshold. The presence of a gap between the effects of the reform on cash holdings (Figure 4) and export growth (Figure 5) can either reflect the fact that efforts to raise international sales took time to materialize or that firms did not immediately invest in the expansion of their international customer bases. The breakdown over time of the effects of the reform on proxies of marketing in section 7.2 provides evidence in support of the second hypothesis and suggests that companies waited until the end of the crisis to invest in the acquisition of new international customers.

6.2 Expansion of the customer base

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

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

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

[Insert Table 6 here]

The decomposition of the effects between existing and new customers shows that the increase in export growth cannot be explained by a decrease in production costs. The expansion of the customer base, however, could still be explained by mechanisms other than firms investing in the formation of demand for their products. First, firms could have simply started selling more products, which may have attracted new customers. In the first three columns of Table 6, we test whether firms realize higher international sales by selling more units of their existing products or by expanding their set of products. The estimations indicate that firms do not alter their product mix following the reform but rather sell more of their current products to new customers.[44]

Second, the reform may have allowed firms to expand their production capacity. This would have enabled firms to serve more customers without necessarily lowering infra-marginal production costs, which would be in line with the absence of effects on existing customers. We test this alternative explanation in the last two columns of Table 6 by sorting firms by the ratio of inventoried production over sales. Under the capacity constraints hypothesis, the effects should be concentrated among firms with low amounts of inventoried production because they do not have additional units to sell to potential new customers. Instead, we find the effects of the reform to be only significant for firms with high production reserves.

Third, firms could have started selling higher quality products to new customers. This would have led average sales per customer to rise, as an increase in quality while holding production costs fixed should result in higher trade volumes (Khandelwal, 2010). In columns 1 and 2 of Table 7, we show that neither average sales per customer nor average sales per new customer increase following the reform, which allows us to rule this third and final alternative mechanism.

[Insert Table 7 here]

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

The absence of an effect on average sales, moreover, suggests that firms do not target specific customers when expanding their customer base.[45] The regressions of the share of one-time customers on payment periods in columns 3 and 4 support this hypothesis, as we find that firms do not initiate more short-term trade relationships following the shock. Taken together, these results suggest that new customers are observationally identical to existing customers. The expansion of the customer base, therefore, is associated with a marked reduction in sales concentration across customers (column 5).[46] Using the Herfindahl index of sales across customers in a given country m, we estimate that a one-standard-deviation liquidity shock reduces sales concentration by 2.3% from the pre-reform mean.

6.3 Robustness checks

The identifying assumption underlying our instrumentation strategy is that the exposure to the reform $\overline{\textit{Distance to 60-day rule}_{f,t}}$ affects exports only through its impact on the variation in payment periods. However, it is possible that the exposure to the policy may be related to the composition of the products sold by firms. In that case, our estimations may not capture the heterogeneous treatment of the reform but rather the presence of differentiated demand dynamics across products. To test this hypothesis, we disaggregate our data one step further at the firm-country-product-year level. This allows us to introduce country-product-year fixed effects and account for differentiated demand shocks across products and potential composition effects. Table 8 presents the estimation of the reduced-form equation based on the equation displayed in section 6.1. In the reduced-form specification, the variation in payment periods is not instrumented but directly replaced by $\overline{\textit{Distance to 60-day rule}_{f,t}}$, the ex ante exposure to the reform.[47] The results show that our main conclusion is unchanged, as firms more exposed to the reform still achieve higher export growth by investing more in the acquisition of new customers.[48]

[Insert Table 8 here]

We proceed to several exercises to assess the sensitivity of our results to alternative specifications. For brevity, we relegate the details of the robustness checks to sections III and IV of the Online Appendix and summarize the main tests here. First, we change the specification by considering OLS estimations or by including the derogations in the definition of the instrument. Second, the effects of the variation in payment periods on exports is reassessed using different levels of aggregation (firm, firm-year). Third, we test several alternative methods of constructing the instrument. Fourth, we re-estimate the impact of

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

[46] The acquisition of small customers compared to existing customers, in contrast, is not expected to have a significant impact on the concentration of the customer base.

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

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

the reform on the different components of export growth using the standard growth rate instead of the mid-point growth rate. Fifth, we compute the standard errors using alternative definitions of clusters. Taken together, the tests strongly support the presence of an economically significant effect of the reform on export growth.

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

6.4 Exposure to the reform

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

[Insert Table 9 here]

Table 9 presents the estimations of the effects of the reform on export growth for different sub-samples of firms. Each of the sub-samples is obtained by ranking firms according to the four indicators of financial constraints described above. Columns 1 to 8 show that the coefficients are significant at the 5% level only for small firms and firms with low levels of cash and high levels of debt and that exhibit high idiosyncratic risk. Combined with the results in Table 2, this finding strongly supports the idea that the decrease in payment periods spurs export growth by easing access to short-term financing for liquidity-constrained firms.

[Insert Table 10 here]

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

7 Liquidity constraints and informational frictions

7.1 Do firms attract new customers by lowering prices?

How did firms attract new customers? An interpretation of our results along the lines of Chevalier and Scharfstein (1996) would be that the relaxation of liquidity constraints allowed firms to charge lower prices to invest in the acquisition of new customers.[49] We take this hypothesis to the data by examining how product prices reacted to the variation in payment periods. The mechanism in question predicts that we should observe a positive relationship between the variation in payment periods and the evolution of prices. To test this prediction, exports are aggregated at the level of a product p (defined as an 8-digit item of the Combined Nomenclature)[50], a firm f, a country m and a time t. Our proxy for price $Price_{f,m,p,t}$ is given by the ratio of the volume to the quantity of product sold ("unit value"). We specify our regression as

$$\Delta Price_{f,m,p,t} = \kappa_f + \chi_{m,p} + \psi_t + \zeta_1 \cdot \overline{Distance\ to\ 60\text{-}day\ rule}_{f,t} + \zeta_X \cdot X_{f,t} + \upsilon_{f,m,p,t} \tag{4}$$

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

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

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

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

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

[Insert Table 11 here]

Table 11 presents the results of the estimations. We find no evidence of a statistical link between the variation in payment periods and prices (column 1), suggesting that firms do not rely on price strategies to acquire new customers. The absence of an average effect on prices, however, may actually be concealing heterogeneous patterns among customers. In particular, it is possible that firms raise prices with their new customers but simultaneously lower prices with their existing customer base. We therefore separately examine at the evolution of prices for existing and new customers:

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

with S denoting stable customers and N denoting new customers as in subsection 3.1. Columns 2 and 3 show the results of the regression of prices charged to existing and new customers on the variation in payment periods. We find the coefficient of the variation in payment periods to be non-significant for both variables, which rules out the hypothesis of the presence of differentiated price dynamics across customers.

[Insert Table 12 here]

A high degree of product differentiation may limit the ability of firms to attract new customers through low prices. It is possible, therefore, that prices of homogeneous products reacted more to the variation in payment periods. We separately examine price dynamics for homogeneous and differentiated products following the Rauch (1999) classification and check whether prices react more to the liquidity shock for homogeneous products.[53] We do not find any significant effect of the reform on the prices of either type of product, indicating that firms do not rely on differentiated pricing strategies across products (columns 4 and 5).

7.2 Evidence of investment in marketing

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

[Insert Table 13 here]

In Table 12, we use the firm-level specification presented in section 5 to assess the reaction of the number of workers and hours worked to the decrease in payment periods. Specifically, we examine

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

the number of workers and hours worked for firms' entire workforce, (columns 1 and 4), marketing division (columns 2 and 5), and other divisions (columns 3 and 6). We find that the reform shock did not affect the number of workers or the hours worked in marketing or in other activities. This finding suggests that following the reform, firms did not invest in marketing by recruiting workers but rather outsourced their marketing activities.[54] This absence of effect on total employment contrasts with the findings of Barrot and Nanda (2016), who show that a US federal reform that accelerated payments to small business contractors of the US government had positive employment effects. The fact that our reform was implemented in the middle of the financial crisis likely encouraged firms to turn to external service providers for their marketing activities rather than hiring sales workers.

[Insert Figures 6a and 6b here]

In Table 13, we proxy for investment in marketing by the purchase of external services and the share of intangible assets in total assets. In our data, purchases of external services total consist of outsourcing expenses (39%), advertising costs (11%), travel and transportation costs as well as external R&D costs (50%).[55] We find that a decrease in payment periods by 3 days raises the ratio of purchases of external services over total assets by 1.3% from its pre-reform mean (column 2), which would imply a 12% increase in advertising if the variations in purchases of external services were entirely driven by advertising. Intangible assets are composed of investment in "concessions, patents, and similar brands" (63%) and "other intangible assets" (37%), which include firms' communication media such as websites. Importantly, we do not include goodwill in intangible assets, as it could directly reflect future expected benefits associated with firms' customer base. Similarly, we find that a decrease in payment periods by 3 days raises the ratio of investment in intangible assets over total assets by 3.6% from its pre-reform mean (column 4). Taken together, our results strongly suggest that the relaxation of liquidity constraints lowered the costs of financing the acquisition of new customers through marketing.

The results in subsections 5.2 and 6.1 show that firms did not immediately begin growing more abroad after the enactment of the reform. A potential explanation for the presence of such a gap is that firms did not invest in the expansion of the customer base during the 2008-2009 financial crisis and instead waited for the economic situation to improve. Figures 6a and 6b confirm this hypothesis. The graphs show that firms more exposed to the reform (i.e., a distance to the 60-day threshold greater than the sample median) only started investing relatively more in intangible capital (resp., made more use of external services) in 2010 (resp., 2011). These results underline the importance of matching financing opportunities with growth opportunities in firms' expansion strategies.

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

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

7.3 The role of informational frictions

The fact that firms use marketing and not price-based strategies suggests that the main barrier that liquidity-constrained firms face in acquiring new customers is informational in nature. This implies that liquidity-constrained firms should favor trade relationships for which information asymmetries are likely to be low (see subsection VI of the Appendix for a more detailed discussion). In this subsection, we compare the effects of the relaxation of liquidity constraints across products, customers and markets to understand the interactions of informational and financial frictions in the formation of the customer base.[56]

[Insert Table 14 here]

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

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

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

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

$$\begin{aligned}\Delta Exports_{f,m,p,t} = \dot{\alpha}_{f,m,t} + \dot{\gamma}_p + \dot{\beta}_X \cdot X_{f,t} \; + \; \dot{\beta}_1 \cdot \overline{Distance\ to\ 60\text{-}day\ rule}_{f,t} \\ + \; \dot{\beta}_2 \cdot 1(Differentiated)_p \times \overline{Distance\ to\ 60\text{-}day\ rule}_{f,t} + \dot{\epsilon}_{f,m,t}\end{aligned} \tag{5}$$

This specification differs from equation 2 in two important ways. First, we use the reduced form to flexibly assess how the impact of the reform varies across products.[57] The difference in the sensitivity

[56] For convenience, we return below to the setting of Table 8 and define a product as a 4-digit product code of the harmonized Combined Nomenclature. However, our results are robust to changing the product classification or the unit of aggregation.

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

of exports of differentiated products to the liquidity shock is captured by the $\dot{\beta}_2$ coefficient. Second, we use firm-country-year fixed effects instead of firm fixed effects. This specification is more demanding because the coefficients are identified by the comparison of export dynamics across products, *within firms and countries*.[58]

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

[Insert Table 15 here]

We then compare the effects of the reform across customers. Chaney (2014) shows that trading with a firm in a foreign country (being "connected") subsequently reduces the costs of finding trade partners in the same network. Importers that have already traded with French firms, therefore, should be easier to reach.[59] Every year, we identify new buyers that have never interacted with a French exporter before ("non-connected" firms) [60] and compute the growth rate of exports to connected and non-connected buyers. Table 15 shows that exports to non-connected firms increase more following the enactment of the reform, confirming that informational frictions are the main obstacle firms face in expanding their customer base.

[Insert Table 16 here]

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

Column 1 of Table 16 presents the reduced-form estimation with firm fixed effects. The distance coefficient is equal to 0.005, meaning that on average, ten additional days of distance to the 60-day

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

[59]For instance, connected importers may have adapted their production process to French standards (lower specificity of inputs) or be more aware of the existence of French suppliers (lower search costs).

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

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

8 Conclusion

What are the effects of liquidity constraints on firms' customer acquisition strategy? If firms primarily attract new customers using promotions, liquidity-constrained firms will be priced out of competitive markets and should instead attempt to avoid competition by targeting "niche" markets (e.g., differentiated products, remote geographical areas). In contrast, if the main obstacle that firms face in acquiring new customers is informational in nature (e.g., marketing), liquidity-constrained firms should favor standardized products and easily accessible customers to avoid information asymmetries. The presence of liquidity frictions, therefore, can have dramatically different positive implications for the type of product and the amount of information available to customers depending on which mechanism prevails.

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

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

The second contribution of this paper is to show that liquidity constraints primarily distort firms' customer base by amplifying the role of informational frictions. When examining the effects of the reform on firms' customer acquisition strategy, we find the reduction in payment periods to be associated

with sizable increases in proxies for marketing expenditures. In contrast, we find no evidence that the relaxation of liquidity constraints allowed firms to charge lower prices. Comparing the effects of the liquidity shock across product and customer types, our results indicate that liquidity frictions prevent firms from reaching out to distant customers and from selling products for which quality is more difficult to establish ex ante or more relationship-specific.

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

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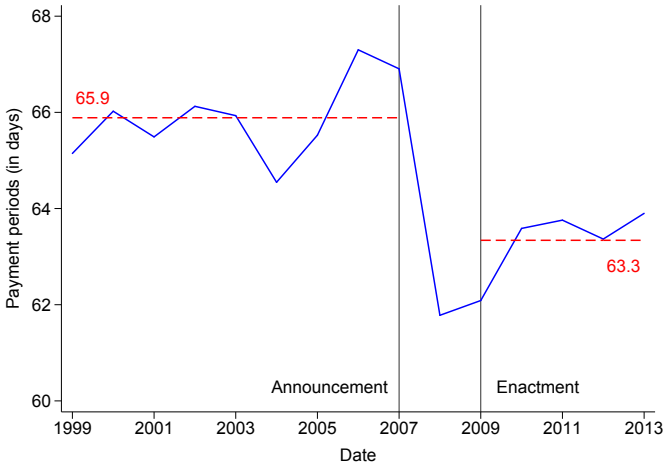
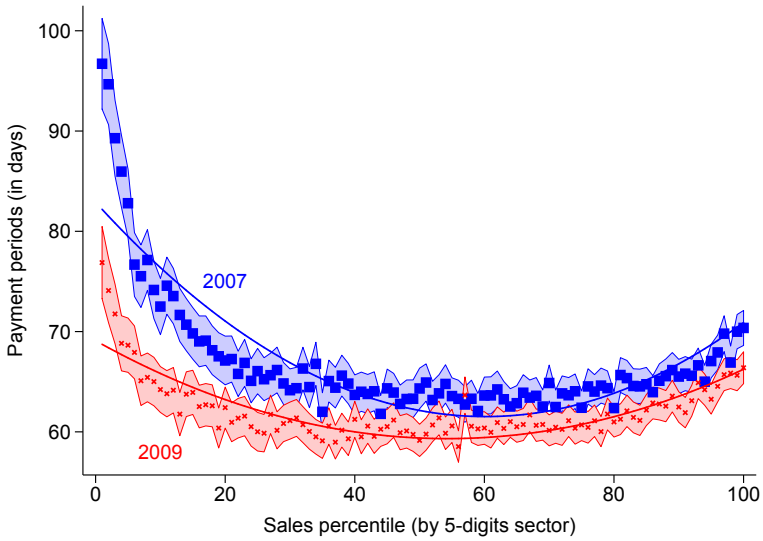
Figures and tables

Figure 1: Payment periods before and after the reform



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

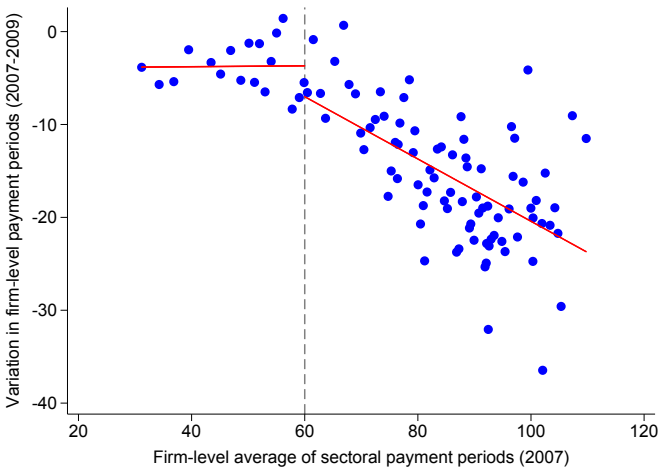
Figure 2: Payment periods by firm size



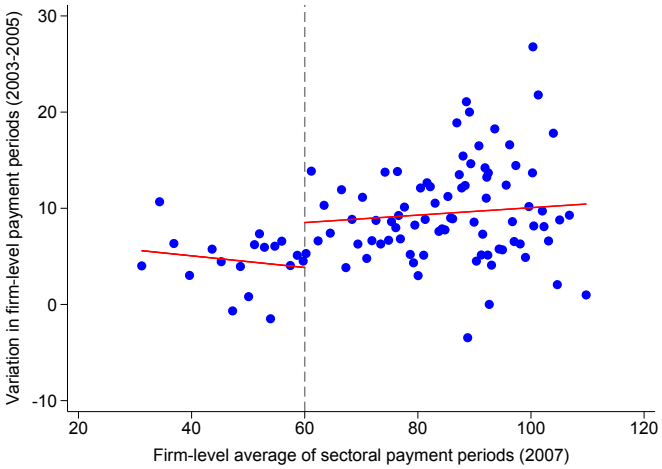
Note: This graph displays average payment periods by firm size in 2007 and 2009 for the universe of non-financial French firms (agricultural and public firms are excluded from the sample). The x-axis gives the percentile of sales computed by sector. A sector is defined as a 5-digit code of the NACE (EU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

Figure 3: Effects of the reform on payment periods

(a) Policy (2007-2009)

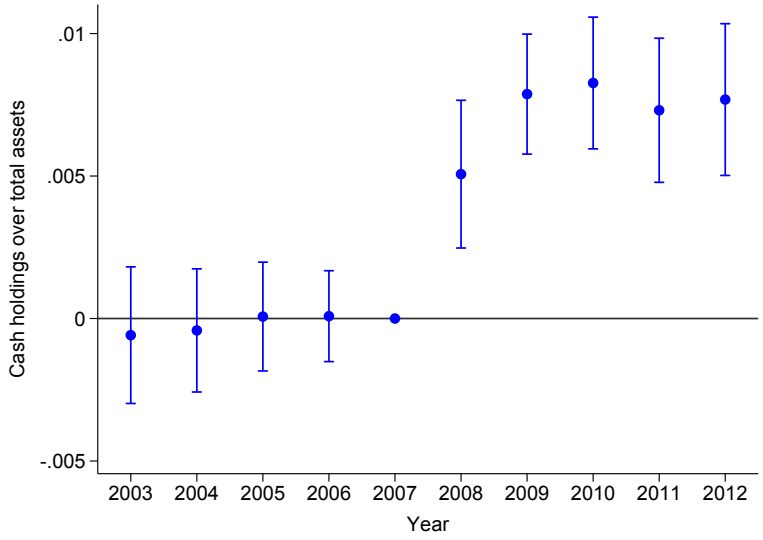


(b) Placebo (2003-2005)



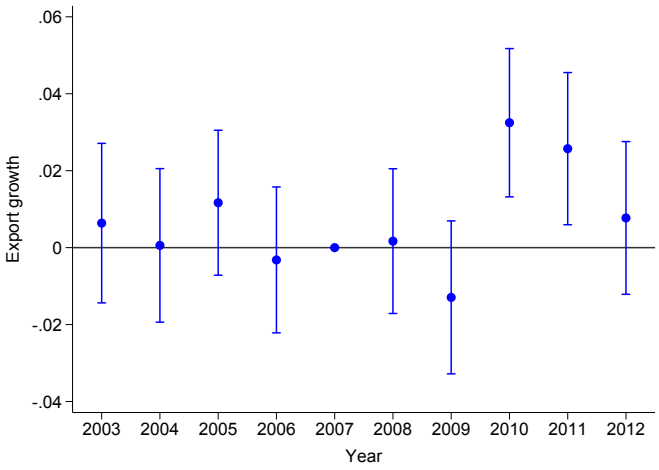
Note: The figures display the evolution of firm-level payment periods between 2007 and 2009 (top figure) and between 2003 and 2005 (bottom figure) as a function of sectoral payment periods faced by firms in 2007. Payment periods are computed as the firm-level ratio of accounts receivable over sales multiplied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

Figure 4: Dynamics of the effects of the reform on cash holdings



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

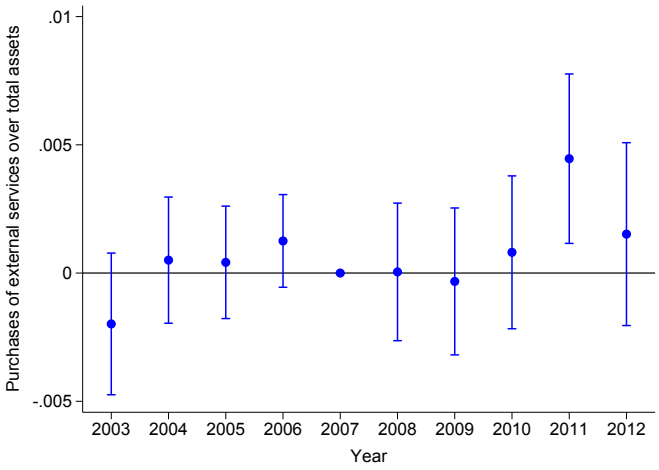
Figure 5: Dynamics of the effects of the reform on export growth



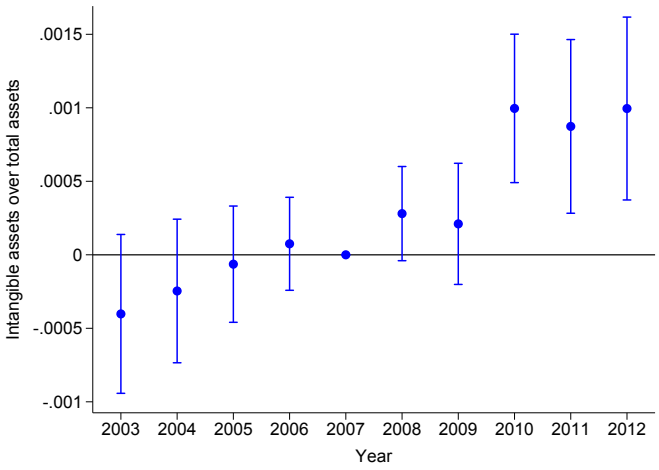
Note: The figure displays the coefficients of the regression of the variation in exports on a dummy $1(Distance\ to\ 60\text{-}day\ rule > Median)_f$ interacted with time. The dummy is equal to one when the variable $\overline{Distance\ to\ 60\text{-}day\ rule}_f$ is higher than the sample median. The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

Figure 6: Dynamics of the effects on marketing

(a) Purchases of external services over total assets



(b) Intangible assets over total assets



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

Table 1: Effects of the reform on payment periods

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

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

Table 2: Payment periods and capital structure

Dependent variables (scaled by *Total assets*$_{f,t}$):	*Working capital*$_{f,t}$	*Cash*$_{f,t}$	*Credit line*$_{f,t}$	*Long-term credit*$_{f,t}$
	(1)	(2)	(3)	(4)
Δ*Payment periods*$_{f,t}$	0.022***	−0.014***	0.014***	−0.005
	(0.006)	(0.004)	(0.003)	(0.004)
Observations	96,709	96,709	96,709	96,709
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
F-stat	66.7	66.7	66.7	66.7

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

Table 3: Effects of the reform on domestic sales and sourcing strategies

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

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

Table 4: Payment periods and exports

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

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

Table 5: Effects of payment periods on the formation of a customer base.

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

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

Table 6: Alternative mechanisms: product mix and capacity constraints

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

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

Table 7: Sales per customer, trade duration, and concentration of the customer base

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

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

Table 8: Effects of payment periods on product-level exports

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

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

Table 9: Heterogeneity I - Intensity of liquidity constraints

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

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

Table 10: Heterogeneity II - Exposure to the reform

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

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

Table 11: Payment periods and product prices

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

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

Table 12: Effects of the reform on marketing and non-marketing workers

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

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

Table 13: Effects of the reform on marketing expenditures

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

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

Table 14: Heterogeneity III - Informational frictions

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

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

Table 15: Connected and non-connected customers

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

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

Table 16: Heterogeneity IV - ex ante market penetration

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

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

Additional tables and figures for Online Appendix

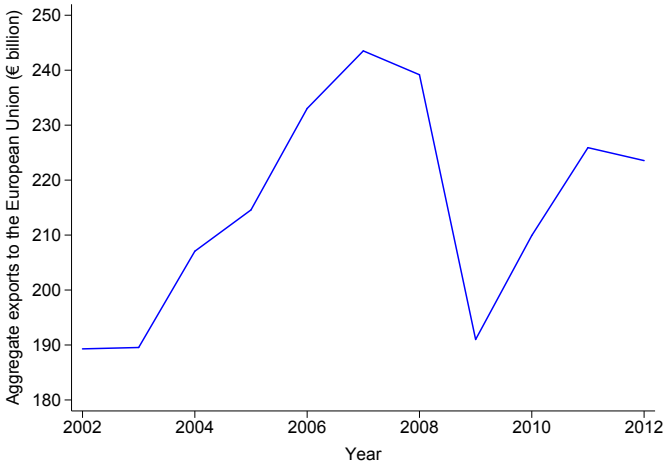
I Descriptive statistics

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

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

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

Figure A1: Aggregate exports to the European Union



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

Table A2: Description of the dataset

Panel A: Definitions of the variables	
Export variables	
$1(Differentiated)_{f,m,p,t}$	For this variable, a product p is defined as a 4-digit code of the harmonized Combined Nomenclature (CN) product classification. We attribute to each 8-digit product a number (0: homogeneous, 1: reference priced, 2: differentiated) in line with its position in the Rauch (1999) classification. For each firm-country-product-year observation, the Rauch code is computed as the average of the Rauch code weighted by exports. Observations are ranked as "Homogeneous" (resp. "Differentiated") if the average Rauch code is below (resp. above) the median. *Source: Customs.*
% *of one time customers*$_{f,m,t}$	Fraction of total sales of firm f at time t realized with customers with which firm f only trades at time t *Source: Customs.*
Δ*Customer base*$_{f,m,t}$	Exports of firm f realized in country m with new customers at time t minus the amount of exports of firm f realized in country m with customers lost at time $t-1$ (scaled by the average of total exports in country m between t and $t-1$). *Source: Customs.*
$\Delta Exports_{f,m,t}$	Variation in the amount of exports (in mid-point growth rate) of firm f in country m between t and $t-1$ conditional on firm f being present in m at t and $t-1$. *Source: Customs.*
$\Delta Exports_{f,m,t}$ (connected customers)	Variation in the amount of exports (in mid-point growth rate) of firm f in country m realized with customers that already had traded with a French exporter before. The variable is only defined if firm f is present in country $m$at both t and $t-1$. The variable is not defined for the year 2003. *Source: Customs.*
$\Delta Exports_{f,m,t}$ (non-connected customers)	Variation in the amount of exports (in mid-point growth rate) of firm f in country m realized with customers that had never traded with a French exporter before. The variable is only defined if firm f is present in country $m$at both t and $t-1$. The variable is not defined for the year 2003. *Source: Customs.*
$\Delta Price_{f,m,p,t}$	Variation in prices of product p in country m charged by firm f between time t and time $t-1$. Prices are proxied by unit values, that is by the ratio of the volume of sales to the quantity of product sold. A product is defined as a 8-digit code of the Combined Nomenclature. *Source: Customs.*
Δ*Product base*$_{f,m,p,t}$	Exports of firm f in country m at time t of new products minus the amount of exports of firm f in country m at time t of discarded products (scaled by the average of total exports in country m between t and $t-1$). A product is defined as a 8-digit code of the Combined Nomenclature. *Source: Customs.*
Δ*Stable customers*$_{f,m,t}$	Variation in the amount of exports of firm f realized in country m with customers with which firm f trades at both t and $t-1$ (scaled by the average of total exports in country m between t and $t-1$). *Source: Customs.*
Δ*Stable products*$_{f,m,t}$	Variation in the amount of exports of firm f realized in country m of products that firm f sells at both t and $t-1$ (scaled by the average of total exports in country m between t and $t-1$). A product is defined as a 8-digit code of the Combined Nomenclature. *Source: Customs.*
$Entry_{f,m,t}$	Probability of firm f entering country m at time t conditional on firm f being not present in m at time $t-1$. *Source: Customs.*
$Exit_{f,m,t}$	Probability of firm f exiting country m at time t conditional on firm f being present in m at time $t-1$. *Source: Customs.*
$log(Exports/customer)_{f,m,t}$	Average sales per customer *Source: Customs.*
$log(Herfindahl)_{f,m,t}$	Logarithm of the Herfindahl index of sales across customers of firm f in country m at time t. The Herfindahl index is computed by squaring the share of sales realized with each customer (expressed in percentage) and then summing the resulting numbers. *Source: Customs.*

Panel A: Definitions of the variables (continued)	
Lost customers$_{f,m,t}$	Exports of firm f realized in country m with customers lost at time $t-1$ (scaled by the average of total exports in country m between t and $t-1$). *Source: Customs.*
Market share$_{f,m,07}$	Sales of firm f in country m in 2007. *Source: Customs.*
New customers$_{f,m,t}$	Exports of firm f realized in country m with new customers at time t (scaled by the average of total exports in country m between t and $t-1$). *Source: Customs.*
Stickiness$_{p}$	Gives the value of the "relationship stickiness" index associated with product p (Martin, Mejean and Parenti, 2018). A higher value of the index signals longer durations of trade relationships for a given product and reflects higher informational frictions (see section V). *Source: Customs*
Firm variables	
Δ*Payment periods*$_{f,t}$	Variation in payment periods from customers. Payment periods from customers are defined as the ratio of accounts receivable over sales multiplied by 365. *Source: Tax returns.*
Δ*Payment periods (suppliers)*$_{f,t}$	Variation in payment periods to suppliers. Payment periods to suppliers are defined as the ratio of accounts payable over sales multiplied by 365. *Source: Tax returns.*
Δ*Domestic turnover*$_{f,t}$	Variation in domestic sales in mid-point growth rate. *Source: Tax returns.*
Δ*Hours*$_{f,m,t}$	Variation in the number of hours worked (in mid-point growth rate) by workers employed by firm f between time t and time $t-1$. *Source: DADS.*
Δ*Net payment periods*$_{f,t}$	Variation in net payment periods (see section IV). *Source: Tax returns.*
Δ*Number workers*$_{f,m,t}$	Variation in the number of workers (in mid-point growth rate) employed by firm f between time t and time $t-1$. *Source: DADS.*
Age$_{f,t}$	Age of the firm. *Source: Tax returns.*
Cash/TA$_{f,t}$	Ratio of cash holdings to total assets. *Source: Tax returns.*
Credit lines/TA$_{f,t}$	Ratio of drawn credit lines to total assets. *Source: Tax returns.*
Import share$_{f,t}$	Ratio of total imports to total purchases. *Source: Tax returns.*
Intangible assets/TA$_{f,t}$	Ratio of the sum of "concessions, patents and similar brands" and "other intangible assets" to total assets. *Source: Tax returns.*
Inventoried production/Sales$_{f,t}$	Difference between stocked production and the variation in merchandise stocks. *Source: Tax returns.*
Labor productivity$_{f,t-1}$	Value-added over the number of employees (lagged value). *Source: Tax returns.*
log(Total Assets)$_{f,t-1}$	Logarithm of total assets (lagged value, thousands of euros).*Source: Tax returns.*
log(Turnover)$_{f,t}$	Logarithm of turnover (thousands of euros). *Source: Tax returns.*
Long-term debt/TA$_{f,t-1}$	Ratio of long-term debt to total assets (lagged value). *Source: Tax returns.*
Purchases of external services/TA$_{f,t}$	Ratio of the sum of outsourcing expenses and other external expenses to total assets. *Source: Tax returns.*
$\overline{\textit{Sales growth rate}}_{f,t}$	Sales-weighted average of sectoral sales growth rates between $t-1$ and t. *Source: EAE, Tax returns.*
Working capital/TA$_{f,t}$	Ratio of the sum of inventories, accounts receivable net of accounts payable and other operating receivable to total assets. *Source: Tax returns.*
Instruments	
$\overline{\textit{Distance to 60-day rule}}_{f,t}$	Sales-weighted average of the 2007 sectoral distance of payment periods from customers to the 60-day threshold multiplied by a dummy equal to one after 2007 (see section 4). *Source: EAE, Tax returns.*
$\overline{\textit{Distance to 60-day rule (supplier)}}_{f,t}$	Sales-weighted average of the 2007 sectoral distance of payment periods to suppliers to the 60-day threshold multiplied by a dummy equal to one after 2007 (see section 4). *Source: EAE, Tax returns.*
$\overline{\textit{Net payment periods}}_{f,t}$	Sales-weighted average of 2007 sectoral net payment periods (see section IV). *Source: EAE, Tax returns.*

Panel B: Summary Statistics

	# Obs.	Mean	Std. Dev.	Percentiles 5th	25th	50th	75th	95th
Export variables								
1(Differentiated)$_{f,m,p,t}$	4,170,772	1.55	0.73	0.00	1.00	2.00	2.00	2.00
% of one time customers$_{f,m,t}$	807,650	0.09	0.23	0.00	0.00	0.00	0.03	0.77
Δ*Customer base*$_{f,m,t}$	807,650	0.02	0.52	-0.85	-0.02	0.00	0.03	0.96
Δ*Exports*$_{f,m,t}$	807,650	-0.01	0.81	-1.51	-0.44	0.00	0.42	1.48
Δ*Exports*$_{f,m,t}$ (connected)	268,639	-0.34	1.76	-2.00	-2.00	-1.20	2.00	2.00
Δ*Exports*$_{f,m,t}$ (non-connected)	728,844	0.08	0.93	-1.57	-0.43	0.03	0.54	2.00
Δ*Price*$_{f,m,p,t}$	3,758,105	0.63	10.86	-0.64	-0.16	0.01	0.22	1.81
Δ*Product base*$_{f,m,p,t}$	807,650	-0.00	0.46	-0.72	-0.01	0.00	0.01	0.71
Δ*Stable customers*$_{f,m,t}$	807,650	-0.02	0.62	-1.16	-0.30	0.00	0.26	1.06
Δ*Stable products*$_{f,m,t}$	807,650	-0.01	0.65	-1.19	-0.32	0.00	0.30	1.15
Entry$_{f,m,t}$	2,817,999	0.05	0.22	0.00	0.00	0.00	0.00	1.00
Exit$_{f,m,t}$	939,299	0.14	0.35	0.00	0.00	0.00	0.00	1.00
log(Exports/customer)$_{f,m,t}$	807,650	10.25	2.16	6.78	8.79	10.23	11.68	13.86
log(Herfindahl)$_{f,m,t}$	807,650	8.70	0.68	7.33	8.42	9.00	9.21	9.21
Lost customers$_{f,m,t}$	807,650	0.18	0.39	0.00	0.00	0.00	0.14	1.13
New customers$_{f,m,t}$	807,650	0.20	0.41	0.00	0.00	0.00	0.16	1.22
Stickiness$_{p}$	4,146,657	0.04	0.28	-0.43	-0.15	0.08	0.25	0.41
Firm variables								
Δ*Payment periods (suppliers)*$_{f,t}$	96,758	0.17	3.01	-4.18	-1.17	0.07	1.37	4.77
Δ*Payment periods*$_{f,t}$	96,758	0.10	2.53	-3.64	-0.94	0.06	1.07	3.84
Δ*Domestic turnover*$_{f,t}$	96,758	-0.00	0.29	-0.42	-0.09	0.02	0.11	0.35
Δ*Hours*$_{f,m,t}$	87,336	-0.01	0.17	-0.23	-0.06	-0.00	0.05	0.20
Δ*Net payment periods*$_{f,t}$	96,758	-0.03	2.43	-3.64	-1.07	-0.01	1.02	3.55
Δ*Number workers*$_{f,m,t}$	87,336	-0.01	0.17	-0.22	-0.06	0.00	0.05	0.20
Age$_{f,t}$	96,758	24.74	18.37	3.00	12.00	21.00	34.00	54.00
Cash/TA$_{f,t}$	96,758	0.08	0.11	0.00	0.01	0.04	0.11	0.30
Credit lines/TA$_{f,t}$	96,758	0.02	0.06	0.00	0.00	0.00	0.01	0.15
Import share$_{f,t}$	96,758	0.26	0.25	0.00	0.05	0.20	0.42	0.76
Intangible assets/TA$_{f,t}$	87,336	0.02	0.03	0.00	0.00	0.01	0.02	0.07
Inventoried production/Sales$_{f,t}$	87,336	0.00	0.04	-0.05	-0.01	0.00	0.01	0.06
Labor productivity$_{f,t-1}$	96,758	0.07	0.05	0.03	0.04	0.06	0.08	0.15
log(Total Assets)$_{f,t-1}$	96,758	9.55	1.27	7.78	8.63	9.37	10.33	11.95
log(Turnover)$_{f,t-1}$	96,758	9.76	1.22	8.04	8.89	9.62	10.51	12.03
Long-term debt/TA$_{f,t-1}$	96,758	0.04	0.06	0.00	0.00	0.01	0.05	0.16
Purchases of external services/TA$_{f,t}$	87,336	0.23	0.14	0.07	0.13	0.20	0.30	0.51
Sales growth rate$_{f,t}$	96,758	0.01	0.13	-0.22	-0.03	0.03	0.07	0.17
Working capital/TA$_{f,t}$	96,758	0.20	0.18	-0.06	0.08	0.18	0.30	0.51
Instruments								
Distance to 60-day rule$_{f,t}$	96,758	2.14	1.93	0.00	0.00	2.33	3.82	4.95
Distance to 60-day rule (supplier)$_{f,t}$	96,758	9.86	11.36	0.00	0.00	7.35	15.91	31.56
Net payment periods$_{f,t}$	96,758	0.83	1.78	-1.50	0.00	0.00	1.83	4.22

Table A3: Export values and number of destinations served

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

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

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

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

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

Table A5: Duration of trade relationships

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

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

II Derogations

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

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

III Robustness checks

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

[Insert Table A6 here]

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

[Insert Table A7 here]

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

Accordingly, we reduce the dimension of our data in two steps. First, we sum all the exports at the firm-year level and estimate our baseline specification without the country dimension and with $Y = \Delta Exports$ (columns 1 and 2). We can see that the negative and significant relationship between the variation in payment periods and export growth is still present even when abstracting from country level-variations. In a second stage (columns 3 and 4), we remove the time dimension of the dataset by computing the growth rate of firm total exports between 2006 and 2009. $\Delta Payment\ periods$ is defined in this context as the long difference of payment periods between 2006 and 2009. It is instrumented by $\overline{Distance\ to\ 60\text{-}day\ rule}_{f,07}$. Once again, the causal relationship that we uncover resists to the change in the unit of observation and stays significant at the 5% whether we include controls or not.

[Insert Table A8 here]

Another potential concern with our empirical strategy relates the weights used to compute the instrumental variable. We use firms' past sectoral sales as weights to compute the firm-level average distance to the 60-day threshold. We argue that the weights are likely to depend primarily on technological constraints and on the sectoral specialization of the firm. It may be possible, however, that the portfolio of sectors of a firm may be related to its capacity of acquiring customers. The statistical link between the exposure to the reform and the export behavior would as a consequence reflect the presence of these confounding factors. Since those factors are likely to vary little over time, we should under this hypothesis find evidence of a statistical link between the exposure to the reform and the variation in exports even before the implementation of the reform. Subsection 6.1 shows that we don't.

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

[Insert Table A9 here]

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

[Insert Table A10 here]

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

Table A6: Alternative specifications

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

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

Table A7: Alternative units of aggregation

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

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

Table A8: Alternative measures of exposure to the reform

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

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

Table A9: Alternative computations of standard errors

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

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

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

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

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

IV Accounting for both demand and supply of trade credit

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

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

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

[Insert Figure A3 here]

This idea is illustrated by Figure A3. In the industrial mechanical engineering sector, payment periods from customers (PPC) far exceeded payment periods to suppliers (PPS) before the reform with net payment periods of 54 days in 2007. As PPC were much more distant to the 60-day threshold, they decreased more than PPS. This resulted in net payment periods of 42 days in 2009. Conversely, PPS were higher than PPC for wholesalers of non-specialized food in 2007, leading to net payment periods of minus 12 days. Net payment periods in this case increased after the reform, reaching minus 2 days. This mechanism implies that previous imbalances between PPC and PPS are predictive of the sign and the magnitude of the subsequent change in net payment periods. We formalize this idea by instrumenting $\Delta Net\ payment\ periods_{f,t}$ by

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

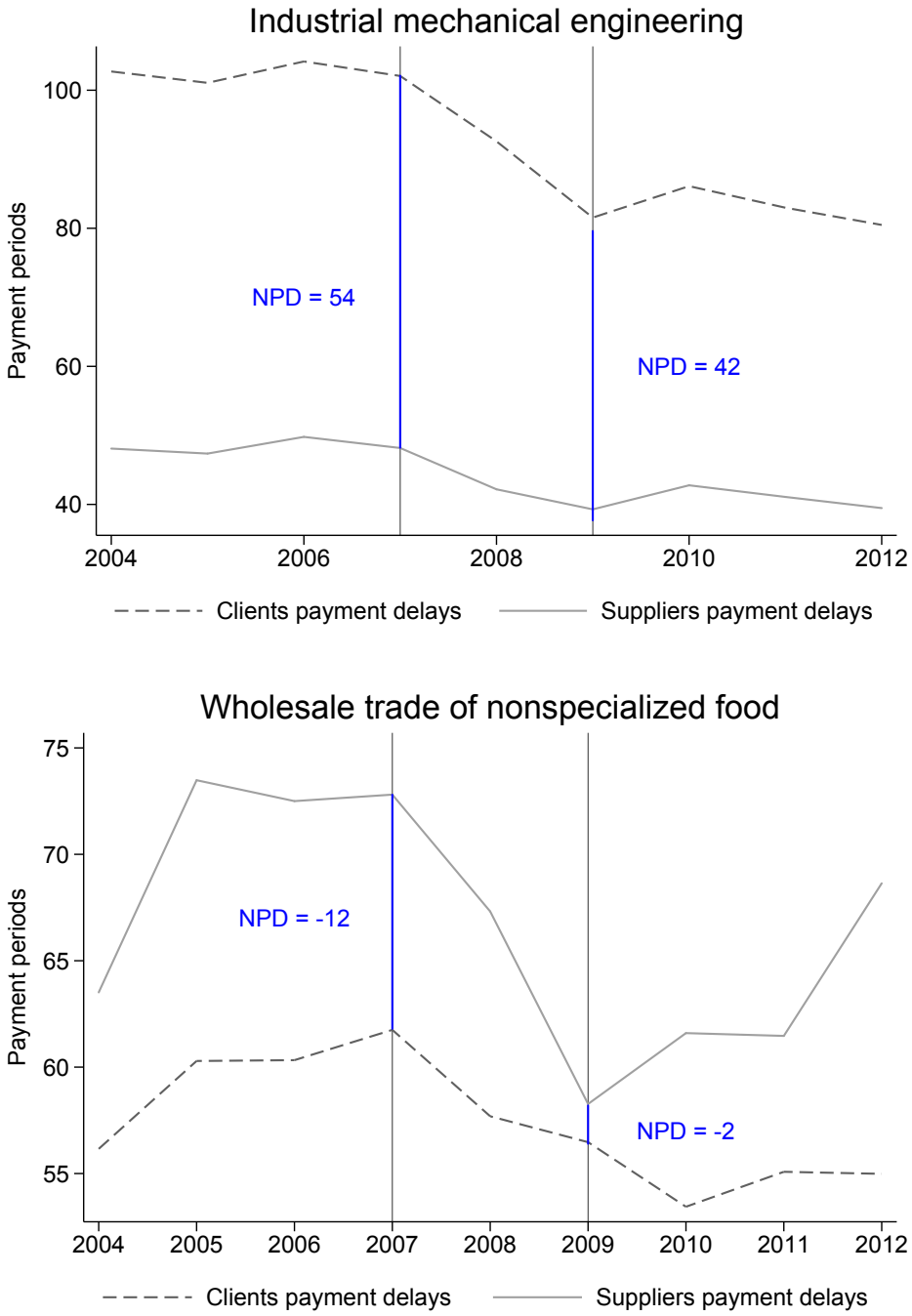
where $\overline{Net\ payment\ periods}_{s,07}$ denotes the average value of net payment periods in sector s in 2007.

[Insert Tables A11 and A12 here]

Tables A11 and A12 reproduce the results of the previous section using this alternative measure of payment periods. We can see that each additional day of imbalance between supplier and customer periods is associated with a subsequent decrease in 0.01 day, meaning that the adjustment was much less

pronounced in net terms than for customer payment periods. We find that as with $\Delta Payment\ periods_{f,t}$, a decrease in net payment periods leads to higher growth of exports and a higher probability of entry. The effect on the probability of exiting a country is not significantly different from zero. Strikingly, the magnitudes of the effects are much larger. This is in line with the intuition that a decrease in payment periods from customers *compared to payment periods to suppliers* is more important for the firm than the sole decrease in payment periods from customers.

Figure A3: Effects of the reform on net payment periods



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

Table A11: Net payment periods and exports

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

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

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

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

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

V Relationship stickiness

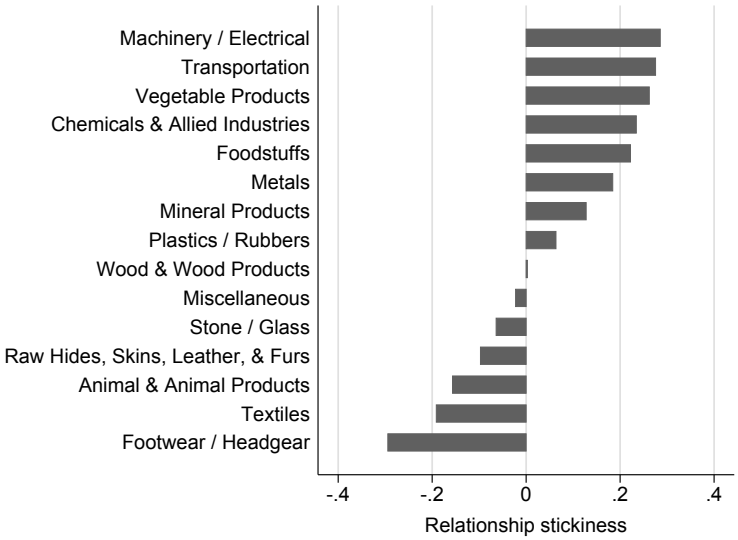
The index of relationship stickiness developed by Martin, Mejean and Parenti (2018) is based on the average length of trade relationships for a given product. In practice, the duration of a trade relationship is measured as the time (in months) between the first transaction of a given product between a seller and customer and the first time the same customer imports the same product from a different French exporter.[61] Interpreting the length of trade relationships at the individual level is however not straightforward as a long spell can either be reflective of high switching costs or a good match quality between the buyer and the seller. Martin, Mejean and Parenti (2018) use the average export volume over the length of the transaction ($Size_{b,s,p}$ for a buyer b, a seller s and a product p) as an indicator of the quality of the match. More precisely, denoting d a decile of $Size_{b,s,p}$ for a given product and a given importing country c, we compute the average trade duration $Duration_{c,p,d}$ in size-bin d and estimate[62]

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

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

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

Figure A4: Relationship stickiness by product category



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

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

VI A stylized model of investment in customer capital

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

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

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

The temporal structure of marketing expenditures (governed by the parameter γ) is determined by the intensity of informational frictions. When it is costly to identify customers (high search costs) or to switch suppliers (high input specificity), customer acquisition is likely to be more important for the firm (high γ). Conversely, firms operating in fluid product markets are likely to devote relatively more effort to maintain their existing customer base (low γ).[63]

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

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

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

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

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

Equation 8 states that all other things equal, a firm is more likely to be liquidity-constrained when the

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

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

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

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

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

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