Time is Money:
Cash-Flow Risk and Product Market Behavior

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Very preliminary - Comments are welcome.

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Abstract

Long payment delays raise cash-flow risk; in the presence of financial constraints and if firms partially hedge, payment delays should affect firms' real decisions. Introducing cash-flow risk management in a dynamic contracting environment, we investigate the role of payment delays in the decision to enter or to exit product markets. Our model predicts that an increase in payment delays in the markets in which the firm is already operating lowers the probability to enter a new market when cash holdings are low. We exploit a large scale variation in (domestic) payment delays triggered by a French reform enacted in 2009 to investigate how exporters adjusted their export market portfolio in response to changes in cash-flow risk. The empirical framework relies on the disaggregated nature of export data to introduce market fixed-effects at a refined level so as to control for aggregate shocks. Moreover, we exploit the ex ante heterogeneity in sectoral exposure to the reform as an instrument to the variation in payment delays. The estimations strongly support our empirical predictions: a 100% increase in payment delays (approximately the interquartile gap) raises the probability to exit an export market by 5.2% and lowers the probability of entry by -9.8% relative to their unconditional values. These effects are robust to a range of alternative specifications; estimations on sub-samples suggest that the source of identification comes from small firms operating in sectors relying on external finance.

"Remember that Time is Money. [...] Money, more or less, is always welcome; and your Creditor had rather be at the Trouble of receiving Ten Pounds voluntarily brought him, tho' at ten different Times or Payments, than be oblig'd to go ten Times to demand it before he can receive it in a Lump."
Benjamin Franklin, "Advice to a Young Tradesman" (1748).

In the light of the recent evolutions of the factoring industry, Benjamin Franklin's advice (see above) seems more relevant than ever: according to the World Factoring Yearbook (2014), the global factoring volume (*i.e.*, the volume of account receivables sold in exchange of an immediate cash payments) increased by 72% between 2007 and 2013 to reach 2 230 billions euros (around 3% of global 2013 GDP). In France in which our empirical investigation takes place, the volume of credits taken over by factoring firms rose by more than

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300% between 2004 and 2014 (ASF, 2014). Strikingly, while firms seem to attach growing importance on hedging this liquidity risk, empirical evidence on the real effects of payment delays is limited. Yet, if firms do not fully hedge and if the supply of external finance is not perfectly elastic, payment delays should affect firms' decisions (Froot, Scharfstein and Stein, 1993).

Decisions on whether to enter or to exit a market are presumably most likely to be impacted by payment delays. There is indeed pervasive evidence that payment delays vary significantly between sectors: Petersen and Rajan (1997) show for instance on COMPUSTAT data that while large manufacturing firms are paid by their customers within 62 days on average, it takes about 71 days for services companies to have an invoice settled[1]. These variations also hold between countries: according to Atradius (Atradius, 2016), a factoring firm which conducts a yearly survey on payment practices on approximately 3000 companies across Western Europe, average payment delays amount to 32 days in Denmark but reach 82 days in Italy. A firm that contemplates exporting in a new market might thus give up in view of the additional liquidity risk that this transaction generates; to use Hummels and Schaur's (2013) words, payment delays may in this respect make *time act as a trade barrier*.

This article investigates both theoretically and empirically the role of payment delays on firms' export market decisions. On the theoretical side, we consider a dynamic contracting environment based on Philippon and Sannikov (2007) in which the manager of a firm (the agent) must contract with a bank (the principal) to get financed. While the volume of cash-flows is deterministic and publicly known, the timing of payment is random and follows a Poisson process. At every period, the agent has the option to pay an entry cost to enter in a new market, which raises future cash-flows but lengthens the average gap between payments. Since cash-flow payments are assumed to independent, it would be optimal to enter immediately in the absence of information asymmetry (that is, there is no value value of waiting such as in McDonald and Siegel (1986)). We assume however that it is costly for the agent to maintain cash-flow payments at their optimal rate ; in a competitive setting, offering flexible payment terms can indeed be necessary as doing otherwise might be interpreted as a bad signal on the product's quality (Lee and Stowe, 1993).

Dynamic contract techniques developed in DeMarzo and Sannikov (2006) and Biais et al. (2007) show that a simple implementation of the contract makes the exercise of the firm's entry and exit options entirely conditional to the level of cash holdings. If the level of cash holdings reaches an optimally determined threshold, the firm will enter the new market; if it is too low, the contract will terminate. Importantly, in absence of cash-flow payments, cash holdings decrease continuously: hence, the manager of the firm is incentivized to always exert high effort so as to maintain payment occurrences at their optimal level. In particular, since the principal's profit function is endogenously concave, the bank acts as the creditor in Franklin's emphasized quotation and therefore prefers frequent payments of small amounts to large payments in a lump sum.

This framework yields clear-cut empirical predictions on the role of payment delays (*PD*). When average payment delays in the initial market increase, two opposing effects operate: on the one hand, the probability to enter a new market decreases since it is more difficult for the manager to gather enough cash to reach the entry threshold ; on the other hand, the amount of cash that the bank requires to finance the entry cost decreases since exporting becomes less risky in relative terms. When cash holdings are low, the first effect dominates the second; when cash holdings approach the entry threshold, however, our model predicts that an increase in average PD in the initial market actually prompts firms to enter the market as the liquidity risk implications fade out. Concurrently, an increase in average *PD* or a decrease in future profitability in the new market always unequivocally lowers the probability of entry.

To test these predictions, we exploit a large-scale variation in contractual payment delays following the enactment in 2009 of a French reform ("Loi de Modernisation de l'Economie" or LME) aiming at reducing excessive payment delays. This reform extended the 2006 law presented and studied by Barrot (forthcoming) by prohibiting payment contracts between *domestic* firms operating in any sectors to stipulate payment delays

[1] I multiply the average account receivables-over-sales and acount payables-over-sales ratios by 365 to estimate of the clients and suppliers payment delays in days. See section 2.2 for the limits of this measure.

longer than sixty days. Although public authorities considered at the time that the reform was globally successfully applied (ODDP, 2010), a precise examination of the effects of this law is particularly challenging since *(a)* there is no natural control group to which the econometrician might refer and *(b)* the reform was voted in mid-2008 and but took only effect at the beginning in 2009, i.e. precisely during the peak of the global financial crisis.

We tackle these identification issues by building an econometric framework based on three pillars. First, we exploit rich fiscal and survey data sets provided by the French statistical institute (Insee) to estimate payment delays at the firm-level. Our measure is based on the observation made by Ng, Smith and Smith (1999) that since most of trade credit determinants (*e.g.,* intensity of competition, quality uncertainty) hold at the industry-level, payment delays are relatively stable within an sector. Payment delays on the clients side are therefore estimated at the industry-level (defined as a 4-digits SIC equivalent) as the mean of the accounts receivables over sales ratio. We proceed similarly to measure *PD* on the suppliers side, which allows us to quantify payment delays *in net terms, i.e.* to compare how long it takes for a firm to be paid by its clients to the amount of time that is needed for this firm to pay its suppliers. We then use information on the breakdown of firms' sales by sector to define payment delays at the firm-level as the weighted average of sectoral net payment delays (*NPD*). According to this measure, a firm that operates in sectors that exhibit high *NPD* will experience long payment delays irrespectively of the firm's own tax reports. This metric has therefore the advantage to give firm-level information on *NPD* while being presumably uncorrelated to the firm-level unobservable variables (*e.g.*, intensity of firm-level financial constraints).

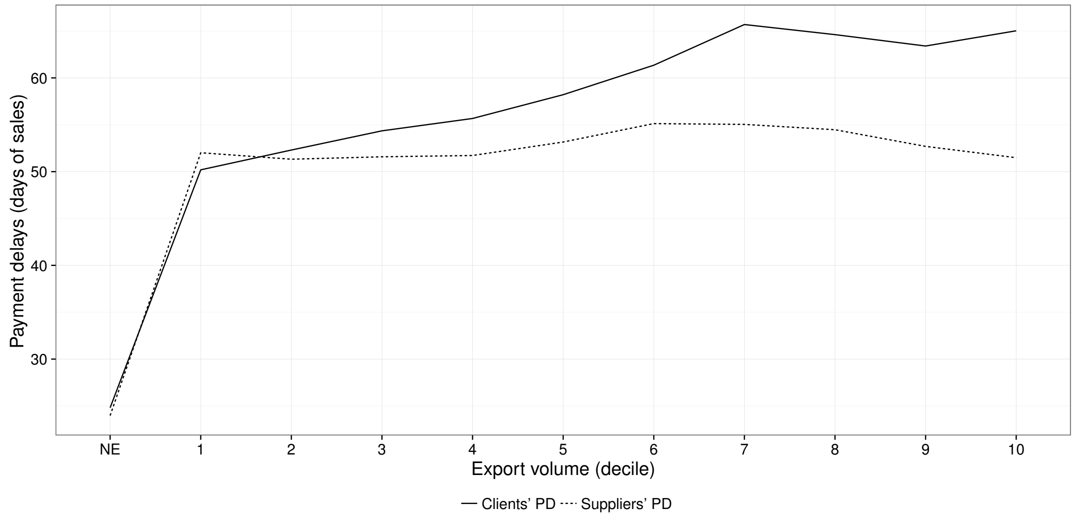
Second, we use the sixty-days-rule defined by the law to estimate the firm's *exposure to the reform prior to its enactment* as the sales-weighted average of the sectoral changes in *NPD* that would be needed for the reform to be perfectly enforced. Broadly speaking, this variable measures the distance in days to the situation in which all payment delays are inferior or equal to sixty days. This distance is then included as an instrument for the actual variation in *NPD*. This instrument strategy has two main advantages: first, it allows to overcome the absence of control group by exploiting the *ex ante* variation in exposure to the reform. Second, it enables to only capture the part of the variation in *NPD* that can be explained by the enactment of the reform and thereby to leave aside the potential effects of confounding aggregate shocks (*e.g.,* the financial crisis).

Third, we rely on the disaggregate nature of export data to introduce a whole set of market fixed effects as in Paravisini et al. (2014). Our estimates are thus based on the comparison between firms differently affected by the reform of export outcomes *in a given industry and a given destination.* This procedure allows first to control for any market-level shock that might have affected exports by shifting the supply (*e.g.,* input shocks) or the demand curve (*e.g.,* real estate crisis). Moreover, the presence of market dummies removes the effects of specialization patterns: if firms that export in markets particularly hit by the crisis are also on average more exposed to the reform, an estimation without fixed effects might lead to inappropriately conclude to a causal effect of the variation in *NPD* on export outcomes.

In line of the empirical predictions, our estimates point to a significant effect of the variation in *NPD* in the French market on the decisions to enter and to exit export markets. A 100% increase in *NPD* (approximately the interquartile gap) thus raises the probability to exit an export market by 5.2% and lowers the probability of entry by -9.8% relative to their unconditional values. We find no evidence of an effect at the intensive margin: according to the *"(S,s)"* nature of our model (Caplin and Leahy, 2010), this suggests that the economic shock generated by the variation in *NPD* was strong enough for firms to prefer leaving an exit market as a whole than adjusting the volume of their exports. This absence of effect at the intensive margin is also a strong argument to demonstrate that our specification is successful in its attempt to disentangle the effects of the reform from the impact of the crisis: since Bricongne et al. (2012) find that the effects of the crisis were four times larger in magnitude at the intensive than at the extensive margin, our estimations should have pointed to a strong effect at the intensive margin had the variation in *NPD* only been a noisy measure of the intensity of the financial crisis.

These results prove robust to a battery of reliability checks. First, we investigate whether these effects still

Figure 1: Payment delays and export activity



This figure plots clients and suppliers estimated payment delays (y-axis) as a function of export activity (x-axis): "NE" stands for "not exporting", and the numbers denote the corresponding deciles in total exports. Clients (resp. Suppliers) *PD* are estimated as the mean for a given level of export activity of the account receivables over sales (resp. account payables over sales) ratio. Average values are then multiplied by 365 to be expressed in days of sales. Accounting data is taken from tax returns (BRN-RSI) and export data from customs declarations (see sections 2.2 and 2.3). Only information on manufacturing and retail firms in 2013 is retained.

hold using alternative measures of payment delays. If anything, our estimates appear to be *larger* in magnitude when taking into account the effects of differences in sourcing strategy or in market power in the computation of payment delays. Second, when restricting the estimations to sub-samples of our data set, we find that consistently with theory, the effects of the variation in *NPD* are stronger for small firms that operate in sectors that are dependent on external finance. Moreover, the export markets that are the most affected by the reform are the destinations in which small exporters are the most represented (Europe inside and outside the EU).

Our emphasis on the effects of payment delays on export market decisions is justified by the particular characteristics of export transactions. As stressed by Amiti and Weinstein (2011), export transactions differ from domestic transactions as they entail *longer payment delays* and *higher customer risk*. On the basis of survey evidence, Schmidt-Eisenlohr (2013) finds that in 78% of export transactions, the importer pays after reception of the product. This means that shipping time comes in addition to the payment delays that prevail in the domestic market: Amiti and Weinstein (2011) thus estimate that the median transportation time can be estimated to two months. Figure 1 shows that this fact can be observed in firms' tax returns: as firms export more in volume, they have on average higher net payment delays (clients *PD* minus suppliers *PD*). Higher customer risk then results from the difficulty to settle a dispute in an international setting and on the differences in quality of institutions between countries. Courts may in particular function more or less effectively: studying duration of legal procedures in 103 countries, Djankov et al. (2003) estimate that it takes approximately one month and half for a court in Singapore to collect a bounced check, while more than three years are needed in Poland.

Since export transactions generate more frictions than domestic ones, Feenstra, Li and Yu (2014) argue that exporters are more likely to be financially constrained that domestic producers, a prediction that they confirm using financial data on Chinese firms. In any rate, the presence of both a public (export credit agencies) and private ("export credit", "export credit insurance", "export factoring") supply of contracts designed especially for exporters seem to indicate that the specificities of export operations call for a separate contractual treatment. The optimal portfolio of export markets may therefore not only be determined by profit considerations

(Mélitz, 2003), but also by whether the payment delays that hold in those markets allow the firm to maintain a cash flow that is sustainable given its financing conditions. In the presence of a variation in domestic liquidity risk such as that triggered by the 2009 French reform, firms might have to readjust their market portfolio and therefore to decide to quit or to enter a new export market, a prediction that our empirical evidence strongly supports.

Our results contribute to a recent strand of literature that investigates the role of working capital risk management in international trade. In an influential paper, Antràs and Foley (forthcoming) shows that the negotiation of financing terms is key in building and maintaining trade relationships, and that the way customer risk is managed shapes the impact of crises on supplier-customer links. Using data on U.S. banks' trade finance claims by country, Schmidt-Eisenlohr and Niepmann (2016) estimate that a one standard deviation negative shock to a country' trade insurance supply lowers export by U.S. firms to that country by 1.5% (see also Aubouin and Engemann (2014)). More broadly, this article relates to another group of publications (Manova (2013) ; Feenstra, Li and Yu (2014) ; Paravisini et al. (2014)) that look at the role of credit supply on exports[2]. In contrast with the theories put forward by this literature, our model provides a contractual framework in which debt plays only an indirect role in the decision to entry or exit an export market: in a dynamic framework, only the level of cash matters to ensure that the entry in a new export market is sustainable in terms of working capital management. Accordingly, we find no role of the variations in leverage on export decisions between 2008 and 2009.

This article then falls within the wide array of articles that study the interactions between structural characteristics of product markets and capital structure policies, and more specifically on the role of cash holdings on entry patterns[3]. Boutin et al. (2013) find evidence that entry is negatively correlated to the cash hoarded by incumbent affiliated groups and positively associated with the level of entrant groups' cash; in line with the authors' results, our estimates point to a positive correlation between level of entrant groups' cash and the probability of entry. Frésard (2010) then shows that large cash reserves act as a comparative advantage in product markets as they lead to systematic future market share gains at the expense of industry incumbents. In comparison, our results suggest that firms operating in sectors where payment delays are low benefit from a comparative advantage on their rivals as they are more likely to enter a new export market and less likely to exit.

The closest paper to this article is undoubtedly Barrot (forthcoming): studying an early implementation of the 2009 reform on the trucking sector, Barrot finds using differences-in-differences that corporate defaults fell following the reform and that the decrease in payment delays triggered the entry of small firms in the trucking industry. This article extends Barrot's work on three points: first, we bring a theoretical model that allows to understand precisely the effects of payment delays on product market decisions. Far from being univocal, the impacts of payment delays thus crucially depend on the level of the firm's cash holdings. Second, since the setting of the LME reform does not lend itself well to a differences-in-differences estimation, we deviate from Barrot's methodology by relying on the heterogeneity of the exposure to the reform to instrument the variation in payment delays. Third, thanks to our quantitative measure of payment delays, we are able to disentangle the effects of the variations of clients *PD* from suppliers *PD* by computing payment delays in net terms.

We eventually contribute to a burgeoning strand of theoretical papers devoted to the study of real options in presence of financing constraints. Three different lines of articles can be distinguished: a first series of studies investigate how the exercise of real options is affected by exogenous financing costs resulting from debt overhang issues or uncertainty on capital supply (Sundaresan, Wang and Yang (2015); Bolton, Wang and Yang

[2]Note that Chaney (2005), which was the first article to analyse the role of financial constraints on firm-level exports, emphasized the role of *liquidity* constraints and is thus closer to an analysis in terms of working capital management than of credit constraints.

[3]A major part of this literature is devoted to the examination of the role of leverage on product market decisions. Chevalier (1995) shows notably that LBO supermarkets charge higher prices following the LBO when market rivals are also highly leveraged; Khanna and Tice (2000) find evidence that highly levered supermarkets responded less aggressively to the entry of Wal-Mart in their local markets. See Parsons and Titman (2008) for a survey.

(2014); Hugonnier, Malamud and Morellec (2014)). "Real option signalling" models then show that in presence of asymmetric information, the timing of the exercise of the real option can be used as a signal to the principal on the quality of the project or on the financial strength of the agent (Grenadier and Malenko (2011); Morellec and Schürhoff (2011); Bustamante (2011); Bouvard (2014)). A last strand of models (Philippon and Sannikov (2007); Biais et al. (2010); Gryglewicz and Hartman-Glaser (2015)) allows the agent to affect the stochastic process of the real option's underlying. The agent in our model can in this way affect the rate of arrival of payments, which in turn changes the probability of entry in a new export market. In addition to account for the logistical constraints entailed by export transactions, this model turns out to analytically simple as most of the empirical predictions can be derived by studying a single ordinary differential equation with border conditions.

The remainder of the paper is organized as follows. Section 1 specifies the theoretical model and the empirical predictions that it yields. The details of the LME reform and the data sets used are described in section 2. In section 3, we present in detail the identification strategy. Empirical results are displayed in section 4; in section 5 we consider several extensions and robustness tests. Results are discussed in section 6. Section 7 concludes.

1 Theoretical framework

1.1 Setup of the model

This model builds on the dynamic real option model with agency presented Philippon and Sannikov (2007): first, Brownian motions are replaced by Poisson processes (as in Sannikov (2005)) which, by their discrete nature, are naturally more suited to the study of the timing of cash-flows payments. Second, the exercise of the real option is allowed to affect the volatility of the cash-flow process since figure 1 suggests that payment delays increase with the level of exporting.

The resolution of the optimal contract is based on martingale techniques developed in a Brownian framework in DeMarzo and Sannikov (2006) and adapted to point processes in Biais et al. (2010) and Sannikov (2005). A brief sketch of the proofs initially presented in Philippon and Sannikov (2007) is recalled in appendix A ; new results using the concavity of the principal functions are derived and presented in detail in section 1.3 and appendix B.

A cash-constrained entrepreneur (the agent) seeks outside financing I to have her firm started. She contracts with a bank (the principal) to fund the set-up costs and to cover the losses of her project ; both the entrepreneur and the bank are risk-neutral[4] and discount future cash flows at the market interest rate r. Time is continuous.

The annual expected sales of the firm are given by Π_t ; the occurrence of cash-flows arrivals cash-flows is modeled by a point process $N = \{N_t\}_{t \geq 0}$. N is assumed to follow a Poisson process of intensity $\lambda = \{\lambda_t\}_{t \geq 0}$: the average time between payments at time t, our measure of the average payment delays, is therefore given by $1/\lambda_t$.

At time $t = 0$, the project starts with an initial expected profitability Π_I and an average number of payments per year given by λ_I (I stands for "initial"). Then, at every instant $t \geq 0$, the entrepreneur has the option to pay an entry cost K and to start entering in a new export market[5] which is posited to simultaneously change annual sales from Π_I to Π_E and the average number of payments from λ_I to λ_E (E stands for "export"). In line with standard international trade models (Mélitz, 2003), in the absence of information asymmetries, it would be

[4] Gryglewicz and Hartman-Glaser (2015) investigate the role of the agent's risk aversion in a dynamic model of real option with agency. They find that risk aversion has an ambiguous effect as it could lead to earlier as well as later exercise of the real option. For the sake of clarity, the role of risk aversion is not taken into account in this theoretical analysis, but is discussed in the empirical part of the paper.

[5] The firm might indeed already be exporting: this model thus generates predictions for the decision to *enter in an new export market* and not only on the decision to *start exporting*.

optimal to start exporting immediately as long as the option to export is profitable : $\Pi_E - \Pi_I > rK$ (1); the condition (1) is assumed to hold in the following. Moreover, figure 1 suggests to impose $\lambda_I > \lambda_E$ such that the average payment delays increases with export activity.

Since the focus of this paper is to investigate the effects of the volatility induced by the *uncertainty over the timing of payments*, the following analysis abstracts from the role of the *uncertainty over the amount of cash-flows* by assuming that the volume of cash-flows is deterministic (it only depends on whether the firm exports or not) and that cash-flows are evenly distributed over the year: $X_t = \Pi_t/\lambda_t$. The expected instantaneous change in cash-flows is thus given by

$$E_t[dY_t] = \lambda_t X_t = \lambda_t \Pi_t/\lambda_t = \Pi_t \tag{2}$$

Note however that for a given Π_t, the variance of X_t is decreasing in λ_t:

$$Var_t[dY_t] = \lambda_t (X_t)^2 = \lambda_t (\Pi_t/\lambda_t)^2 = \Pi_t^2/\lambda_t \tag{3}$$

Information frictions arise as it is assumed that the entrepreneur must exert an effort to maintain a high rate of cash-flow arrivals. Previous research tends to show that the collection of account receivables is a costly process: using mandatory pension contributions as an exogenous shock on cash, Bakke and Whited (2012) show that firms recover receivables when facing a liquidity shock, suggesting that firms balance out the cost of collecting commercial debt with their liquidity needs to determine the optimal level of receivables collection. In presence of product risk, trade credit might be the optimal way for firms with no reputation to provide their clients with a warranty clause (Lee and Stowe, 1993): the buyer can delay the payment so as to check whether the the product meets his requirements. Collecting receivables might thus deter clients from coming back to make future purchases, which is costly for the manager.

Formally, the presence of moral hazard in this model is introduced for all $t \geq 0$ by allowing the agent to reduce the intensity of the Poisson process from λ_t to $\theta_t \lambda_t$ (with $\theta_t \in [0,1]$) in exchange for a private benefit $(1-\theta_t)\lambda_t$ per cash-flow unit[6] ; the effort process $\theta = \{\theta_t\}_{t\geq 0}$ is unobservable by the principal. Importantly, shirking reduces the rate of cash-flows but does not modify their volume, thereby reducing the expected instantaneous profitability of the firm. For all $t \geq 0$, the instantaneous flow of private benefits dY_t^B is then equal to $dY_t^B = (1-\theta_t)\lambda_t X_t$.

The agent is not allowed to save money [7] so that her consumption process is defined by:

$$dc_t = dY_t^B + di_t \tag{4}$$

where $dc_t \geq 0$ is her increase in consumption and $di_t \geq 0$ is her increase in income paid by the principal. $c = \{c_t\}_{t\geq 0}$ and $i = \{i_t\}_{t\geq 0}$ are assumed to be right continuous with left limits. The principal has complete control over the agent's retribution i, over the (possibly random) timing of the export option exercise τ_K and over the (possibly random) termination date τ_L of the contract. The present value of future payment to the agent is in particular assumed to be finite: $\int_0^{\tau_K \wedge \tau_L} e^{-rt} i_t dt < \infty$ (5). The principal's set of admissible controls is denoted by P. On her side, the agent determines the effort intensity $\theta = \{\theta_t\}_{t\geq 0}$. Given i, τ_K and τ_L, the agent's admissible set is given by $A(i, \tau_K, \tau_L)$.

In case of termination of the contract, the principal gets L which could be interpreted as a liquidation value or as the value the principal would derive if it has to begin a new contract with another entrepreneur (see DeMarzo and Sannikov (2006)). Similarly, the agent gets her outside option value R when the contract is terminated, where R could reflect what she could keep of the processes of the liquidation of her firm or,

[6] The intensity of the moral hazard problem could be modulated through an additional parameter $\kappa > 0$ such that the private benefits equal $\kappa(1-\theta_t)\lambda_t$. Setting $\kappa = 1$ does not change the main properties of the model but simplifies significantly the proofs.

[7] DeMarzo and Sannikov (2006) shows that if the private saving rate of the agent is strictly inferior to the market interest rate, it is optimal for the agent never to save money.

perhaps more realistically in this context, the value she would obtain if she had her project financed by another bank. Termination of the contract is assumed to be socially inefficient, which imposes the inequality $L + R < \Pi_K / r$ (6).[8]

Two additional conditions are necessary: first,

$$\lambda_I > \lambda_E > r \tag{7}$$

is assumed. This assumption is very likely to hold: remember that λ can be interpreted as the average number of payments received by the firm during the year. The second constraint imposes that the outside option of the entrepreneur is strictly superior to the value of an additional cash-flow:

$$R > \max(X_I, X_E) \tag{8}$$

This inequation is quite reasonable for most of the firms: when annual cash-flows do not depend on a particular customer, an additional cash-flow payment is generally inferior to the liquidation value of the firm. However, for firms with a very high operational leverage (e.g., in the aircraft or boat industry), this assumption might be violated. Section 1.3 discusses the consequences of this constraint.

The agent's problem is to maximize her expected discounted utility W_0 :

$$W_0 = \max_{\theta \in A(i,\tau_K,\tau_L)} E^\theta \left[\int_0^{\tau_L} e^{-rt} dC_t + Re^{-r\tau_L} \right] \tag{9}$$

where E^θ denotes the expectation operator under the probability $\mathbf{P}^\theta$ given by θ. It is also assumed that for every strategy θ, her continuation utility W_t^θ must exceed the value of her outside option at every time t:

$$W_t^\theta = E^\theta \left[\int_t^{\tau_L} e^{-r(s-t)} dC_s + Re^{-r(\tau_L - t)} | \mathscr{F}_t^N \right] \geq R. \tag{10}$$

where $\mathscr{F}^N = \{\mathscr{F}_t^N\}_{t\geq 0}$ is the filtration generated by N. The principal's problem is to maximize its expected discounted profit; using the continuation utility of the agent as a state variable (see for instance Spear and Srivastava (1987)), the principal's profit $b^I(W_0)$ for a given starting value W_0 can be expressed as:

$$b^I(W_0) = \max_{(i,\tau_K,\tau_L)\in P} \max_{\theta \in A(i,\tau_K,\tau_L)} E^\theta \left[\int_0^{\tau_L \wedge \tau_K} e^{-rt} (dY_t^R - di_t) - 1_{\tau_K < \tau_L} e^{-r\tau_K} K + Le^{-r\tau_L} \right] \tag{11}$$

subject to (10) and to make the contract incentive-compatible for the agent. Similarly to (11), consider eventually for a given starting value W_0 the function $b^E(W_0)$ giving the profit of principal if the firm is already exporting:

$$b^E(W_0) = \max_{(i,\tau_L)\in P} \max_{\theta \in A(i,\tau_L)} E^\theta \left[\int_0^{\tau_L} e^{-rt} (dY_t^R - di_t) + Le^{-r\tau_L} \right] \tag{12}$$

1.2 Resolution of the optimal contract

Martingale techniques show that incentive compatibility impose to make the continuation utility of the agent W_t evolve according to

$$dW_t = rW_t dt + X_t(dN_t - \lambda_t dt) - di_t \tag{13}$$

Intuitively, by setting the sensibility of the agent's continuation utility to the cash-flow process equal to 1, the principal makes the agent indifferent between shirking ($\theta_t < 1$) and exerting high effort ($\theta_t = 1$). In the regions

[8] In the empirical part of the paper, the termination of the contract when the firm is exporting is often interpreted as an exit from an export market. In this case, the termination values L and R might be thought as the values the principal and the agent would obtain after the exit.

where $di_t = 0$, the principal's profit functions follow the following differential equation:

$$rb(W_t) = \Pi_t + (rW_t - \Pi_t)b'(W_t) + \lambda_t(b(W_t + X_t) - b(W_t)) \tag{14}$$

Proceeding by backward induction as in Philippon and Sannikov (2007), the optimal contract can be fully characterized after exporting and before exporting by the equation (14) with the appropriate border conditions.

1.2.1 Optimal contract after exporting

After paying the entry cost K, the cash-flows process of the firm is characterized by $X_t = X_E$, $\lambda_t = \lambda_E$ and $\Pi_t = \Pi_E$. The optimal contract is given by the following proposition:

Proposition 1. *(Sannikov 2005) In the optimal contract, the continuation value W_t evolves according to (13) starting with value W_0. When $W_t \in [R, R^*[$, with $R^* = \Pi_E/r$ the agent receives no payment: $di_t = 0$. When W_t reaches R^*, payments di_t cause W_t to reflect at R^*. The profit function b^E follows (14) on the interval $[R, R^*]$ with the boundary conditions $b^E(R) = L$ and $b^E(R^* + \omega) = -\omega$ for all $\omega \geq 0$. The contract is terminated at time τ_L when W_t reaches R.*

The upper threshold R^* corresponds to the private benefit the agent would get if she chooses to shirk forever: $\theta_t = 0$ for all $t \geq 0$. When $W_t \geq R^*$, the moral hazard problem disappears: the agent gets all the proceeds of the cash-flows as if she was the sole owner of the project.

1.2.2 Optimal contract before exporting

In the initial stage of the game, the cash-flows process of the firm is characterized by $X_t = X_I$, $\lambda_t = \lambda_I$ and $\Pi_t = \Pi_I$.

Proposition 2. *(Philippon and Sannikov 2007) In the optimal contract, the continuation value $W_t \in [R, W_K[$ evolves according to (13) starting with value W_0 with $di_t = 0$ for all $t \geq 0$. The profit function b_I follows (14) on the interval $[R, W_K]$ with the boundary conditions $b^I(R) = L$ and $b^I(W_K + \omega) = b^E(W_K + \omega) - K$ for all $\omega \geq 0$. If W_t reaches W_K before R at time τ_K, the firm starts exporting and the optimal contract is given by Proposition 1. If W_t reaches R first at time τ_L, the contract is terminated.*

In contrast with the perfect information case, it is optimal for the agent and the principal to wait that W_t reaches the threshold W_K to start exporting. Note that in contrast with standard real option models (e.g. McDonald and Siegel (1986)), waiting does not provide any additional information on the profitability of the firm: by assumption, cash-flows are *iid*. The value of waiting in this model stems from the moral hazard problem: by making entry conditional on the continuation value of the agent passing a given threshold, the contract gives incentives to the agent to maintain a high rate of cash-flow arrival and thus allows to decrease the risk of liquidating the firm, which is costly for the principal.

1.2.3 Implementation of the optimal contract

The optimal contract has a natural implementation with cash reserves (see Biais et al. (2007)). Defining the stock of cash L_t by $L_t = W_t - R$, the optimal contract can be defined as following:

- The entrepreneur begins with a reserve of cash $L_0 = W_0 - R$. It then evolves according to $dL_t = rL_t dt + X_t(dN_t - \lambda_t dt)$. Note that cash reserves decrease in absence of cash-flows arrival.
- If her cash reserves reach $L_K = W_K - R$, the agent enters in a new export market. If she runs out of cash first, the firm is liquidated.
- After starting to export, the agent is paid every time the level of cash goes above $L^* = R^* - R$. The firm is liquidated as soon as the agent runs out of cash.

The initial level of cash reserves L_0 is determined by the respective bargaining powers of the agent and the principal. In particular, if the bank is a monopoly, $W_0 = L_0 + R$ is defined by the condition $b_I'(W_0) = 0$. On the opposite, if the agent has all the bargaining power, W_0 is pinned down by the conditions $b_I(W_0) = I$ and $b_I'(W_0) < 0$.

1.3 Empirical predictions

This implementation allows us to make predictions about observable outcomes. The first result shows that in the two polar cases of bargaining process between the agent and the principal described above, initial financing decreases with the average payment delays and increases with profitability.

Proposition 3. *If there is perfect competition among banks or if the bank acts like a monopoly, the initial cash financing L_0 decreases with $1/\lambda_I$ (the average PT before exporting) and increases with Π_I (the profitability before exporting).*

The intuition behind proposition 3 is clear: when the agent has all the bargaining power, she gets all the net benefits from running the project. Since a higher profitability and lower *PD* increases the expected value of the firm (by raising profits and lowering the probability of liquidation), the initial utility and therefore the initial financing that the agent secures increases. If the bank is a monopoly, then in face of better firm's fundamentals the bank has interests in diminishing the probability of liquidation by increasing the amount of initial financing so as to extract more of the firm's future value.

The following result is more counterintuitive: the amount of cash L_K required to enter in a new export market *increases* as initial conditions of the firm improve.

Proposition 4. *The amount of cash required to enter in a new export market L_K decreases with $1/\lambda_I$ (the average PT before exporting) and Π_E (the profitability after exporting) and increases with $1/\lambda_E$ (the average PT after exporting), Π_I (the profitability before exporting) and K (the cost of entry).*

The threshold L_K is the result from an arbitrage for the bank between the value of exercising the entry option and the value of waiting that the agent builds cash reserves (which lowers the chances of a costly liquidation). All other things equal, if the initial conditions of the firm improve, exporting becomes more risky in relative terms, which induces it to raise the required amount of cash. Proposition 4 leads therefore to seemingly paradoxical conclusions: a deterioration of the payment conditions might lead firms with high levels of cash to enter the export market as differences in *PD* between exporting and not exporting fade out.

The following proposition shows however that for low levels of cash, the initial profitability and average *PD* have an opposite effect on the probability of exporting:

Proposition 5. *For a given amount of cash $L < L_K - X_I$, the probability to enter in a new export market (resp being liquidated) in a given period of time (e.g. a year) decreases (increases) with the average PT before exporting $1/\lambda_I$ and increases (decreases) with the profitability Π_I.*

A decrease in average *PD* has two opposite effects: it increases the threshold L_K and it increases the future prospects of the firm by lowering the probability of liquidation. Proposition 5 shows that if firm's cash reserves are far enough from the barrier L_K, the first effect is dominated by the second one.

This result might not hold in general if we relax condition 8 by allowing $R \leq \max(X_I, X_E)$: for low levels of cash $L \in [0, X_I - R]$, the probability of entry might increase with average *PD*. The intuition is that for a firm that is liquidity-distressed, an increase in average payment delays makes the principal expect longer intervals between cash-flow arrivals and thus tempers the stringency of the requirement of an immediate important payment, which reduces the probability of an immediate liquidation and thus increases the probability of exporting.

We test these assertions in the following sections.

2 Background and data description

2.1 Payment delays reform

The 2009 payment delays reform is the outcome of a long-term process of reflections and negotiations on the regulation of payment delays in France. Since 2000, the regulation of late payment practices has been on the European agenda (Barrot, forthcoming): based on the notion that *"heavy administrative and financial burdens are placed on businesses, particularly small and medium-sized ones, as a result of excessive payment periods and late payment"*, the directive 2000/35/EC allowed firms to demand interest payments to their debtors in case of excessive payment delays (30 days). In France where *PD* were in average higher than in the other members of the European Union (ODDP, 2007), the government took up this issue by fostering negotiations between professional organisations representing clients and suppliers of a given sector. This resulted in 2006 in a reform limiting contractual payment delays to thirty days in the trucking sector, and in 2007 in a agreement to limit contactual *PD* to ninety days in the automobile sector.

The 2009 reform extended these reforms by generalizing as of January, 1. 2009 the limit of contractual payment delays to sixty days in any transactions involving French firms, regardless of the sectors they are operating in. More precisely, the limit was set to sixty days after sending the invoice or forty-five days after the end of the month in which the invoice has been sent. Excess payment delays are to be reported to public authorities by firms' accounting auditors: sanctions resulting from a violation of the contractual limits can reach a maximum of 2 millions euros. These rules appear to be enforced in practice: in 2015, a major telecom group had to settle a fine of 750 000 euros (around 845 000 $) following several complaints of excessive payment delays[9].

The 2009 law featured several major exceptions to the sixty-days-rule. First, in some sectors of activity involving the production or the sale of perishable products contractual payment delays were restricted to be shorter (e.g. thirty days for transactions involving frozen food products). Second, some sectors whose activity is highly seasonal (e.g. the toy industry) or where the immediate enforcement of the sixty-day-rules appeared to be problematic could benefit from longer contractual payment delays; however, these derogations scheduled a progressive normalization of the contractual payment delays limit to the general sixty-days-rule before 2012 at the latest. The list of derogations is displayed in appendix D. Third, the reform put only a ceiling on *contractual PD* and not on *actual PD*, which might differ in practice. Eventually, the scope of the 2009 reform included only *domestic* transactions, thereby leaving aside import and export transactions: this point is important as it allows us to investigate the effect of payment delays in the domestic market on decisions made in foreign product markets.

Overall, several specificities of this reform that makes it particularly challenging to use for causal inference have motivated our empirical strategy described in section 3:

(a): Absence of a natural control group Unlike Barrot (forthcoming) or Barrot and Nanda (2016), no natural control group emerges as this reform affects all sectors[10]. Discontinuities induced by the derogations to the reform cannot be exploited as they are clearly endogeneous (derogations would be granted to some professional organisations representing a given sector provided they could justify that the sixty-days-rule would affect them more than other sectors).

(b): 2008-09 financial crisis The 2009 reform was voted on August 4. 2008, that is only a few weeks before the Lehman Brothers collapse. French export transactions were greatly affected by the ensuing global

[9] See a press article here (in English).

[10] Unfortunately, if the 2006 reform proved well-suited for a difference-in-difference setting, firms in the trucking sector do virtually no exporting (which makes it likewise impossible to use the trucking sector as a control group for this reform). Similarly, the 2007 agreement may seem promising at first glance since the automobile sector is one the main French exporting industries; however, the non-binding nature of the agreement casts some doubt on the actual enforcement of the payment delays limits (ODDP, 2008). In fact, this report suggests that it is because of the very difficulties faced by the government to enforce the 2007 agreement that public authorities decided to move from an approach based on interprofessional negotiations to a general law that incorporated all sectors.

financial crisis: Bricongne et al. (2012) find that exports dropped by -16.2% between September 2008 and April 2009, the contribution of the intensive margin being four times higher in magnitude than the extensive margin one. Should this effect not be properly accounted for, any inference in this period would be subject to the risk of being contaminated by the confounding presence of the 2008 financial crisis.

(c): Presence of derogations The 2009 law allowed some sectors to deviate from the sixty-days-rule because of particular difficulties (seasonal activity, particular payment usages...) to implement it as of 2009. If those difficulties are correlated to firms' export market behavior, the measured variation in payment delays might be endogenous.

(d): Anticipation Eventually, since the law was voted in mid-2008, firms might have been anticipating the enactment of the law and begun to adjust their payment contracts as of 2008. This possibility has been studied by the public instance responsible for the follow-up of the enactment of the reform (ODDP, 2008). It found that out of of a sample of nearly 200 credit managers of large industrial firms, 47% tried to renegotiate their payment contracts as of 2008; however, some credit managers report that these negotiations proved difficult to succeed, since the different firms involved would wait for all their main clients and customers to agree to modify their delays as well so as not to bear alone the working capital costs.

2.2 *Measurement of payment delays and firm-level data*

Traditional firm-level data sets such as tax returns databases do not feature information on contractual payment delays[11]. However, a natural measure of the actual client payment delays (used for instance in ODDP (2010) or Barrot and Sauvagnat (2015)) might be derived from standard balance sheet data by defining for a firm f

$$\overline{Client_f} = \frac{Account\ receivables_f}{Sales_f} * 365$$

The ratio is multiplied by 365 so as to be readily interpretable in delays of days; assuming that firm f's clients meet their contractual payment delays, $\overline{Client_f}$ can be thought as the average contractual payment delays between firm f and its client for a given fiscal year. This measure corresponds to $1/\lambda$ in our model, i.e. the average gap between cash-flow payments.

Since the reform affected suppliers as well as clients payment delays, it is necessary to find an estimation of the variation in payment delays that takes both sides of trade credit into account. Suppliers' *PD* are therefore symmetrically computed as

$$\overline{Supplier_f} = \frac{Account\ payables_f}{Sales_f} * 365$$

which leads to define "net" payment delays $\overline{NPD_f}$ as $\overline{Client_f} - \overline{Supplier_f}$. Positive $\overline{NPD_f}$ mean that firm f is paid slower by its clients than it pays its suppliers.

Notwithstanding their simplicity and ease of interpretation, there are several reasons to believe that these direct measures of *PD* might be biased. First, as noted by Barrot (forthcoming), these estimations are subject to measurement error as they compare the amount of sales generated in the whole fiscal year to the amount of trade credit recorded at the time of the tax report. If firm f's sales fall at the time of the tax report, clients trade credit will fall and thus $\overline{Client_f}$ will be underestimated. Second, actual *PD* when estimated this way might significantly differ from effective *PD*: if firm f for instance sell all its account receivables to a factoring firm, actual *PD* will be zero while effective *PD* will stay strictly positive. Since the 2009 reform limits contractual payment delays but not effective payment delays, our preferred estimate should be closer to the former than the latter.

[11] See Antràs and Foley (forthcoming) for a recent example of a data set including such information.

Using data on trade credit contracts from COMPUSTAT firms, Ng, Smith and Smith (1999) show that contractual payment delays vary widely across industries but much less within a given sector (a result later confirmed by Costello (2013)). This finding is consistent with the fact most of the trade credit determinants emphasized in existing trade credit theories[12] are homogeneous at the sector-level. Provided that measurement errors are independent across firms, better estimations of *PD* in sector s $\overline{Client_s}$ and $\overline{Supplier_s}$ are given by the sectoral mean[13] of $\overline{Client_f}$ and $\overline{Supplier_f}$.

Table 1: Top and bottom 5 sectors for $\overline{Client_s}$ and $\overline{Supplier_s}$ (2007)

$\overline{Client_s}$ (DoS)		$\overline{Supplier_s}$ (DoS)	
Construction of military vehicles	153.72	Manufacture of batteries	85.66
Nuclear materials processing	138.87	Retail trade services of tobacco	84.47
Production of synthetic rubber	111.75	Manufacture of other non-metallic products	83.48
Production of fiber optic cables	105.85	Construction of military vehicles	83.30
Manufacture of industrial gases	104.63	Nuclear materials processing	80.28
Retail trade services of meat	4.29	Stalls and markets	25.72
Retail trade services of bread	4.22	Potato processing	25.45
Grocery retailers	3.55	Manufacture of medical instruments	23.42
Food retail trade	3.13	Food retail trade	22.80
Retail trade services of tobacco	2.64	Manufacture of tobacco products	21.20

This table displays the NAF-4 digits sectors in the manufacturing or retail sectors with the highest and lowest values of average actual clients *PD* ($\overline{Client_s}$) and suppliers *PD* ($\overline{Supplier_s}$). The values are given in days of sales (DoS). A value of 100 for $\overline{Client_s}$ means that the average gap between cash-flow payments for firms in sector s is 100 days.

Table 1 displays the sectors with the highest and lowest values of $\overline{Client_s}$ and $\overline{Supplier_s}$. The estimations are made on balance sheet data coming from the tax returns collected by the French fiscal administration (see Bertrand, Schoar and Thesmar (2007), Garicano, Lelarge and Van Reenen (2013) or Boutin et al. (2013) for other uses of this data). This data set gives accounting information for the whole universe of French firms in the private sector, excluding the financial and agricultural sectors; we restrict ourselves to the 2007-2011 period. In addition of balance sheet information, a common identifier among all French firm data (SIREN number) and a 4-digits sector classification are provided. Since our focus is on the effects of *PD* on the export markets behaviour, only firms belonging to the manufacturing and retail sectors (the two main French exporting sectors) are retained.

Several patterns emerge from table 1. First, highest $\overline{Client_s}$ and $\overline{Supplier_s}$ appear mostly in heavy industry, while lowest $\overline{Client_s}$ and $\overline{Supplier_s}$ are mostly to be seen in business-to-consumers ("B2C") sectors. However, there is no direct mapping between the sectoral rank of $\overline{Client_s}$ and of $\overline{Supplier_s}$: in 2007, the correlation between the two is only 28.0%. This can be explained by the sectoral differences in positions along the value-added chain: for instance, the sector "Retail trade services of tobacco" can be considered as B2C from the point of view of its clients but is B2B ("business-to-business") from the point of view of its suppliers, which explains the difference in relative positions of this sector between the first and the second column.

Once $\overline{Client_s}$ and $\overline{Supplier_s}$ are estimated, we are able to get back to firm-level measures of *PD* by relying on extensive yearly survey by the Ministry of Industry (Enquête Annuelle des Entreprises, "EAE"). The survey

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

[13] For each sector, observations that are superior to the median plus five times the interquartile gap or inferior to the median minus five times the interquartile gap are removed in the computation of the mean so as to limit the effects of outliers.

is exhaustive for French firms with more than 20 workers or whose sales exceed 5 millions euros and contains information on the different 4-digits sectors in which a firm operates ; smaller firms are surveyed according to a stratified sample design. 36 231 manufacturing firms and 22 602 retail firms thus appear in 2009 in our data set. Denoting by $\omega_{f,s} = Sales_{s,f} / Sales_f$ the weight of firm f's sales in sector s $Sales_{s,f}$ in its total sales, contractual clients and suppliers PD are estimated by

$$Client_f = \sum_s \omega_{f,s} \overline{Client_s} \text{ and } Supplier_f = \sum_s \omega_{f,s} \overline{Supplier_s}$$

and similarly net contractual payment delays NPD_f are defined as $NPD_f = Client_f - Supplier_f$. Our measure of contractual PT is therefore a sales-weighted sum of the PD might have to agree to through its presence in an industry.

The main variable of interest is the change in net payment delays between 2008 and 2009; decomposing this variation, one can see that

$$\begin{aligned}
\Delta NPD_{ft} &= \sum_s \omega_{f,t} \overline{NPD}_{s,t} - \sum_s \omega_{f,t-1} \overline{NPD}_{s,t\text{-}1} \\
&= \sum_s \omega_{f,t-1} (\overline{NPD}_{s,t} - \overline{NPD}_{s,t\text{-}1}) + \sum_s (\omega_{f,t} - \omega_{f,t\text{-}1}) \overline{NPD}_{s,t} \\
&= \Delta_T NPD_{ft} + \Delta_\omega NPD_{ft}
\end{aligned}$$

where $\Delta_T NPD_{ft}$ is the variation in net PD holding the market shares constant and $\Delta_\omega NPD_{ft}$ reflects the change in sectors of activity. Since $\Delta_\omega NPD_{ft}$ reflects product market decisions and might be correlated to the firm's export behavior, we only keep $\Delta_T NPD_{ft}$ and define

$$Var\, NPD_{ft} = \frac{\Delta_T NPD_{ft}}{|NPD_{f,t-1}|}$$

as our explanatory variable of interest. $Var\, NPD_{ft}$ therefore measures the variation (in percentage) in payment delays holding market shares constant. A potential limitation of this measure, however, is that it abstracts from differences in sourcing strategy: a firm that products most of its inputs should be less affected by a variation of its suppliers PD than a firm that heavily relies on outsourcing. We build therefore an alternative measure of PD by defining

$$\overline{Supplier_f}^{alt} = \frac{Account\ payables_f}{Purchases_f} * 365$$

so that

$$NPD_f^{alt} = Client_f - \frac{Purchases_f}{Sales_f} Supplier_f^{alt}$$

and compute $Var\, NPD_{ft}^{alt}$ accordingly[14].

Information on group ownership is eventually added using the LIFI ("Liaisons financières") survey; exhaustive on the set of firms that employ more than 500 employees, that generate more than 60 millions euros in revenues or that hold more than 1.2 million euros of traded shares, the LIFI survey is completed by data coming from Bureau Van Dijk (Diane-Amadeus data set) so as to cover the whole universe of French corporate groups. This data set allows us to identify the set of business units that belong to the same corporate group and to determine whether a given business unit can be classified as a SME according to the French legislation[15].

[14]The value of $NPD_{f,09}^{alt}$ is computed with the ratio $Purchases_f / Sales_f$ at its 2008 value so that $Var\, NPD_{ft}^{alt}$ only captures the changes in payment delays.

[15]According to a 2008 law, a firm (which can be composed of several business units) is considered as a SME if (1) it employs less than 250 workers and (2) it generates less than 60 millions euros in revenues or possesses less than 43 millions euros in total assets.

2.3 *Export data*

Export data comes from the French customs (DGDDI). For each firm identified by its SIREN number, this data set gives the (free on board) value of exports by country and by product ; products are identified by a 6-digit number (CPF6) easily comparable to the French activity nomenclature. A firm operating in the French metropolitan territory must report detailed information to French customs if it exports more than 1 000 euros outside the European Union. To facilitate intra-EU trade, however, firms are not required to provide information at the product-level if its total exports to the European Union for a given year are inferior to 150 000 euros and therefore do not appear in the data.

A lot of observations are excluded as export information is added since a firm must export at least once between 2007 and 2011 to appear in the resulting data set: from 58 833, the number of firms present in 2009 falls to 33 009. Exports are then clustered at the firm-country-industry level by summing all export flows from the same firm f to the same country c in the same 2-digits product classification i ("industry").

The export behavior at the *intensive margin* can then be observed by defining $\Delta Y_{fcit} = \Delta \log(Exports_{fcit})$ if firm f is present in the market *(c,i)* in t and $t-1$. To have a sharp distinction between the intensive and extensive margins, a firm is considered to be present in a market if $Exports_{fcit}$ is at least equal to 5 000 euros. As in Paravisini et al. (2014), the export behavior at the *extensive margin* is treated differently depending if the firm enters or exits a given market. If firm f is present in market *(c,i)* at time $t-1$, we set $Exit_{fcit} = 1$ if f is not present at time t and 0 otherwise. Entries are more tricky as one must define the set of potential markets $\Omega(f)$ in which firm f might enter[16]. Building on Paravisini et al. (2014) and denoting by c^{TOP} the set of the top 50 countries of exports for French firms in 2007, $\Omega(f)$ is defined as follows:

- If firm f exports at time $t-1$, then $\Omega(f) = \left\{c^{TOP} \times i^{Exp}_{t-1}\right\}$ in which i^{Exp}_{t-1} denotes the set of industries in which f exports at $t-1$
- If firm f does not export at time $t-1$, then $\Omega(f) = \{c^{TOP} \times i^{Dom}_{t-1}\}$ in which i^{Dom}_{t-1} denotes the set of domestic industries in which f sells its products at $t-1$ (this information being given by the EAE)

If firm f is not present in market *(c,i)* $\in \Omega(f)$ at time $t-1$, we set $Entry_{fcit} = 1$ if f is present at time t and 0 otherwise.

3 Empirical strategy

3.1 *PT variation and export market behavior*

This section describes our approach to identifying the causal effects of payment delays on export market decisions. In order to disentangle the effects of the 2009 reform from the presence of the financial crisis (point (b) in section 2.1), we first rely on the disaggregated nature of export data by bringing the analysis to the market level and introducing industry-country fixed effects (Paravisini et al., 2014). By comparing export outcomes within an industry-country pair, we are able to remove any market-level shock that hit demand (*e.g.*, household over-indebtness) or supply (*e.g.*, variation in input prices) between 2008 and 2009 in a given market. Instead of comparing total export variations, our estimations will therefore be based on the comparison of export outcomes in a industry-country pair between firms that were differently affected by the reform.

Market fixed effects additionally allow to take into account a possible correlation between the exposure to the reform and the presence in certain markets. Suppose for instance that because of their position in the input-output network, firms that were exporting plastics and rubber products to the US experienced a strong fall in *NPD* following the reform. A "naive" estimation might erroneously conclude to a significant positive

[16] In the absence of such restrictions, the set $\Omega(f)$ is composed of approximately 25 industries * 200 countries = 5000 markets, which generates very low entry probabilities. To facilitate the estimation of linear probability models, we focus here on the "most reasonable" entry markets which we define as the product of the industries in which firms are already present and the top 50 export destinations for French firms.

effect of the variation in payment delays to the drop in exports to that market even in the absence of actual causation. Removing average trends at the market level ensures that our estimations are not prone to such potential bias.

The introduction of fixed effects will however not yield unbiased estimates if the impact of the crisis is heterogeneous among firms exporting in the same market. We first rely on accounting data to assess the impact of the crisis at the firm-level; we use in particular the firm-level variation of the operational margin $\Delta OperMarg_{f,t}$ to control for changes in profitability and the variation in the cash-to-assets ratio $\Delta CashTA_{f\,t}$[17] to control for the evolution of the level of liquidity of the firm (a description of the construction of these variables is given in Table 2). Note that the introduction of $\Delta CashTA_{f,t}$ is all the more necessary to test the empirical predictions presented in section 1.3 than proposition 5 predicts that a change in *PD* should affect the extensive margin decisions *holding constant the level of cash*.

Since Bricongne et al. (2012) find that French exporters' reaction to the crisis varied a lot with firm's size[18], we also add the lag of the logarithm of total assets $Size_{f,t\text{-}1}$; similarly, a dummy $Group_{f,t\text{-}1}$ is included to control for heterogeneity in financing conditions due to the affiliation to a business group. Going beyond the simple affiliation to a group, Boutin et al. (2013) find that the product market entry decisions of a given business group depends upon whether the group to which it belongs generates a lot of liquidity or not; the variable $BG\ Liquidity_{f,t\text{-}1}$ (defined as the logarithm of the total cash holdings of the business units belonging to the same group than f) is thus included to take into account differences in "war chest" among business groups.

Another potential concern with this approach is that the methodology designed to compute $Var\ NPD_{ft}$ might make it inappropriately capture sectoral variations of factors correlated to payment delays. If that is the case, then the $Var\ NPD_{ft}$ coefficient will not necessarily reflect the single effect of *PD* variation. In order to control for such correlations, we use the same methodology to build $Var\ Sales_{ft}$ and $Var\ Inv_{ft}$ (see table 2 for the details of the computation): this allows us to take explicitly into account the effects of the crisis as experimented by firm f through the sales-weighted mean of the variation in sectoral sales (which we interpret as a measure of the impact of the crisis on the supply-demand equilibrium at the sectoral level) and investment (which captures the changes in expectations on future profitability and possibly the effects of the tightening of credit conditions). $Var\ NPD_{ft}$ might also simply reflect firm f's exposure to financial constraints through its presence on sectors with varying dependence on external finance (Rajan and Zingales, 1998): we take this eventuality into account by introducing the sales-weighted average of sectoral financial dependence, $ExtFin_{f,t\text{-}2}$, where financial dependence is defined as the average share of capital expenditures that is not financed by operating cash-flows[19]. This measure has been in particular previously used in previous work on the links between finance and international trade such as Manova (2013) or Paravisini et al. (2014).

For $Z_{fcit} \in \{\Delta Y_{fcit}, Exit_{fcit}, Entry_{fcit}\}$, the baseline regression is therefore specified as

$$Z_{fcit} = \alpha_{ci} + \beta Var\ NPD_{ft} + \gamma X_{ft} + \epsilon_{fcit} \text{ for } t = 2009 \tag{15}$$

where α_{ci} is the industry-country fixed effects and X_{ft} the set of firm-level control variables. Several features in equation 15 are worth emphasizing: first, since the left-hand variable is observed at the firm-country-industry-level and right-hand sides variables only at the firm-level, error delays ϵ_{fcit} will be correlated for a given firm

[17] Unreported regressions (available on demand) include the debt-to-assets ratio in the set of control variables but do not find any significant effects.

[18] Bricongne et al. (2012) find that while all firms have been evenly affected by the crisis, large firms did mainly adjust through the intensive margin and by reducing the portfolio of products offered in each destination served while smaller exporters have been instead forced to reduce the range of destinations served or to stop exporting altogether.

[19] Rajan and Zingales (1998) recommend to use the average values taken for the US economy, as they advocate that the US financial system is the most developed one and that the values of *ExtFin* computed for the US economy would therefore capture variation in financial dependence due only to industrial factors (degree of uncertainty, of redeployability of the assets...) and not to variation in development of the financial system. We use here the values taken for the French economy since (1) our identification does not depend on cross-country variations (2) the French financial system is arguably developed enough for *ExtFin* to mostly capture variation in demand-originated variation in financial dependence.

f. Bertrand, Duflo and Mullainathan (2004) and Petersen (2009) show with Monte-Carlo simulations that this will lead to underestimate standard errors and thus to underreject the null hypothesis of non significance. We follow the econometric literature on that subject and cluster standard errors by firm to allow for arbitrary patterns of cross-correlation. Second, for $Z_{fcit} \in \{Exit_{fcit}, Entry_{fcit}\}$, equation 15 boils down to a linear probability model. The choice of a linear estimator over nonlinear ones can be understood by the necessity for the estimator to handle a large number of fixed effects, which the probit estimator appears to struggle with (see Greene (2004)). This suggests the use of logit models ; however, this strand of nonlinear econometric models does not easily deal with endogeneity issues[20], a problem we now turn to.

3.2 *Description of the IV strategy*

There are indeed several reasons to believe that $Var\,NPD_{ft}$ might be endogenous[21]. As previously noted in point (c), derogations to the 2009 might cause the variation in PD to be driven by export-related factors and thus create a form of simultaneity in equation 15. More importantly, if there are omitted variables (such as aggregate factors) that drive $Var\,NPD_{ft}$ even in the presence of control variables, the estimated coefficient $\hat{\beta}$ will be biased. Ideally, we would want $Var\,NPD_{ft}$ to only reflect the effect of the reform. A natural way to make it so is to rely on the sixty-day-rule: since the reform gave a clear ceiling to contractual payment terls, it is possible to determine to which extent sectors were likely to be affected by the reform. For a given sector s, we define to that end excessive net payments delays $\overline{ENPD}_s$ as the mean for all firms f in s of

$$\max(0, Client_f - 60) - \max(0, Supplier_f - 60)$$

$\overline{ENPD}_s$ can be interpreted as a measures of the net change in PD needed to reach the setting where the reform is perfectly enforced: if $Client_f$ and $Supplier_f$ were always inferior to sixty days in sector s, then $\overline{ENPD}_s$ would equal zero. Similarly, if suppliers excessive PD were about as high than clients excessive PD, the needed change in PD would be zero in net terms. In general, a high value of $\overline{ENPD}_s$ means that clients PD are on average higher than sixty days and that suppliers PD are relatively low. The firm-level variable $ENPD_{f,t\text{-}2}$ is then computed as

$$ENPD_{f,t\text{-}2} = \sum_s \omega_{f,s,t\text{-}1} \overline{ENPD}_{s,t\text{-}2}$$

For $t = 2009$, the variable $ENPD_{f,t\text{-}2}$ is thus the mean of the sectoral excessive net payments computed in 2007 weighted by the sectoral sales of firm f in 2008. This variable is used as in instrument for $Var\,NPD_{ft}$:

$$Var\,NPD_{ft} = \eta_{ci} + \xi ENPD_{f,t\text{-}2} + \rho X_{ft} + \nu_{fcit} \text{ for } t = 2009 \tag{16}$$

We expect a negative significant coefficient ξ: the variation in net payment delays subsequent to the reform should correct for previous excessive PD.

The identification assumption behind our IV strategy is that factors other than payment delays that affect export outcomes of firms present *in a given market* are not correlated to the exposure to the reform. This assumption might be violated if firms with more market power were more likely to be affected by the reform than other. Since one of the main goal of the reform was to put an end to abusive practices resulting (in particular) from dominant positions in supplier-customer relationships, this might create some bias in our estimations since export decisions are presumably correlated with market power. We turn to these issues in section 5.

This instrumentation strategy has several advantages in this context: first, in the absence of a control

[20] Recent developments (Wooldridge, 2014) suggest that quasi-maximum likelihood techniques can be developed to get consistent estimators in logit models with a continuous endogenous regressor.

[21] Note however that the problem of endogeneity is much milder than if we directly used accounting data to estimate $Var\,NPD_{ft}$. Since the use of trade credit is presumably correlated to the intensity of financial constraints (see for instance Smith (1987)), this kind of measure would be correlated to *firm-level* unobservable factors driving also export decisions.

Table 2: Descriptive statistics

This table summarizes the main variables used (Panel A) and presents summary statistics (Panel B).

Panel A: Data Definitions	
Dependent variables	
ΔY_{fcit}	$\Delta\log(Exports_{fcit})$ if firm f is present in the market *(c,i)* at time t and $t-1$. *Source: Customs.*
$Exit_{fcit}$	$Exit_{fcit} = 1$ if firm f is present in market *(c,i)* at time $t-1$ and f exits at time t (0 otherwise). *Source: Customs.*
$Entry_{fcit}$	$Entry_{fcit} = 1$ if firm f is not present in market *(c,i)* at time $t-1$ and f enters at time t (0 otherwise). *Source: Customs.*
Independent variables	
$Var\ NPD_{f,t}$	Variation in the sales-weighted average of sectoral net payment delays (see section 2.2), standardized by the absolute value of $NPD_{f,t\text{-}1}$. *Source: EAE, BRN-RSI.*
$Var\ Sales_{f,t}$	Variation in the logarithm of sales-weighted average of sectoral total sales. *Source: EAE, BRN-RSI.*
$Var\ Inv_{f,t}$	Variation in the logarithm of sales-weighted average of sectoral total investment. *Source: EAE, BRN-RSI.*
$\Delta OperMarg_{f,t}$	Variation in the EBIT over sales ratio, standardized by $OperMarg_{f,t\text{-}1}$. *Source: BRN-RSI.*
$\Delta CashTA_{f,t}$	Variation in the (net) cash to assets ratio, standardized by $CashTA_{f,t\text{-}1}$. Cash holdings are computed in "net" delays, that is by removing bank overdrafts. *Source: BRN-RSI.*
$\Delta DebtTA_{f,t}$	Variation in the long-term debt to assets ratio, standardized by $DebtTA_{f,t\text{-}1}$. *Source: BRN-RSI.*
$Group_{f,t}$	Dummy indicating the affiliation to a business group. *Source: LIFI.*
$Size_{f,t\text{-}1}$	Lag of the logarithm of total assets. *Source: BRN-RSI.*
$BG\ Liquidity_{f,t\text{-}1}$	Lag of the logarithm of total cash holdings of the firm f's business group. *Source: LIFI, BRN-RSI.*
$ExtFin_{f,t\text{-}2}$	Lag of the logarithm of the sales-weighted average of the sectoral mean of the share of capital expenditures that is not financed by operating cash-flows (computed in 2007). *Source: EAE, BRN-RSI.*
Instrument	
$ENPD_{f,t\text{-}2}$	Sales-weighted average of sectoral excessive net payment delays computed in 2007 (see section 3.2). *Source: EAE, BRN-RSI.*

Panel B: Summary Statistics								
				Percentiles				
Name	# Obs.	Mean	Std. Dev.	5^{th}	25^{th}	50^{th}	75^{th}	95^{th}
ΔY_{fcit}	113 788	-0.49	1.36	-2.90	-1.08	-0.33	0.18	1.44
$Exit_{fcit}$	147 776	0.23	0.42	0.00	0.00	0.00	1.00	1.00
$Entry_{fcit}$	800 000	0.02	0.13	0.00	0.00	0.00	0.00	0.00
$Var\ NPD_{f,t}$	18 691	-0.52	3.74	-4.38	-0.41	-0.04	0.58	1.48
$ENPD_{f,t\text{-}2}$	18 876	-35.66	131.88	-144.77	-31.24	-8.19	11.37	27.03
$Var\ Sales_{f,t}$	18 976	-0.16	0.11	-0.35	-0.20	-0.14	-0.08	-0.02
$Var\ Inv_{f,t}$	18 940	-0.27	0.27	-0.68	-0.40	-0.25	-0.14	0.15
$\Delta OperMarg_{f,t}$	18 236	-0.03	0.12	-0.20	-0.05	-0.01	0.01	0.08
$\Delta CashTA_{f,t}$	17 892	-0.84	4.69	-4.72	-0.35	0.10	0.51	0.96
$\Delta DebtTA_{f,t}$	18 113	0.00	0.05	-0.05	-0.01	0.00	0.00	0.09
$Group_{f,t}$	18 976	0.59	0.49	0.00	0.00	1.00	1.00	1.00
$Size_{f,t\text{-}1}$	18 933	8.45	1.66	5.82	7.44	8.40	9.42	11.28
$BG\ Liquidity_{f,t\text{-}1}$	18 424	0.39	1.78	0.00	0.00	0.00	0.00	3.57
$ExtFin_{f,t\text{-}2}$	18 976	-11.04	10.75	-25.83	-13.63	-9.52	-7.10	7.41

group (point (a)), it allows to turn a *qualitative* assignment (treatment versus control group) into a *quantitative* one (to what extent is firm f exposed to the reform?). Second, the instrument is designed so as not to take into account derogations (point (c)). Our first-stage estimation thus only captures the variation of net *PD* that can be explained by the sixty-days-rule and should leave aside the effects of derogations; in the end, derogations should only bring down the coefficient $\hat{\xi}$ but should leave $\hat{\beta}$ unaffected. In other terms, the IV estimator captures the *local average treatment effect* (LATE) by relying on the effects of the reform only in the sectors that applied the sixty-days rule (*compliers*). Equation 16 eventually gives a convenient way to test point (d); if $\hat{\xi}$ is significantly different from zero for $t = 2008$, one might conclude that firms have indeed anticipated the reform by modifying their *PD* as of 2008.

3.3 Descriptive statistics

Since the estimations requires to observe export and accounting data for $t = 2008$ and 2009, our main data set is restricted to 18 991 present in the EAE in both years. To minimize the effects of outliers while keeping the maximum of information, we only remove observations that are superior (resp. inferior) to the median plus (resp. minus) five times the gap between the 95$^{\text{th}}$ and 5$^{\text{th}}$ percentile. Most of the firms are SMEs (73.8 %) and belong to the manufacturing sector (70.3 %); they are moreover relatively mature (the median age is 23 years). Panel B of table 2 shows that average total assets is around 5 millions euros, and that 59 % of the firms in the data set belong to a business group, which is in line with the importance of business groups in the French economy (Boutin et al., 2013).

The effects of the crisis are clearly visible in the summary statistics. The operating margin dropped on average by -3%, while sectoral sales (as measured by $\mathit{Var\ Sales}_{f,t}$) decreased by -16%. On the export side, we observe an exit probability of a market (c, i) between 2008 and 2009 of 23%; when firms maintained their presence in a market, they decreased the volume of exports by 49% on average. The probability of entry in a new export market is on the other hand about 2%. Net payment delays decreased by -52% on average, but a closer look to the distribution shows that they increased for half of firms, which makes explicitly appear that the renegotiation of *PD* produced both winners and losers.

Median excessive payment delays were about -8.2 days prior to the reform, which means that the majority of firms were located in sectors where most of the excessive payment delays were to be found on the suppliers side. This is mainly due to the presence of retail firms in the data set; the retail sector was indeed perceived as one of the sectors who benefitted the most from important suppliers *PD* (ODDP, 2010). When we restrict the data set to manufacturing firms, median $\mathit{ENPD}_{f,t\text{-}2}$ increases to 6.4 days, indicating that a strict application of the reform should normally impact more client *PD* in the manufacturing sector.

4 Results

4.1 Variation in net payment delays

In column 1 to 6, equation 16 is tested for $t = 2009$ at the firm-level; standard errors are here clustered by industry (2 digits). This exercise allows to understand as a first step the impacts of the sixty-days-rule on net payment delays. The effect of $\mathit{ENPD}_{f,t\text{-}2}$ is negative and significant, which is line with the idea of the reform as correcting past excessive payment delays. On average, our estimations indicate that an increase of $\mathit{ENPD}_{f,t\text{-}2}$ by one day decreases $\mathit{Var\ Sales}_{f,t}$ by -0.2%. This effects is robust to the addition of control variables; in particular, the effects of $\mathit{Var\ Sales}_{f,t}$ and $\mathit{Var\ Inv}_{f,t}$ is found to be non-significant, which alleviates the concern that $\mathit{Var\ NPD}_{f,t}$ might be driven by aggregate shocks due to the crisis. Similarly, $\mathit{Var\ NPD}_{f,t}$ does not seem to be correlated with the sales-weighted average of sectoral financial dependence $\mathit{ExtFin}_{f,t\text{-}2}$. Interestingly, we find a negative (though imprecisely estimated) effect of $\mathit{Size}_{f,t\text{-}1}$ on the variation in net *PD*, which suggests that in addition to the sectors in which the firm was operating, the effect of the reform also depended also on its size. Our estimations also point to a robust and significant effect correlation between $\Delta \mathit{CashTA}_{f,t}$ and $\mathit{Var\ NPD}_{f,t}$.

Table 3: Variation in net payment delays

	OLS (1)	OLS (2)	OLS (3)	OLS (4)	OLS (5)	OLS (6)	OLS (7)	OLS (8)
	$Var\ NPD_{f,08\text{-}09}$						$Var\ NPD_{f,07\text{-}08}$	$Var\ NPD_{f,09\text{-}10}$
$ENPD_{f,t\text{-}2}$	-0.002^{***}	-0.002^{***}	-0.002^{***}	-0.002^{***}	-0.002^{***}		-0.007	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)		(0.011)	(0.001)
$Var\ Sales_{f,t}$		-0.383	-0.432	-0.106	-0.515	-0.422	11.755^{*}	0.205
		(1.321)	(1.335)	(1.570)	(1.380)	(1.337)	(6.861)	(0.805)
$\Delta OperMarg_{f,t}$		-0.466	-0.471	-0.478	-0.453	-0.469	0.500	-0.503
		(0.341)	(0.369)	(0.379)	(0.384)	(0.368)	(1.512)	(0.465)
$Size_{f,t\text{-}1}$		-0.101^{*}	-0.106^{*}	-0.104^{*}	-0.100	-0.106^{*}	-0.217	0.043
		(0.056)	(0.057)	(0.056)	(0.059)	(0.057)	(0.141)	(0.062)
$Group_{f,t\text{-}1}$		0.150	0.125	0.124	0.123	0.124	0.252	0.059
		(0.160)	(0.154)	(0.151)	(0.155)	(0.154)	(0.249)	(0.062)
$\Delta CashTA_{f,t}$			0.017^{**}	0.017^{**}	0.016^{*}	0.017^{**}	0.034^{**}	-0.003
			(0.008)	(0.008)	(0.008)	(0.008)	(0.015)	(0.004)
$Var\ Inv_{f,t}$				-0.288				
				(0.578)				
$ExtFin_{f,t\text{-}2}$					0.008			
					(0.018)			
$ENPD^{d}_{f,t\text{-}2}$						-0.002^{***}		
						(0.001)		
Observations	18 591	17 856	17 154	17 118	17 154	17 154	12 670	12 633
Fixed effects	No	No	No	No	No	No	No	No
R^2	0.004	0.006	0.006	0.007	0.007	0.006	0.025	0.002

All standard errors are clustered at the sector (NAF 2-digits) level. *, **, and *** denote statistical significance at 10, 5 and 1%. Standard errors are given in parentheses.

We then test for the hypothesis that firms anticipated the reform by testing equation 16 for $t = 2008$. We find no evidence of such effects (column 7). As suggested by ODDP (2010), the application of the reform prior to 2009 was difficult since it involved convincing all the actors implied in the customer-supplier relationship to renegotiate their payment delays so as not to impose the financial burden on a single firm. Similarly, we perform a placebo equation by testing equation 16 for $t = 2010$ and find once again no effect of a correction of excessive net payment delays. Eventually, modifying the instrument so as to take into account the effects of derogations (see Appendix C) barely changes the estimations.

4.2 *Extensive margin*

Table 4 shows the results of the estimations of equation 15 for $Z_{fcit} = Exit_{fcit}$ (panel A) and $Z_{fcit} = Entry_{fcit}$ (panel B). Column 1 of panel A find a positive significant association between the probability of exit and $Var\ NPD_{f,t}$; however, the coefficient becomes non significant as soon as we include control variables. In particular, we see that larger firms with better operating margins had lower probability of exit between 2008 and 2009. Similarly, an increase in the cash-to-assets ratio $CashTA_{f,t}$ is associated with a higher survival rate in export markets. In line with Boutin et al. (2013) higher business group liquidity appears to be negatively correlated with the probability of product market exit, suggesting that firms with "deeper pockets" fared better during the crisis.

Consistently with the results from the first-stage estimations, the Kleibergen-Paap statistics go in favour of a rejection the hypothesis of a weak instrumentation; moreover, when $Var\ NPD_{f,t}$ is instrumented with $ENPD_{f,t\text{-}2}$, the coefficient on $Var\ NPD_{f,t}$ becomes positive and highly significant. This result is very intuitive: columns 3-6 indicate that longer payment delays had a positive effect on the probability of exit. The magnitude of the effect is non-negligible: according to our estimations, a 100% increase in net payment delays (approximately the interquartile gap) would increase the probability of exit by 1.2%.

The fact that simple OLS do not allow to pin down this effect suggests the presence of confounding aggregate factors leading direct estimations to yield biased estimates. By capturing the part of the variation in net payment delays that can be explained by the exposure to the reform, we are able to isolate the causal effect of $Var\ NPD_{f,t}$ on firms' exit decisions.

Table 4: Effects of $Var\ NPD_{f,t}$ at the extensive margin

	Panel A: Exit					
	OLS (1)	OLS (2)	IV 2SLS (3)	IV 2SLS (4)	IV 2SLS(5)	IV 2SLS (6)
	$Exit_{fcit}$					
$Var\ NPD_{f,t}$	-0.001^{**}	-0.001	0.014^{***}	0.012^{**}	0.011^{**}	0.009^{**}
	(0.001)	(0.001)	(0.005)	(0.005)	(0.005)	(0.005)
$Var\ Sales_{f,t}$		0.026		0.042^{*}	0.040	0.033
		(0.022)		(0.025)	(0.025)	(0.025)
$\Delta OperMarg_{f,t}$		-0.047^{**}		-0.036	-0.049^{**}	-0.054^{**}
		(0.022)		(0.024)	(0.024)	(0.024)
$Size_{f,t-1}$		-0.021^{***}		-0.022^{***}	-0.022^{***}	-0.022^{***}
		(0.002)		(0.002)	(0.002)	(0.002)
$Group_{f,t-1}$		-0.005		-0.005	-0.004	0.000
		(0.006)		(0.006)	(0.006)	(0.006)
$\Delta CashTA_{f,t}$					-0.001^{**}	-0.002^{***}
					(0.001)	(0.001)
$\Delta DebtTA_{f,t}$						-0.009
						(0.042)
$BG\ Liquidity_{f,t-1}$						-0.001^{*}
						(0.001)
Observations	151 981	147 776	150 537	146 332	140 789	134 073
Product-Destination FE	Yes	Yes	Yes	Yes		Yes
R^2	0.072	0.080	-	-	-	-
Weak identification (KP stat)	-	-	213.57	203.96	196.27	179.48
	Panel B: Entry (exporters)					
	OLS (1)	OLS (2)	IV 2SLS (3)	IV 2SLS (4)	IV 2SLS(5)	IV 2SLS (6)
	$Entry_{fcit}$					
$Var\ NPD_{f,t}$	-0.000	-0.000	-0.002^{***}	-0.002^{***}	-0.002^{***}	-0.002^{**}
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
$Var\ Sales_{f,t}$		0.001		0.000	-0.000	0.000
		(0.002)		(0.002)	(0.002)	(0.002)
$\Delta OperMarg_{f,t}$		0.004		0.005	0.005	0.004
		(0.003)		(0.004)	(0.004)	(0.004)
$Size_{f,t-1}$		0.002^{***}		0.002^{***}	0.003^{***}	0.002^{***}
		(0.000)		(0.000)	(0.000)	(0.000)
$Group_{f,t-1}$		0.001		0.001	-0.000	0.002
		(0.001)		(0.001)	(0.001)	(0.001)
$\Delta CashTA_{f,t}$					-0.000	-0.000
					(0.000)	(0.000)
$\Delta DebtTA_{f,t}$					-0.000	-0.004
					(0.000)	(0.006)
$BG\ Liquidity_{f,t-1}$						0.001^{**}
						(0.000)
Observations	810 350	800 000	804 250	793 950	753 650	751 950
Product-Destination FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.006	0.007	-	-	-	-
Weak identification (KP stat)	-	-	333.10	318.64	301.10	291.47

All standard errors are clustered at the firm level. *, **, and *** denote statistical significance at 10, 5 and 1%. Standard errors are given in parentheses. The Kleibergen-Paap statistic (KP stat) tests for the presence of a weak instrument in presence of heteroscedasticity (high values suggest to reject the null hypothesis of weak identification).

Panel B displays the results of the regressions on the probability of entry for the subpopulation of firms that already export in 2008. The estimates do not substantially change if we also include non-exporters (last column in appendix C). However, since in our data set the probability of entry for non-exporters is very low (0.2 %), equation 15 is imprecisely estimated on this sub-sample (see appendix C), which explains why we exclude it from our main estimations.

In a very coherent way, the results shows that $Var\ NPD_{f,t}$ had a positive and highly significant effect on $Entry_{fcit}$. On average, a 100% increase in $NPD_{f,t}$ would lead to a 0.2% increase of the probability of entry. When compared to the unconditional probability of entry (2%), an interquartile gap increase of payment delays leads to 9.8% rise in the probability of entry. Modifying the restrictions made on the set of potential entry market might however yield different magnitudes of this effect. Furthermore, we see that once again that the liquidity provided by the group and the size have a significant effect on the extensive margin decisions. Being affiliated with a cash-rich group thus seems to facilitate exporting, presumably by providing the necessary internal funds to finance the sunk and fixed costs associated with the exporting activity. Interestingly, the simple affiliation to a group ($Group_{f,t\text{-}1}$) does not seem to have an effect neither on exit nor on entry decisions. We find eventually no effect of the variation in long-term debt on the exit/entry decisions, which seems to suggest that financial frictions rather affect export decisions in the form of liquidity constraints (through $CashTA_{f,t}$ and $Var\ NPD_{f,t}$) than of credit constraints.

4.3 Intensive margin

Table 5: Effects of $Var\ NPD_{f,t}$ at the intensive margin.

	OLS (1)	OLS (2)	IV 2SLS (3)	IV 2SLS (4)	IV 2SLS(5)	IV 2SLS (6)
				ΔY_{fcit}		
$Var\ NPD_{f,t}$	−0.001	−0.000	−0.011	−0.018	−0.018	−0.017
	(0.001)	(0.001)	(0.012)	(0.012)	(0.012)	(0.011)
$Var\ Sales_{ft}$		0.234***		0.198**	0.232***	0.226***
		(0.072)		(0.077)	(0.076)	(0.077)
$\Delta OperMarg_{ft}$		0.319***		0.298***	0.301***	0.343***
		(0.053)		(0.054)	(0.057)	(0.059)
$Size_{f,t\text{-}1}$		−0.013***		−0.012***	−0.010**	−0.011**
		(0.004)		(0.004)	(0.004)	(0.004)
$Group_{f,t}$		−0.008		−0.008	−0.013	−0.016
		(0.014)		(0.014)	(0.014)	(0.014)
$\Delta CashTA_{f,t}$					0.002	0.003*
					(0.002)	(0.002)
$\Delta DebtTA_{f,t}$						0.030
						(0.117)
$BG\ Liquidity_{f,t\text{-}1}$						0.000
						(0.002)
Observations	116 683	113 788	115 542	112 647	108 537	104 089
Industry-Country FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.012	0.013	-	-	-	-
Weak identification (KP stat)	-	-	185.17	177.62	170.22	156.29

All standard errors are clustered at the firm level. *, **, and *** denote statistical significance at 10, 5 and 1%. Standard errors are given in parentheses. The Kleibergen-Paap statistic (KP stat) tests for the presence of a weak instrument in presence of heteroscedasticity (high values suggest to reject the null hypothesis of weak identification).

Table 6 shows the result of the estimations of equation 15 for $Z_{fcit} = \Delta Y_{fcit}$. We find a positive correlation between ΔY_{fcit} and the variation in operating margin $\Delta OperMarg_{ft}$ as well as with $Var\ Sales_{ft}$, which measures the variation of sectoral sales in the industries in which firm f operates. Consistently with Bricongne et al. (2012), we find that larger firms reduced more their exports at the intensive margin.

The coefficient $Var\ NPD_{f,t}$ appears to be negative in all specifications but is too imprecisely estimated to be considered as significant (except in column 6 where it is significant at the 10% level). The fact that $Var\ NPD_{f,t}$ has a significant effect on the extensive margin but not on the intensive margin proves to be another strong argument against the hypothesis that $Var\ NPD_{f,t}$ conveys only a noisy measure of the financial crisis and that the effects that we observe are the consequence of aggregate confounding factors. As Bricongne et al. (2012) shows, the effects of the crisis were four times higher at the intensive margin than on the extensive one: if $Var\ NPD_{f,t}$ were correlated to the effects of the financial crisis, $Var\ NPD_{f,t}$ should also be strongly correlated to ΔY_{fcit}. The absence of effects at the intensive margin thus suggests that our empirical strategy is successful in its attempt to isolate the effect the reform in the variation of net payment delays.

5 Robustness tests

5.1 Alternative specifications

Table 6: Alternative specifications.

	IV 2SLS (5) - ΔY_{fcit}		IV 2SLS (5) - $Exit_{fcit}$		IV 2SLS (5) - $Entry_{fcit}$	
	Coef./SD	KP/Obs.	Coef./SD	KP/Obs.	Coef./SD	KP/Obs.
Baseline	-0.018	170.220	0.011^{**}	196.273	-0.002^{***}	301.098
	(0.012)	108 537	(0.005)	140 789	(0.001)	753 650
Sourcing	-0.139^{***}	19.658	0.041^{**}	17.883	-0.008^{***}	41.580
	(0.048)	109 040	(0.016)	141 533	(0.002)	754 050
Size	0.018	38.619	0.041^{**}	36.584	-0.004^{***}	57.323
	(0.025)	108 536	(0.016)	140 824	(0.001)	750 900
Derogations	-0.018	176.637	0.011^{**}	203.208	-0.002^{**}	302.466
	(0.012)	108 537	(0.005)	140 789	$(0.8\cdot10^{-3})$	753 650
Days-days	$0.8\cdot10^{-4}$	1688.537	$0.5\cdot10^{-4**}$	176.677	$-0.7\cdot10^{-6***}$	2676.632
	$(0.5\cdot10^{-5})$	109 969	$(0.2\cdot10^{-4})$	142 625	$(0.2\cdot10^{-5})$	762 100

All standard errors are clustered at the firm level. *, **, and *** denote statistical significance at 10, 5 and 1%. Standard errors are given in parentheses. The Kleibergen-Paap statistic (KP stat) tests for the presence of a weak instrument in presence of heteroscedasticity (high values suggest to reject the null hypothesis of weak identification). All estimations are made according to the IV 2SLS (5) model (see tables 4 and 6). *Baseline* denotes the estimations with the standard specification of $Var\,NPD_{f,t}$; *Sourcing* is designed so as to take into account differences in sourcing strategies; *Size* incorporates the size as a proxy for market power in $Var\,NPD_{f,t}$; *Derogations* include the role of derogations in the computation of the instrument and *Days-days* uses $\Delta_T NPD_{f,t}$ instead of $Var\,NPD_{f,t}$.

The methodology of construction of $Var\,NPD_{f,t}$ is based on a set of assumptions that, if proved wrong, might render our estimations invalid. First, our measures do not take into account differences in sourcing strategy. We therefore reestimate our equations using $Var\,NPD^{alt}_{f,t}$ (see section 2.2) and $ENPD^{alt}_{f,t\text{-}2}$ as instrument (*Sourcing* line). The negative effect of $Var\,NPD_{f,t}$ at the intensive margin becomes significant, which suggests that firms reduced their exports in response to increases in net payment delays. The sign of the other coefficients is unchanged; the magnitude of the effects appear however to be much stronger (there is approximately a factor 4 compared to the baseline model), at least in part as a result of a tighter distribution of $Var\,NPD^{alt}_{f,t}$ (its estimated standard deviation is about two times lower than for $Var\,NPD_{f,t}$).

The construction of $Var\,NPD_{f,t}$ then relies on the notion that most of the determinants of payment delays are sectoral. There is however empirical evidence (Giannetti, Burkart and Ellingsen, 2011) that payment delays depend on market power. Not taking into account this factor might invalidate our instrumentation strategy: if firms with more market power were more likely to be affected by the reform, then our identification assumption might be violated. A simple way to tackle this issue is to construct a measure of net payment delays that incorporates the effects of market power so as to remove the potential correlation between the instrument and the error term in equation 15.

Since ODDP (2010) display anecdotal and empirical evidence that excessive payment delays are more common in intermediate and large firms, we use the size of the firm as a proxy of its market power. Precisely, we define

$$NPD_f^{size} = \sum_s \omega_{f,s} \overline{NPD}_{s,z}$$

with $\overline{NPD}_{s,z}$ the average net payment delays in sector s for small firms ($z = SME$) or large firms ($z = Not\ SME$). $ENPD^{size}_{f,t-2}$ is defined accordingly. The effects (*Size*) are quite similar to the baseline estimations (albeit a bit larger in magnitude), which suggests that a limited role of market power in the exposure to the reform.

We then look the effects of integrating the derogations in the computation of the instrument on the export coefficients; the results are barely unchanged (*Derogations*). Eventually, we replace $Var\ NPD_{f,t}$ by $\Delta_T NPD_{f,t}$ in equation 15 so as to directly get the effects of a change in *NPD* in days on export decisions (*Days-days*). According to this estimation, an increase in *NPD* of ten days raise the exit probability by 5% and lowers the entry probability by nearly 0.1%.

5.2 Unobserved heterogeneity

A last issue of concern is the role of uncontrolled heterogeneity in our results. Systematic unobserved variations between groups differently affected by the reform might lead us to erroneously conclude to a causal effects of $Var\ NPD_{f,t}$ on export outcomes (Bakke and Whited, 2012). We therefore re-estimate our regressions on different sub-samples of firms and export markets: in addition to highlight the source of identification of the estimations, this exercise allows us to assess whether our results still hold for groups of firms that are supposedly more homogeneous.

Table 7: Unobserved firm heterogeneity.

	IV 2SLS (5) - ΔY_{fcit}		IV 2SLS (5) - $Exit_{fcit}$		IV 2SLS (5) - $Entry_{fcit}$	
	$Var\ NPD_{f,t}$	KP/Obs.	$Var\ NPD_{f,t}$	KP/Obs.	$Var\ NPD_{f,t}$	KP/Obs.
Baseline	-0.018	170.220	0.011^{**}	196.273	-0.002^{***}	301.098
	(0.012)	108 537	(0.005)	140 789	(0.001)	753 650
Manufacturing	-0.011	146.974	0.012^{**}	167.272	-0.002^{**}	227.810
	(0.012)	84 748	(0.005)	108 799	$(-0.9\cdot10^{-3})$	546 650
Retail	-0.035	18.867	0.001	23 763	$-0.3\cdot10^{-3}$	29.215
	(0.022)	23 078	(0.010)	31 206	(0.001)	207 000
Financially dependent	-0.016	151.409	0.008^{*}	173.840	-0.001^{*}	236.066
	(0.011)	60 224	(0.004)	77 374	$(0.8\cdot10^{-3})$	389 450
Financially independent	-0.092	3.090	0.114	3.010	-0.015	2.516
	(0.104)	47 628	(0.075)	62 636	(0.012)	364 200
SME	-0.030^{*}	167.201	0.013^{*}	96.332	-0.003^{***}	191.614
	(0.016)	51 680	(0.007)	68 137	(0.001)	434 700
Not SME	-0.009	57.316	0.009	64.084	$-0.4\cdot10^{-3}$	89.882
	(0.017)	56 230	(0.006)	71 850	(0.002)	318 850
Cash-poor	-0.003	87.140	0.008	97.034	-0.002	182.285
	(0.015)	55 971	(0.005)	72 796	(0.001)	379 500
Cash-rich	-0.040^{*}	51.464	0.019^{**}	93.448	-0.003^{**}	102.778
	(0.021)	51 906	(0.009)	67 215	(0.001)	374 100

All standard errors are clustered at the firm level. *, **, and *** denote statistical significance at 10, 5 and 1%. Standard errors are given in parentheses. The Kleibergen-Paap statistic (KP stat) tests for the presence of a weak instrument in presence of heteroscedasticity (high values suggest to reject the null hypothesis of weak identification). All estimations are made according to the IV 2SLS (5) model (see tables 4 and 6). *Baseline* denotes the estimations with the standard specification of $Var\ NPD_{f,t}$; *Cash-poor* (resp. *Cash-rich*) denotes the set of firm whose cash-to-ratio is inferior (resp. superior) to the median; *Financially independent* (resp. *Financially dependent*) denotes the set of firm whose average external financial dependence $Extfin_{f,t\text{-}2}$ is inferior (resp. superior) to the median.

We first rerun IV 2SLS for equation 15 on the subsets of manufacturing and retail firms: the suspicion of a confounding role of unobserved heterogeneity between these two groups is high since (1) they were unequally affected by the reform (see section 3.3) (2) they gather firms with presumably very different unobserved characteristics which might have affected their export decisions. If our estimations do not reveal any effects on these subgroups, it would clearly show that these are the unobserved differences between them that have been driving our results.

Table 7 shows that if our results hold for the subset of manufacturing firms, they disappear when we restrict the sample to the retail sector. This might point to a role of financial constraints which may be more of a concern for manufacturing industries due to their greater needs for external finance. This explanation is supported by lines 3-4 in which we separate the split the sample between *financially dependent* ($Extfin_{f,t-2}$ superior to the median) and *financially independent* firms (below the median): we find that the variation in net payment delays have causal effects only for financially dependent firms.

We then separately look at the effects of variations in *NPD* on SMEs and large firms: they seem only to affect export outcomes of small firms, which is consistent with the notion that financial constraints are necessary for payments delays to have an impact on real outcomes. Rather surprisingly, when we divide our samples between *cash-rich* (cash-to-assets ratio superior to the median) and *cash-poor* firms (below the median), we note that the coefficients are significantly different from zero only in the cash-rich group. This fact is however easily explained by the observation that SMEs hold on average much more cash cash than larger firms (16.1 versus 7.4% of total assets), presumably for precautionary motives in response to tighter financial constraints (Bates, Kahle and Stulz, 2009).

The sample is eventually divided in different geographic zones to investigate the role of unobserved heterogeneity between export markets. One may in particular be concerned by the role of the US export market (which was at the time suffering the consequences of the financial crisis) in our estimations: we find that our results are barely unchanged when we exclude all the exports flows to the United States. The variable $Var\ NPD_{f,t}$ has significant effects on the entry/exit decisions concerning countries that are geographically close (European Union, Europe excluding the EU). However, the effects fade out as we look to more remote destinations (America, Africa, Asia). This finding is coherent with an effect of $Var\ NPD_{f,t}$ mostly located on small exporters which on average have only access to the markets with the lowest costs of entry (Eaton, Kortum and Kramarz, 2011).

6 Discussion of the results

Our results are consistent with the empirical predictions presented in section 1.3: when domestic net payment delays increase, the probability of entry in a new export market decreases and the probability of leaving a market increases. Broadly speaking, when faced with higher domestic liquidity risk, firms adjust their market portfolio so as to be less exposed to foreign liquidity risk. It is important in this sense that the estimations include the changes in cash holdings as control variable: the estimation of the $Var\ NPD_{f,t}$ coefficient thus cast aside the impacts of the variation in payment delays on firms' cash holdings to only capture the effects of the modification of firms' anticipations on their ability to maintain a sustainable cash flow in export markets.

Our findings are also coherent with most of the models that investigate the role of corporate finance in international trade (e.g. Manova (2013), Feenstra, Li and Yu (2014) or Caggese and Cuñat (2013)) if we make the assumption that higher net payment delays raise fixed costs of exporting. However, our findings strongly reject the hypothesis of an effect of net payment delays on the variable cost of exporting. This absence of effects at the intensive margin, though surprising at first glance, can be understood within the "*(S,s)*" framework (Caplin and Leahy, 2010) of our model: in presence of uncertainty and of fixed costs, *(S,s)* models predict that firms do not adjust their behavior continually to changes in their environment but rather in a "lumpy" way so as to minimize adjustment costs.

These results are in stark contrast with Paravisini et al. (2014) who find that credit supply only affects the intensive margin of exports through the variable cost of exporting. Yet, this apparent contradiction can easily be overcome by noting that the two studies look at the export effects of financing shocks of a very different nature: while Paravisini et al. (2014) look at the impacts of a temporary fall in debt supply, we investigate the role of a permanent shift in liquidity risk[22]. In face of a short-lived credit crisis, it may be optimal to temporarily

[22]The reform might have had an effect on firms' decisions both through (1) permanent changes in liquidity risk and (2)

adjust through shifting towards more expensive sources of financing such as factoring; though raising the variable cost of exporting, this solution allows to keep exporting in the same markets (albeit at a lower rate through the impact on prices) which allows the firm to avoid a costly exit. In presence of a (large) permanent change in liquidity risk, however, our theory suggest that it is optimal to adjust rather at the extensive margin.

Eventually, it is important to recall that these effects might be influenced by the coincident presence of the financial crisis. Theory in this respect does not provide clear guidance on whether the financial crisis tends to go for or against the effects of the reform. On the one hand, since financial constraints were presumably very high during this period, the real effects of payment delays should have been magnified. On the other hand, precautionary motives might have prevented firms to readjust their portfolio of export markets while it would have been optimal to do so. Further research on other regulations on payment delays such as the Federal Quickpay Initiative in 2011 in the US or the Directive 2011/7/EU that generalizes the French reform to the whole European Union might show whether our results hold with more standard financing conditions.

7 Conclusion

Our results point to a significant effect of the variation in domestic payment delays on the decisions to enter or to exit an export market for small firms operating in sectors relying on external finance. This finding is of particular interest to the study of export barriers in developing countries: while trade credit is a very important source of financing for firms operating in developing countries (Fisman, 2001), excessive payment delays remain a pervasive source of concern while performing day-to-day operations in those markets (ACCA, 2015). Policies aiming at reducing payment delays (such as simplifying customs procedure, see Hummels (2007)) or fostering the development of factoring firms might thus allow small firms in developing countries to access international markets.

The theoretical model then suggests a role of operational leverage (that is, how total sales depend on a single customer) on the effects of payment delays. Using client-level export data might generate interesting results on how firms adjust their portfolio of clients following a shock on liquidity risk (see Kramarz, Martin and Mejean (2014) for a study of the propagation of individual shocks in exporter-importer networks).

Payment delays might also affect other individual outcomes. In this respect, it seems legitimate to believe that *PD* might affect labor decisions (Barrot and Nanda, 2016) since unlike input purchases, wage payment can not generally be delayed; it is possible that in presence of financial constraints, recurrent late payments might deter from hiring since firms fear being unable to meet the additional payroll expenses. Structural estimations might eventually be useful to estimate the aggregate effects of payment delays on the whole economy.

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a temporary impact on cash holdings as firms adjust to their new payment contracts. Since we control for $\Delta CashTA_{f,t}$, our regressions should mostly capture the effects of (1) and leave aside (2).

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Appendix A Characterization of the optimal contract - Proofs

The resolution of this type of continuous-time contracts introduced in section 1.1 is based on the constatation that the lifetime expected utility of the agent evaluated at time t

$$U_t^\theta = E^\theta\left[\int_0^{\tau_L} e^{-rt}dC_s + Re^{-r\tau_L}|\mathscr{F}_t^N\right] = \int_0^t e^{-rt}dC_s + e^{-rt}W_t^\theta$$

is a $\mathscr{F}^N$-martingale under the probability measure $\mathbf{P}^\theta$ given by θ. It is useful in this context to introduce the compensated process $M^\theta = \{M_t^\theta\}_{t\geq 0}$ given by

$$M_t^\theta = \int_0^t (dN_s - \lambda_s\theta_s)ds. \tag{17}$$

The process M^θ can be interpreted as the effective amount of payments minus the payments expectation at time t; in line with the Girsanov theorem for Brownian motions, it can be proved that M^θ is a $\mathscr{F}^N$-martingale under $\mathbf{P}^\theta$. In other terms, once the change of probability induced by the process θ is accounted for, the expectation of realized cash-flows should not change over time. The martingale representation theorem for point processes then allows to state that:

Lemma A.1. *The martingale U^θ satisfies*

$$U_t^\theta = U_0^\theta + \int_0^{t\wedge\tau} e^{-rs} H_s^\theta dM_s^\theta \tag{18}$$

for all $t \geq 0$, $\mathbf{P}^\theta$-almost surely, for some $\mathscr{F}^N$-predictable process $H^\theta = \{H_t^\theta\}_{t\geq 0}$.

Proof: see Brémaud (1981). ■

This result shows that the lifetime utility of the agent evolves directly with the compensated process M^θ. Using (10) and (18), the evolution of the continuation utility of the agent W_t^θ can be computed as

$$dW_t^\theta = rW_t^\theta dt + H_t^\theta X_t dM_t^\theta - dC_t \tag{19}$$

This representation of the continuation utility allows to characterize precisely incentive-compatible contracts in delays of conditions on the process H_t^θ. For the agent to prefer to maintain a high rate of cash-flows arrival by choosing $\theta = 1$, it must be that $H_t^\theta \leq 1$ so that

$$\begin{aligned}
dW_t^\theta &= rW_t^\theta dt + H_t^\theta X_t(dN_t - \lambda_t\theta_t dt) - dY_t^B - di_t \\
&= rW_t^\theta dt + H_t^\theta X_t(dN_t - \lambda_t dt) + (H_t^\theta - 1)(1-\theta_t)\lambda_t X_t dt - di_t \\
&\leq rW_t^\theta dt + H_t^\theta X_t(dN_t - \lambda_t dt) - di_t.
\end{aligned}$$

If this inequality holds, then for all effort intensity θ, the evolution of the continuation utility dW_t^θ is at most equal to the situation with no shirking (last line). This result can be summarized in the following proposition (see Cvitanic and Zhang (2012) for a very detailed proof):

Proposition 6. *A necessary and sufficient condition for the diverting process θ to be incentive-compatible given the contract (i, τ_K, τ_L) is that*

$$\theta_t = 0 \textit{ if and only if } H_t^\theta \leq 1 \tag{20}$$

for all $t \in [0, \tau_L[$, $\mathbf{P}^\theta$-almost surely.

As a corollary, we can deduce that $\hat{\tau} = \inf\{t \geq 0 \,|\, W_t = R\} = \tau_L$. Suppose on the contrary that $\hat{\tau} < \tau_L$. Then by proposition 6 with $\delta > 0$

$$W_{t+\delta} \leq R + \int_{\hat{\tau}}^{\hat{\tau}+\delta} ((rW_s - \lambda_s X_s)ds + X_s dN_s)$$

For the condition (10) to hold, the integral should be negative $\mathbf{P}^\theta$-almost surely, which is not the case.

Since the principal has the possibility to pay the agent for every W_t, the profit function must verify $b(W_t + \Delta i) \geq b(W_t) - \Delta i$ for all nonnegative payment Δi: hence, $b'(W_t) \geq 1$ for all W_t. On the other hand, writing that for all $W_t \geq R$, total surplus $TS(W_t)$ can not be superior to the perfect information case yields $TS(W_t) = b(W_t) + W_t \leq \Pi/r$. These conditions impose that for $W_t \geq R^* = \Pi/r$, $b'(W_t) = -1$.

The following lemma allows to directly show in a Poisson framework that the candidate for the principal's profit function is concave.

Lemma A.2. *Take h a solution (if it exists) of the following differential equation $rh(W) = \Pi + (rW - \Pi)h'(W) + \lambda(h(W+X) - h(W_t))$ (21) with border conditions $b'(W_t) = -1$ for $W_t \geq R^*$ and $\overline{R} = \inf\{W_t \geq R|, |h'(W_t) = -1\}$; thanks to (6), $\overline{R} > R$. Then h is strictly concave on $[R, \overline{R}[$.*

Proof: Suppose that $h'(W_2) \geq h'(W_1)$ with $W_2 > W_1 \in [R, \overline{R}[$. Take $W_a = \arg\max_{[W_1, W_2]} h'(W)$. If $W_a > W_1$, then using (21)

$$(r+\lambda)\frac{(h(W_a) - h(W_1))}{W_a - W_1} \leq rh'(W_a) + \lambda\frac{(h(W_a + X) - h(W_1 + X))}{W_a - W_1}$$

Taking the limit with $W_1 \to W_a$, we have that $h'(W_a) \leq h'(W_a + X)$. If $W_a = W_1$, we know that h' is constant over $[W_1, W_2]$ which implies by a similar reasoning that $h'(W_a) = h'(W_a + X)$. If $W_a + X \geq \overline{R}$, then $h'(W_a) = -1$, contradiction. If $W_a + X \le \overline{R}$, it is necessary by construction that h' is nondecreasing on an interval of the form $[W_a, W_a + X]$. Using the same reasoning recursively, we obtain that there exists $W_h < \overline{R}$ such that $h'(W_h) = -1$, contradiction. ■

Proof of proposition 1 and 2: For any i, τ_K, θ, H^θ and starting value W_0, defining G_t as

$$G_t = \int_0^t e^{-rt}(dY_t - di_t) + e^{-rt} b(W_t^\theta) \tag{22}$$

with b the principal's profit function, one can see that

$$\begin{aligned} e^{rt} dG_t =& (\Pi_t + b(W_t^\theta + H_t^\theta X_t) - b(W_t^\theta))(dN_t - \lambda_t dt) - (b'(W_t^\theta) + 1) di_t \\ &+ (\Pi_t - rb(W_t^\theta) + (rW_t^\theta - H_t^\theta \Pi_t) b'(W_t^\theta) + \lambda_t (b(W_t^\theta + H_t^\theta X) - b(W_t^\theta)) \\ &+ b'(W_t^\theta)(H_t^\theta - 1)(1 - \theta_t)\lambda_t X_t) dt \end{aligned} \tag{23}$$

Then, using the fact that $b'(W) \ge -1$ and that $H_t^\theta \le 1$ we obtain the inequality

$$\begin{aligned} e^{rt} dG_t \le& (\Pi_t + (b(W_t^\theta + X_t) - b(W_t^\theta))(dN_t - \lambda_t dt) \\ &+ (\Pi_t - rb(W_t^\theta) + (rW_t^\theta - \lambda_t H_t^\theta \Pi_t) b'(W_t^\theta) + \lambda_t (b(W_t^\theta + H_t^\theta X) - b(W_t^\theta))) dt \end{aligned} \tag{24}$$

Define the function h^I and h^E as the solutions to the differential equation (21) with the constants and the border conditions given in the propositions 1 and 2 as well as the corresponding G^E and G^I. Using the concavity of h_E, we obtain that

$$\begin{aligned} e^{rt} dG_t^E \le& (\Pi_t + (h_E(W_t^\theta + X_t) - h_E(W_t^\theta))(dN_t - \lambda_t dt) \\ &+ (\Pi_t - rh_E(W_t^\theta) + (rW_t^\theta - \lambda_t \Pi_t) h_E'(W_t^\theta) + \lambda_t (h_E(W_t^\theta + X) - h_E(W_t^\theta))) dt \\ \le& (\Pi_t + (h_E(W_t^\theta + X_t) - h_E(W_t^\theta))(dN_t - \lambda_t dt) \end{aligned} \tag{25}$$

By concavity of h, $h(W_t^\theta + X_t) - h(W_t^\theta)$ is bounded: G_t^E is therefore a $\mathbf{P}^\theta$-supermartingale. We obtain

$$E_\tau^\theta [G_\tau^E] \le E^\theta [G_0^E] = h^E(W_0) \tag{26}$$

with equality if and only if $H_t^\theta = 1$ and $di_t = 0$ for $W_t^\theta \in [R, R^*]$ and $di_t = W_t^\theta - R^*$ for $W_t^\theta \ge R^*$. By definition of b^E, $b^E = h^E$ and proposition 1 follows. A similar reasoning shows $E_{\tau_K \wedge \tau_L}^\theta [G_{\tau_K \wedge \tau_L}^I] \le E^\theta [G_0^I] = h^I(W_0)$ with equality if and only if $H_t^\theta = 1$, if $di_t = 0$ for $W_t^\theta \in [R, W_K]$ and if the contract follows proposition 1 after starting to export, which shows proposition 2. ■

Appendix B Empirical predictions - Proofs

We first have to determine how the profit functions react to changes in the intensity of the Poisson rate.

Lemma B.1. *The function $W \to \partial b^k(W)/\partial \lambda_k$ for $k \in \{I, E\}$ is concave for $W \in [R, R^*]$.*

Proof: Suppose that there exists $W_1, W_2 \in [R, R^*]$ and $t \in]0,1[$ such that

$$\frac{\partial b^k(W_g)}{\partial \lambda_k} < t \frac{\partial b^k(W_1)}{\partial \lambda_k} + (1-t) \frac{\partial b^k(W_2)}{\partial \lambda_k}$$

with $W_g = tW_1 + (1-t)W_2$. By continuity of the function $\lambda_k \to \partial b^k(W, \lambda_k)/\partial \lambda_k$ for a given W[23], this inequality

[23] $\partial b^k/\partial \lambda_k$ is even C^1 as it verifies the first order ordinary differential given by differentiating 21 with respect to λ_k.

is true for an interval $[\lambda_a, \lambda_b]$. Integrating over this interval and using the concavity of b^k yields

$$\begin{aligned} b^k_b(W_g) &< b^k_a(W_g) + t(b^k_b(W_1) - b^k_a(W_1)) + (1-t)(b^k_b(W_2) - b^k_a(W_2)) \\ &< t b^k_b(W_1) + (1-t) b^k_b(W_2) \end{aligned}$$

which is a contradiction with the concavity of b^k_b. ■

Lemma B.2. $\frac{\partial b^I(W)}{\partial \lambda_I} \geq 0$ *and* $\frac{\partial b^E(W)}{\partial \lambda_E} \geq 0$ *for all* $W \in [R, R^*[$.

Proof: Take $k \in \{I, E\}$ and $W \in [R, R^*[$. The equation (21) rewrites

$$\frac{d}{dW}\frac{b^k(W)}{\Pi_k - rW} = \frac{\Pi_k + \lambda_k(b^k(W + X_k) - b^k(W))}{\Pi_k - rW}$$

which leads to

$$b^k(W) = (\Pi_k - rW)\left(\frac{L}{\Pi_k - rR} + \int_R^W \frac{\lambda_k(b^k(\omega + X_k) - b^k(\omega))}{\Pi_k - r\omega} d\omega\right)$$

Noting $\Delta : W \to \lambda_k(b^k(W + X_k) - b^k(W))$, we have then that

$$\frac{\partial b^k(W)}{\partial \lambda_K} = (\Pi_k - rW)\left(\frac{L}{\Pi_k - rR} + \int_R^W \frac{1}{\Pi_k - r\omega}\left(\left.\frac{\partial \Delta(\omega)}{\partial \lambda_k}\right|_{b^k} + \lambda_k\left(\frac{\partial b^k(\omega + X_k)}{\partial \lambda_k} - \frac{\partial b^k(\omega)}{\partial \lambda_k}\right)\right) d\omega\right)$$

Since b^k is concave and $X_k = \Pi_k/\lambda_k$, $(\partial\Delta(\omega)/\partial\lambda_k)_{b^k} \geq 0$. By concavity of $\partial b^k(W)/\partial\lambda_k$ we obtain that $\omega \in [R, W]$

$$\lambda_k\left(\frac{\partial b^k(\omega + X_k)}{\partial \lambda_k} - \frac{\partial b^k(\omega)}{\partial \lambda_k}\right) \geq \frac{\Pi_k}{R^* - R}\left(\frac{\partial b^k(R^*)}{\partial \lambda_k} - \frac{\partial b^k(R)}{\partial \lambda_k}\right) = 0 \tag{27}$$

since $b^E(R^*) = 0$, $b^I(R^*) = -K$ and $b^k(R) = L$ for all λ^k. This shows that $\partial b^k(W)/\partial\lambda_k \geq 0$ for all $W \in [R, R*]$. ■

Proof of proposition 3: If the agent has all the bargaining power, $b^I(W_0) = I$ and $b'^I(W_0) < 0$. Differencing the first equation,

$$\frac{\partial b^I(W_0)}{\partial x} + b'^I(W_0)\frac{\partial W_0}{\partial x} = 0$$

which gives the effect of $1/\lambda_I$. Moreover, replacing dY^R_t by $\Pi_t dN_t$ in (11) and (12) yields $\partial b_r(W_K)/\partial\Pi_r \geq 0$ for $r \in \{I, E\}$; the prediction on the effect of Π_I follows.

If the bank acts like a monopoly, $b'^I(W_0) = 0$ and therefore by (21)

$$r b^I(W_0) = \Pi_I + \lambda(b^I(W_0 + X_I) - b^I(W_0)) \tag{28}$$

Take $\lambda_2 > \lambda_1$ and b_1, b_2, W_1, W_2 solutions of (28) (subscripts are dropped for more clarity). Suppose that $W_2 < W_1$. Then by concavity $b'_1(W_2) > 0$ and $\lambda_1(b^I(W_2 + X_I) - b^I(W_2)) \geq \lambda_1(b^I(W_1 + X_I) - b^I(W_1))$ and therefore $b_1(W_2) \geq b_1(W_1)$ by (21), contradiction. The proof is the same for the effect of Π_I. ■

Lemma B.3. *If* $\tau_K > 0$ *(that is if it is not optimal to immediately export),* $b'^I(W_K) = b'^E(W_K) \leq 0$.

Proof (Philippon and Sannikov (2007): The first equality follows directly from the border conditions given in 1. Suppose then that $b'^I(W_K) = b'^E(W_K) > 0$. By concavity of b_I, $b'_I > 0$ and thus $b_I(W) \leq b_I(W_K) = b_E(W_K) - K$ for all $W \in [R, W_K]$. Taking W^*_E that maximizes b_E, we see that $b_I(W) \leq b_E(W^*_E) - K$. It would be optimal for the firm and the agent to directly choose $W^*_0 = W^*_E > W_0$ and to immediately start to export, which is in contradiction with $\tau_K > 0$. ■

Proof of proposition 4: The exporting threshold W_K is then defined by $b_I(W_K) = b_E(W_K) - K$. Calling $V_I = \{\lambda_I, \Pi_I\}$ and $x_E = \{\lambda_E, \Pi_E\}$ we have for $r \in \{I, E\}$ and for $x_r \in V_r$

$$\frac{\partial b_I(W_K)}{\partial x_r} + \frac{\partial b_I(W_K)}{\partial W_K}\frac{\partial W_K}{\partial x_r} + b_I'(W_K)\frac{\partial W_K}{\partial x_r} = \frac{\partial b_E(W_K)}{\partial x_r} + b_E'(W_K)\frac{\partial W_K}{\partial x_r}$$

since W_K is a parameter for b_I. Noticing that

$$\frac{\partial b_s(W_K)}{\partial x_r} = 0 \text{ if } s \neq r,\ b_I'(W_K) = b_E'(W_K) \text{ and } \frac{\partial b_I(W_K)}{\partial W_K} = b_I'(W_K)$$

we get

$$\frac{\partial b_I(W_K)}{\partial x_r} + b_I'(W_K)\frac{\partial W_K}{\partial x_r} = \frac{\partial b_E(W_K)}{\partial x_r}$$

which gives proposition 4 for V_I and V_E. Eventually, $\partial b_r(W_K)/\partial K = -(b_I'(W_K))^{-1} \geq 0$. ■

Lemma B.4. *For all $\epsilon > 0$, the function $P : W \to E\left[1_{\tau_K < \tau_L} | W_t = W\right]$ is strictly concave (resp. strictly convex) on $[R, W_K - \epsilon]$ if $\lambda_I > r$ (resp $\lambda_I < r$).*

Proof: Noticing first that P is a martingale, writing

$$dP(W_t) = ((rW_t - \Pi_I)P'(W_t) + \lambda_I(P(W_t + X_I) - P(W_t)))dt + (P(W + X_I) - P(W))(dN_t - \lambda_I dt) \tag{29}$$

yields the differential equation verified by P :

$$(\Pi_I - rW_t)P'(W_t) = \lambda_I(P(W_t + X_I) - P(W_t)) \tag{30}$$

On $[W_K - X_I, W_K]$, $P(W + X_I) = 1$ and the differential equation becomes

$$(\Pi_I - rW_t)P'(W_t) = \lambda_I(1 - P(W_t)) \tag{31}$$

On a an interval of the form $[W_K - X_I, W_K - \epsilon]$ with $\epsilon > 0$, this equation can be solved as

$$P(W_t) = 1 - C_\epsilon \left(\frac{\Pi_I - rW_t}{\Pi_I - r(W_K - X_I)}\right)^{\frac{\lambda_I}{r}} \text{ for } W_t \in [W_K - X_I, W_K] \tag{32}$$

with $C_\epsilon > 0$ a constant that depends on ϵ. This function is strictly concave if (resp. strictly convex) if $\lambda_I > r$ (resp $\lambda_I < r$). The following part of the lemma shows that the concavity (convexity) of P "travels" to the rest of the interval through the differential equation (30). Suppose that $\lambda_I > r$ (the other case can be treated by reversing the inequalities in the following) and take $W_\epsilon = \inf\{W_t \in [R, W_K - \epsilon] \mid P \text{ is concave}\}$. Let's make the assumption that $W_\epsilon > R$. On $[R, W_K]$, $P'(W_t) = \lambda_I(P(W_t + X_I) - P(W_t))/(\Pi_I - rW_t)$ and thus P'' exists and is given by

$$P''(W_t) = \lambda_I \frac{\left(P'(W_t + X_I) - P'(W_t)(\Pi_I - rW_t) + r(P(W_t + X_I) - P(W_t))\right)}{\Pi_I - rW_t} \tag{33}$$

By continuity $P''(W_\epsilon) = 0$ and thus

$$(P'(W_\epsilon + X_I) - P'(W_\epsilon))(\Pi_I - rW_\epsilon) + r(P(W_\epsilon + X_I) - P(W_\epsilon)) = 0 \tag{34}$$

Using (30) it can be rewritten

$$P'(W_\epsilon + X_I)(\Pi_I - rW_\epsilon) = (\lambda_I - r)(P(W_\epsilon + X_I) - P(W_\epsilon)) \tag{35}$$

Once again, replacing $(P(W_\epsilon + X_I) - P(W_\epsilon))/(\Pi_I - rW_\epsilon)$ with (30) we eventually get

$$P'(W_\epsilon + X_I) = \left(1 - \frac{r}{\lambda_I}\right) P'(W_\epsilon) \tag{36}$$

The equation (32) shows that $W_\epsilon < W_K - X_I$. On $]W_\epsilon, W_K - \epsilon]$, P is strictly concave. Writing (30) at $W_t = W_\epsilon$ and using the strict concavity of P

$$\begin{aligned}(\Pi_I - rW_\epsilon)P'(W_\epsilon) &= \lambda_I(P(W_\epsilon + X_I) - P(W_\epsilon))\\ &> \lambda_I \frac{\Pi_I}{\lambda_I} P'(W_\epsilon)\\ &> \Pi_I P'(W_\epsilon + X_I)\end{aligned}$$

where the first inequality comes from $f(y) - f(x) > f'(x)(y-x)$ (which is valid for f strictly concave) and the second inequality from the fact that P' is non increasing on $]W_\epsilon, W_k - \epsilon]$. But then

$$P'(W_\epsilon + X_I) < \left(1 - \frac{rW_\epsilon}{\Pi_I}\right) P'(W_\epsilon)$$

and using (36) we get

$$1 - \frac{r}{\lambda_I} < 1 - \frac{rW_\epsilon}{\Pi_I} \Leftrightarrow W_\epsilon < \frac{\Pi_I}{\lambda_I} < R$$

by assumption (8), contradiction. ■

Lemma B.5. *For all $\epsilon > 0$, The function $W \to \partial P(W)/\partial \lambda_I$ is concave for $W \in [R, W_K - \epsilon]$.*

Proof: The proof is the identical to the one presented for the lemma B.1. ■

Proof of proposition 5: Take $\epsilon > 0$ and $W_t \in [R, W_K - \epsilon]$. Using the differential equation 21, P can be expressed as

$$P(W_t) = \int_R^{W_t} \frac{\lambda_I(P(\omega + X_I) - P(\omega))}{\Pi_I - r\omega} d\omega \tag{37}$$

Noting $\Delta_P : W \to \lambda_I(P(W + X_I) - P(W))$, we have that for $W_t \in [R, W_K - X_I[$, $W_t + X_I < W_K$ and

$$\frac{\partial P(W_t)}{\partial \lambda_I} = \int_R^{W_t} \frac{1}{\Pi_I - r\omega} \left(\frac{\partial \Delta_P(\omega)}{\partial \lambda_I}\bigg|_P + \lambda_I \left(\frac{\partial P(\omega + X_I)}{\partial \lambda_I} - \frac{\partial P(\omega)}{\partial \lambda_I} \right) \right) d\omega \tag{38}$$

Since P is concave and $X_I = \Pi_I/\lambda_I$, $(\partial \Delta_P(\omega)/\partial \lambda_I)_P \geq 0$. By strict concavity of $\partial P(W)/\partial \lambda_I$ we have then that for all $\omega \in [R, W]$

$$\lambda_I \left(\frac{\partial P(\omega + X_I)}{\partial \lambda_I} - \frac{\partial P(\omega)}{\partial \lambda_I} \right) > \frac{\Pi_I}{W_K - \epsilon - R} \left(\frac{\partial P(W_K - \epsilon)}{\partial \lambda_I} - \frac{\partial P(R)}{\partial \lambda_I} \right) \tag{39}$$

Since this equality holds for all $\epsilon > 0$, we obtain by continuity with $\epsilon \to 0$

$$\lambda_I \left(\frac{\partial P(\omega + X_I)}{\partial \lambda_I} - \frac{\partial P(\omega)}{\partial \lambda_I} \right) \geq \frac{\Pi_I}{W_K - R} \left(\frac{\partial P(W_K)}{\partial \lambda_I} - \frac{\partial P(R)}{\partial \lambda_I} \right) = 0 \tag{40}$$

since $P(W_K) = 1$ and $P(R) = 0$ for all λ_I. This shows that $\partial P(W_t)/\partial \lambda_I \geq 0$ for all $W_t \in [R, W_K - X_I]$. The proof for the effect of Π_I starts by noting

$$P(W_t) \geq \int_R^{W_t} \frac{\lambda_I(P(\omega + X_I) - P(\omega))}{\Pi_I} d\omega \tag{41}$$

and is then identical than for the effect of λ_I. The second part of the proposition comes naturally from the fact that $E[1_{\tau_L < \tau_K} | W_t = W] = 1 - E[1_{\tau_K < \tau_L} | W_t = W]$. ■

Appendix C Entry of non-exporters

Table 8: Effects of *Var NPD*$_{f,t}$ at the extensive margin (Exit)

	OLS (1)	IV 2SLS (1)	IV 2SLS (2)	IV 2SLS (3)	IV 2SLS (4)
	Entry of non-exporters				All
Var NPT$_{ft}$	-0.000	-0.001	-0.001	-0.001	-0.002^{**}
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Var Sales$_{ft}$	-0.000	-0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Δ*OperMarg*$_{ft}$	0.004	0.005	0.001	0.001	0.005
	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Size$_{f,t\text{-}1}$	0.001^{***}	0.001^{***}	0.001^{***}	0.001^{***}	0.003^{***}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Group$_{f,t}$	-0.000	0.000	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Δ*CashTA*$_{ft}$			0.000	0.000	-0.000
			(0.000)	(0.000)	(0.000)
Δ*DebtTA*$_{ft}$				-0.001	
				(0.003)	
BG Liquidity$_{f,t\text{-}1}$				-0.000	
				(0.000)	
Observations	140 600	139 800	133 300	132 800	886 950
Product-Destination FE	Yes	Yes	Yes	Yes	Yes
R^2	0.013	-	-	-	-
Weak identification (KP stat)	-	37.85	34.00	34.55	337.31

All standard errors are clustered at the firm level. *, **, and *** denote statistical significance at 10, 5 and 1%. Standard errors are given in parentheses. The Kleibergen-Paap statistic (KP stat) tests for the presence of a weak instrument in presence of heteroscedasticity (high values suggest to reject the null hypothesis of weak identification).

Appendix D Derogations

This appendix gives the maximum contractual payment delays 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).

- *Purchases of living cattle:* 20 days
- *Purchases of perishable products:* 30 days
- *Purchases of alcoholic beverages:* 30 days
- *Purchases of grapes and must:* 45 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:* 125 days

- *Aquaculture and marine fish farming:* 120 days
- *Recreational vehicles:* 130 days
- *Toy stores; agricultural supplies:* 150 days
- *Book edition:* 195 days
- *Agricultural machines:* 210 days

Appendix E Unobserved heterogeneity : export markets

Table 9: Unobserved export market heterogeneity.

	IV 2SLS (5) - ΔY_{fcit}		IV 2SLS (5) - $Exit_{fcit}$		IV 2SLS (5) - $Entry_{fcit}$	
	Var NPD$_{ft}$	KP/Obs.	*Var NPD$_{ft}$*	KP/Obs.	*Var NPD$_{ft}$*	KP/Obs.
Baseline	−0.018	170.220	0.011^{**}	196.273	-0.002^{***}	301.098
	(0.012)	108 537	(0.005)	140 789	(0.001)	753 650
Excluding US	−0.017	168.547	0.012^{**}	194.093	-0.002^{***}	300.030
	(0.012)	105 504	(0.005)	136 559	$(0.8 \cdot 10^{-3})$	741 200
EU	−0.006	209.645	0.009^{**}	224.909	-0.003^{***}	301.097
	(0.015)	56 384	(0.005)	65 370	(0.001)	301 460
Excluding EU	-0.034^{*}	97.006	0.015^{*}	127.677	-0.002^{*}	301.098
	(0.019)	54 258	(0.008)	75 419	$(0.9 \cdot 10^{-3})$	452 190
Europe (excl. EU)	−0.045	110.765	0.023^{**}	145.118	-0.004^{***}	301.077
	(0.033)	9 211	(0.012)	12.736	(0.001)	60 292
America	−0.050	68.993	−0.004	91.130	$0.3 \cdot 10^{-3}$	301.082
	(0.037)	8 821	(0.011)	1 558	(0.002)	75 365
Asia	−0.052	50.252	0.024^{*}	77.063	−0.001	301.095
	(0.036)	17 104	(0.013)	24 929	(0.001)	211 022
Africa	0.009	62.550	0.014	83.145	-0.003^{*}	301.085
	(0.052)	13 444	(0.017)	20 409	(0.001)	90 438
Pacific	−0.022	50.814	0.020	60.783	-0.007^{***}	301.002
	(0.058)	3 573	(0.019)	4 787	(0.002)	15 073

All standard errors are clustered at the firm level. *, **, and *** denote statistical significance at 10, 5 and 1%. Standard errors are given in parentheses. The Kleibergen-Paap statistic (KP stat) tests for the presence of a weak instrument in presence of heteroscedasticity (high values suggest to reject the null hypothesis of weak identification). All estimations are made according to the IV 2SLS (5) model (see tables 4 and 6). *Baseline* denotes the estimations with the standard specification.