Do late payers decide to pay faster?

The role of firm size in the persistence of late payment

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Abstract

Despite laws implementing a 60 days' ceiling in payment terms, late payments stay as a subject of concern. In this paper, we investigate whether late payers, i.e., firms with payables exceeding 60 Days of Purchases Outstanding (DPOs), subsequently reduce their payment delays. Using a representative database of French firms, we look at changes of payables for firms paying late with respect to firms paying on time, controlling for operational and financial determinants of payables. Results show that late payers reduce their DPOs by 5.1 days on average. However, this number systematically varies across firm size. While SMEs and ISE paying late reduce significantly their DPOs, returning cash to their suppliers, large firms make on average no effort in that domain, retaining cash. Therefore, the reduction of payment delays determines significant transfers of cash whose burden bears on small buyers with weak bargaining power. However, a significant reduction of buyers' DPOs appeared with the implementation of the French legal 60 days' standard in 2009, what advocates for the strict respect of this norm.

Keywords: Trade credit, late payments, Supply chain finance

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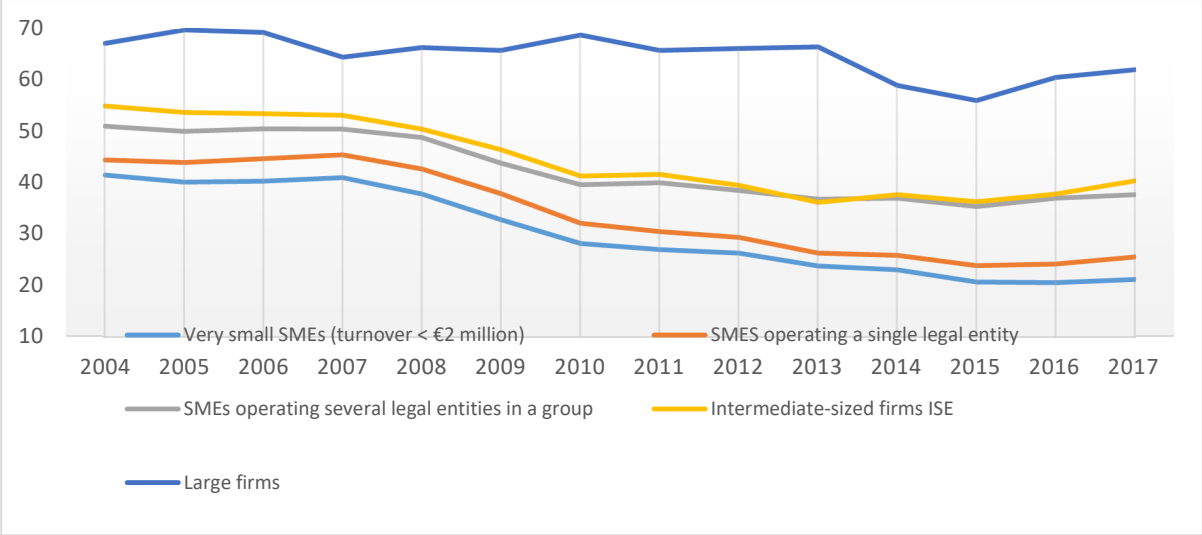
1. Introduction

Late payments, that is the settlement of invoices after the agreed date, represent a danger for the solvency of suppliers. To thwart the negative consequences of late payments on the financial health of firms, a French law ("Loi de Modernisation de l'Economie") introduced in 2009 a legal limit of 60 days for most inter firm payments[1]. In 2011, the European Union launched a "European Directive on combating late payment in commercial transactions" (EU, Directive 2011/7/EU). As in France, the Directive requires that European enterprises pay their invoices within 60 days. However, even if these legal changes have been followed by a reduction of the payment delays during the years around the implementation of the French law and the European Directive, late payments remain a matter of concern. In Europe, professional surveys reveal that the share of payments by due date is 42.8% in 2018 (DNB, 2019). Moreover, in France as in the other European countries, large firms appear to be on average less punctual than SMEs (DNB, 2019). Figure 1 illustrates the French situation using the very representative dataset extracted from the Banque de France FIBEN database we use in this paper. It presents the evolution of the share of firms paying their suppliers after 60 days by size class. First, it shows an overall decreasing trend in the share of late payers across size classes, which in fact reflects the decreasing trend in trade credit when expressed in days of purchases outstanding (DPO). Indeed, the (value weighted) average amount of payables went from 61 days in 2004 to 51 days in 2018 (Banque de France, 2020). Second, Figure 1 shows unambiguously that although the share of firms paying late has fallen, it remains high on average and is positively related to size (Boileau and Gonzalez, 2017). In fact, according to our definition, the majority of large firms appear to be late payers all over the period of observation.

[1] Exceptions concern the sale of fresh foods and the transportation sector that are submitted to even more stringent norms of payment delays.

Figure 1: Share of firms paying after 60 days by firm size - 2009-2018



Firms are assumed to be late payers if their end-of-year payables represent more than 60 days' purchases outstanding (DPO). Very small SMEs are with a turnover lower than 2 million euros. SMEs are with turnover between 2 and 50 million euros. Here, we operate a distinction between SME operating a single legal entity and SMEs operating several legal entities in a business group where entities are grouped because of strong financial links. ISE (Intermediate Sized Enterprises) are with a turnover between 50 and 1.500 million euros. Large corporate businesses have a turnover over 1.500 million euros.

Source: Banque de France FIBEN and authors' computations.

The observed larger prevalence of late payers among larger firms is amplified by the concentration of payables within larger firms. Large firms, *i.e*. firms with turnover larger than €1.500 million, represent around 45% of the total payables of late paying firms operating in France what represent more than 130 billion of euros (2017 data). This persistence likely exacerbates the financial constraints weighing on their suppliers. Indeed, the financial burden of net trade credit, the difference between receivables and payables, is significantly higher for SMEs than for large firms. This burden corresponds to around 12 days of annual turnover for French SMEs against only 4 days for French large firms (Banque de France, 2020). While late payment may not by itself explain this difference, the heterogeneity in payment practices likely contributes to the transfer of liquidity along supply chains, through trade credit.

Thus, trade credit appears to be a major source of liquidity transfers among firms along supply chains. In Europe, it is of the same order of magnitude than short-term bank credit (ECCBSDO, 2016, Banque de France, 2015). The literature as widely acknowledged its importance as a coordination device along supply chains, especially in allowing risk sharing, overcoming of financial constraints, and coordinating inventory and production decisions. Hence, the supply chain finance literature assigns the lengthening of payment delays to fundamental reasons linked in the combined management of operation and

financial risks in the supply chain (Zhao and Huchzermeyer, 2015). Delaying payments allows sharing the funding of inventories (Lee and Rhee, 2011) and, more generally, contributes to the sharing of demand risk across clients and suppliers (Yang and Birge, 2018). Moreover, the finance literature shows that the length of payment delays is linked to frictions in the credit markets that create problems of access to credit for financially constrained firms. It brings evidence that small firms lean on their larger suppliers for funding when access to traditional financial markets is limited (Schwartz, 1974, Petersen and Rajan, 1997, Garcia-Appendini and Montoriol-Garriga, 2020). Thus, buyers with better access to credit – and lower cost of capital – could play a role of liquidity providers to the benefit of smaller and financially constrained firms. Nevertheless, without calling into question the trade credit vs. bank credit problem many firms actually face, recent empirical evidence converges in highlighting another picture of the customer-supplier relationships, which is largely related to frictions in the product markets. This evidence shows that large buyers with market power and large cash reserves are overly delaying payment, thereby borrowing from their small, possibly financially constrained suppliers (Klapper, Laeven and Rajan, 2012, Murfin et Njoroge, 2015, Fabbri and Klapper, 2016, Coricelli and Frigerio, 2019). These results suggest that firms with high bargaining power may be able, by delaying payments to extract excess cash from their suppliers, *i.e.* cash that does not help alleviating their operational and financial constraints.

In that perspective, our paper considers the role of delaying payment as a device to reallocate funds among non-financial firms. Hence, we address the question to know to what extent firms, which are paying late at a given time subsequently, adjust their payment delays to their suppliers. In order to investigate the behavior of firms identified as late payers, we specify a model of changes in payment delays considering the late payer status as an explanatory factor and controlling for operational and financial constraints. Our approach assumes that a share of a firm's changes in payment delays is not related to these constraints and is autonomously linked to being late, reflecting heterogeneous payment behaviors. To avoid endogeneity issues, that is to insure that the late payer status is independent from the unobservable factors explaining changes in payables at the firm level, we adopt the instrumental variable procedure detailed in Wooldridge (2002).

To implement this methodology, we use the Banque de France FIBEN database that includes quite all French firms with turnover over €0.75 million. It contains accounting information on firms as well as firm rating maintained by the Banque de France. The panel we use spans the period 2004 – 2017. It restricts the population to firms with payables lower than 120 or 150 days of purchases outstanding (DPOs), depending of the sector (see below), to dismiss firms whose particular financial or sectoral situation create temporary endured or permanently agreed high values of DPOs which escape their control. On average, our panel contains quite 100.000 firms per year.

Results show that firms which are later payers a given year reduce their payment delays expressed in days of purchases outstanding on average by 5.1 days. This is consistent both with the observed decline in the share of firms paying late and with overall decrease of payables over the period. However, results vary substantially across size classes. More particularly, this number tends to decrease with the firm size in the SMEs and ISEs populations. Thus, SMEs and ISEs return part of the cash provided by the payment delays to their suppliers. However, we do not observe a significant effect of being a late payer on changes in delays of payment in the population of large buyers. Large firms do not react to being a late payer and uphold the liquidity provided by their suppliers. Thus, while we assume that firms are merely sharing the same rationales to resort to trade credit whatever their size, the decision to adjust payment delays reveals considerable heterogeneity in the firms' willingness to reduce excessive payment delays. Given the observed concentration of late payments on large firms, our results contribute to highlight the importance of large firms in the persistence of late payments in France. This questions the widespread view that large firms may act as financial intermediaries channelling resources gathered from the financial sector towards financially constrained clients. On the contrary, large firms may use their bargaining power to impose de facto (either contractually or by disregarding contractual terms) longer payment terms to their suppliers, gaining a permanent access to a cheap source of liquidity.

Moreover, results we get for sub-periods show that the reductions of buyers' DPOs are concomitant to the implementation of the 60 days' norm by the LME. In our model, the firm financial conditions variables capture the impact of the macroeconomic changes on the buyers' financial structure and working capital induced by the 2008 financial crisis and 2011 sovereign debt crisis. Thus, the changes in DPOs associated to the payment status reflect the impact of the changes of economic environment, including the implementation of the 60 days' norm.

The paper is organized as follows. Section 2 presents a review of the literature. In section 3, we present the data and some stylised facts about payment delays in the French context. In section 4, we present the methodology. Section 5 presents the results. Section 6 concludes and presents the public policy implications of our results.

2. The rationales to delay payments: lessons from the literature

Our paper relates mainly to the supply chain finance literature that puts the determination of payment terms at the core of the vertical relationships between suppliers and buyers. In this approach, the payment scheme (cash on delivery or granting payment delays) is a main component of the suppliers'

terms of trade. Accordingly, contractually agreed delays of payment match an optimal level, agreed by the commercial partners, depending upon operational, technological, or strategic and competitive dimensions of vertical relationships. Payment delays may be used by the buyers to verify the product quality (Long *et al*., 1993), to facilitate trade by pooling transactions (Ferris, 1981), to compensate inventory or shortage capacity costs (Seifert *et al*., 2013), or to resolve informational asymmetries along the production chain (Franks and Maksimovic, 1998, Klapper *et al.*, 2012, Kim and Shin, 2012). As part of a supply contract, lengthening of the delays of payment also allows sharing the funding of inventories (Lee and Rhee, 2011) and, more generally, the demand risk across clients and suppliers (Yang and Birge, 2018). Trade credit acts as a commitment device, facilitating specific investments and product differentiation in production (Burkart and Ellingsen, 2004, Cuñat, 2007, Dass *et al.*, 2015). Finally, in the supply chain, delays of payment determine the order quantity (Chang et al., 2008, Seifert et al., 2013, for reviews) and can be used as a strategic leverage to smooth (Fabbri and Klapper, 2008) or increase the supplier's sales and its share in the supply chain profits. In that perspective, late payment, that is payment after the due date, could be considered as a deviation from the payment delay optimal level that could be related to the existence of frictions in the credit markets and in the product markets.

Consider first the role of frictions in the credit market. Since the seminal paper of Schwartz (1974), an important strand of the literature as emphasized, the role of trade credit in overcoming permanent financial constraints of customers resulting from a limited access to bank credit (Petersen and Rajan, 1997, Burkart *et al.*, 2011, Klapper *et al*, 2012, Shenoy and Williams, 2017). In that perspective, credit market frictions rely in particular on the banks' limited knowledge about borrowers' credit worthiness. Therefore, better informed and financially unconstrained suppliers channel financial resources to financially constrained customers, acting as financial intermediaries by establishing credit chains parallel to supply chains.

Nevertheless, firms may deviate unilaterally from the contractually defined payment terms because they face unanticipated events disrupting operations and cash flows. While such events may usually be of idiosyncratic nature, they can also be the result of aggregate shocks. Hence, some works have specifically focused on the changes in trade credit supply during financial crises (*e.g*., Howorth and Reber, 2003, Boissay and Gropp, 2013, Garcia-Appendini and Montoriol-Garriga, 2013, Casey and O'Toole, 2014, Carbo-Valverde *et al.*, 2016, Adelino et al., 2020). They mostly conclude that suppliers back their financially constrained customers in such circumstances. However, this support may be to some extent involuntary, suppliers undergoing their customers' delayed payments.

In fact, one reason for which buyers could use extensively trade credit is that it gives them the opportunity to benefit from a cheap source of funding[2], which they can prefer to internal cash reserves and other external sources of finance, such as bank loans, in accordance with the pecking order theory. As shown in Lins *et al*. (2010), cash holdings provide a precautionary hedge against the possibility that capital market frictions will prevent firms from obtaining external finance. On its side, trade credit could improve the coordination of operations and liquidity management at the firm level (Chod and Zhou, 2014) and mitigate the firm bankruptcy risk (Gamba and Triantis, 2015). Therefore, buyers may have a general preference for trade credit, *i.e.*, for longer payment delays, either ex ante (contractual delays) and ex post (delaying contractual payment). Nevertheless, late payment practices may harm future operations as suppliers could reduce or suspend future deliveries, the provision of trade credit being costly for the suppliers. Therefore, the ability of firms to obtain more favourable payment terms are likely determined by their bargaining power in the vertical relationship. Accordingly, buyers in position to extract longer delays from their suppliers may indeed take advantage from their position. In that case, the decision to delay payment would reflect a strategic intent of buyers, relying on their bargaining power relative to that of buyers.

Thus, consider now the role of the frictions in product markets as a source of late payment. A rich literature has developed arguments that go in that direction. Thus, Wilner (2000) builds a model where trade credit provision depends on the mutual dependency of suppliers and customers. If a customer depends strongly on a supplier's sales, the supplier is in a better position to require buyers to pay more quickly, and vice-versa. The model also predicts higher trade credit provision when the customer's purchases represent a larger share of the supplier's sales. Fabbri and Klapper (2016) empirically show that suppliers with weak bargaining power towards their customers are more likely to extend trade credit and offer a longer payment period before imposing penalties. Moreover, larger buyers generate also more likely overdue payments. In addition, these effects are linked to the degree of horizontal competition between suppliers or between customers. Hence, trade credit provision appears negatively related to the supplier's market power (Fisman and Raturi, 2004, Dass *et al*., 2015, Fabbri and Klapper, 2016, Chod *et al*., 2019).

The link between bargaining power and payment delays is reinforced by the potential substitution between selling price and trade credit provision. The use of trade credit as a competition instrument could be preferred to price discounts. Rather than starting a costly price war that will destroy part of profits, suppliers find interest to delay payments. Vertical restraints theory shows that a competitor

[2] Indeed, the use of price discounts for cash-payments appears at most marginal, so that the cost of payment delays for the buyers is quite low. Moreover, penalties for late payment, while formally widespread, turn out to be rather limited in practice.

that would be tempted to depart from a cooperative behavior in starting a price war does not really get a stable profit on the long run (Besanko *et al*., 2006). In the case where suppliers form an oligopoly, the suppliers themselves prefer the lengthening of delays. Consistent with this idea, Lehar *et al.* (2020) observe an inverse U-shaped relationship between the amount of surplus suppliers get by extending trade credit and the degree of competition in the upstream market. Along the same idea, Gianetti *et al.* (2019) suggest that trade credit provision to high bargaining power customers allows suppliers to price discriminate between different customers without distorting competition in the downstream market, thereby safeguarding their increasing price schedule for the sales to customers with lower bargaining power

Bargaining power is often related to firm size, suggesting that larger customers may be more often in position to delay payment. Indeed, several recent empirical papers highlight that large and high-rated buyers, with a good access to financial institutions and markets, may borrow via trade credit from smaller, financially weaker suppliers. Coricello and Frigerio (2019) document that during the 2009 crisis European SMEs sharply increased their net trade credit, thus transferring financial resources to larger firms. This amplified the liquidity squeeze on SMEs, creating adverse effects on their activity. Most papers in that field document the associated real effects of downstream lending for constrained suppliers. Murfin and Njoroge (2015) find that trade credit provision crowds out investment or other profitable uses of cash for small suppliers. For financially constrained suppliers, late payment precedes a long-term reduction in profitability. Barrot (2016) shows that a French regulation restricting payment delays in the trucking industry has favored an increase in the entry of small firms, also increasing investment and employment. Breza and Liberman (2017) find that the restriction of trade credit use reduces procurement of products mostly purchased from affected suppliers and makes vertical integration more likely. These results underline the importance of trade credit as a dimension of the supplier's profitability and the impact of bargaining power on supplier-customer relationships.

To summarize, trade credit is an important parameter of supplier-customer relationships serving as a coordination mechanism of operational and financial constraints. However, payment terms and practices may also be determined arbitrarily by the respective bargaining powers of commercial partners, at the expense of weaker suppliers. This calls for investigating whether late paying firms, given their operational and financial constraints, make efforts to reduce DPOs (or not) and return cash to their suppliers.

3. Data

The sample

In this paper, we use the Banque de France FIBEN database. It collects the financial statements of companies registered in France with turnover exceeding € 0.75 million or, until 2012, with bank debt exceeding € 0.38 million. Hence, FIBEN represents a large share of French firms at the exception of very small businesses such as proprietorships and small retailers. In 2017, its coverage rate was over 89% in terms of turnover of all companies that are subject to corporate tax in France. The database also contains the solvency' rating provided by the Banque de France ratings system.

The data are collected in FIBEN at the legal entity level. Then, the legal units pertaining to the same firm[3] are consolidated according to their financial links. The study population includes the firms belonging to all industrial and commercial sectors, excluding the financial and the public sectors. The panel covers a period of 14 years, from 2004 to 2017. The size and the sector of activity are determined at the firm level[4]. Appendix A provides a comprehensive presentation of the firms' population.

Days of purchases outstanding (DPOs), defined as "payables" in the following, are computed for each firm on an annual basis by using balance sheet (BS) payable accounts. Thus, DPO is the annual ratio of BS payable accounts, net of advances and prepayments, divided by firm purchases of goods and services and expressed in days (i.e., multiplied by 360). It provides a proxy of the average maturity of current suppliers' invoices of each firm as a buyer. Taking 60 days as the upper (legal) cap, late payers are those firms with computed payables exceeding 60 days.

In this paper, we retain only non-financial and private firms and we restrict the sample to firms with payables positive and lower than 120 days or 150 days in certain sectors (see below). The choice of industry-specific ceilings reflects special payment patterns in well-defined activities where payables are structurally much longer either because of the length of the production process, e.g., real estate construction, because of the practices of paying institutions such as State in healthcare, or because

[3] As defined by the French decree "No. 2008-1354 on the criteria for determining the category to which an enterprise belongs for the purposes of statistical and economic analysis" defines the statistical concept of firm as "the smallest combination of legal units constituting an organizational unit for the production of goods and services which enjoys a certain degree of autonomy in decision-making, in particular for the allocation of its current resource the smallest combination of legal units constituting an organizational unit for the production of goods and services which enjoys a certain degree of autonomy in decision-making, in particular for the allocation of its current resources".

[4] In the case of a firm consisting of several legal units, the sector is determined from a sector grouping of the legal units. The sector retained is that of the legal units whose weight in the firm is the greatest in terms of turnover, if this exceeds 50%. Otherwise, the classification by sector of the various "groupings" of legal units is made based on the number of employees, always if the weight exceeds 50%. Failing that, we return to the classification by turnover, using the sector of units with the highest share.

clients are rather subcontractors than customers, as in services to businesses. Moreover, the 150 days' limit (instead of 120 days) in these industries preserves the same sector composition in the sample as in the total population (see Appendix A.1. for details). Indeed, firms with delays higher than these thresholds – which represent around 5% of the entire FIBEN population – are overly firms facing operational and financial difficulties that favour abnormal extra drawing on payables. We exclude them because we want to focus on firms that are likely to have some discretion in their payment policy, given their operational and financial constraints, in order to adjust (or not) payables if they actually are late payers. Firms in financial distress, or very young firms with limited sales, may be constrained in a way excluding this possibility.

For similar reasons, and following the same procedure, we exclude firms displaying a sales-to-purchases ratio higher than 2.5 in most sectors and higher than 7.5 in the three previously mentioned sectors. Firms beyond these ratios are firms with very low sales (relative to their purchases), reflecting either a starting or a vanishing activity. These firms are assumed to be too far from the frontier of firms that are paying on time, or could at least try to adjust the speed at which they pay invoices. Finally, we exclude firms that are not rated by the Banque de France ratings system and we left out companies belonging to a foreign group as they are more likely not subject to the legal payment norm in force in France for their suppliers. At the end, after panel selection, the annual number of firms in the population is around 100.000 firms per year.

Univariate analysis: Late payments in the French context

Table 1 presents the mean of payables in days of purchases outstanding (DPO) over the 2004-2017 period by firm size. It shows that large firms maintained higher DPOs towards their suppliers over all the period, relative to other firms. Moreover, the median values observed for the large firms remain well beyond the legal ceiling of 60 days. On the contrary, SMEs and intermediate sized businesses reduced DPOs, starting in 2007, just before the implementation of the 60 days' norm by the French "LME" law. This observation is unsurprisingly consistent with the high frequency of late payers among large firms as seen previously from Figure 1. It shows a dramatic drop of the share of firms paying late over the period starting in 2007-2008, just before the implementation of the LME 60 days' norm, except for large firms. While the drop of late payments is impressive in the very small and other SMEs, around two third of the largest firms continue to pay late at the end of the 2010s.

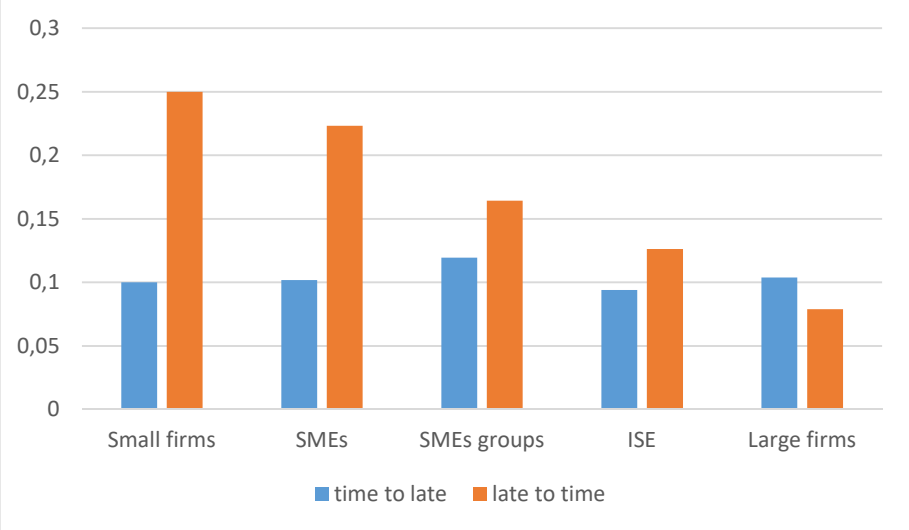
Table 1: Average payables in days of purchases outstanding (DPOs) over the 2004-2017 period

	Small firms	SMEs	SMEs groups	ISEs	Large firms
2004	55,6	56,4	62,6	66,5	69,1
2005	56,2	57,2	62,7	66,5	71,3
2006	56,3	57,1	62,6	65,6	69,4
2007	54,5	55,8	61,4	64,6	71,8
2008	51,2	52,9	58,6	61,2	67,6
2009	49,0	50,1	56,8	59,6	65,2
2010	48,8	49,4	57,2	59,4	64,7
2011	48,1	48,3	56,1	57,8	63,3
2012	46,8	47,5	55,7	57,2	63,5
2013	46,4	47,2	55,9	56,9	63,9
2014	44,8	45,9	55,3	56,5	61,9
2015	44,6	45,6	55,3	56,8	63,5
2016	45,1	46,7	56,3	57,9	65,7
2017	45,3	47,0	56,6	59,3	61,9

Source: Banque de France and authors' calculus.

What does explain both the existence of a sizeable share of late payers among firms and its apparent heterogeneity across size classes? To provide a first insight into the factors explaining these observations, one might consider being a late payer as a state, which each firm may either enter or leave during its existence.

Figure 2: Average transition rates (in %)



Note: "time to late" designates the proportion of firms with DPOs smaller than 60 days that became late payers (DPO's larger than 60 days) over one year. "late to time" designates the proportion of late payers that pay on time one year later. Transition rates are computed including firms that are at least present in the data for 10 years. Source: Banque de France FIBEN database and authors' calculus

Accordingly, the apparent persistence of late payments could be the result of the dynamics of the entry in and exit from the late payer status. Indeed, the longer firms becoming late payers (i.e., with DPOs becoming larger than 60 days) stay in the late payer status, the larger the fraction of firms appearing as late payers a given year. Hence, the length of the late payer spell will be determined by both the rates of entry and exit of the late payer state. Figure 2 illustrates this point by showing the average annual transition rates into and out from the late payer state for five classes of increasing firm size. It appears that while entry rates are similar (although statistically different) across size classes, exist rates are clearly decreasing as firm size increase, ranging from 25% for small firms to 7.9% for large firms. Thus, large firms are late payers for longer durations, which results in the larger proportion of late payers among large firms as observed from Figure 1.[5]

Table 2: Mean, median and standard deviation of the change in payable delays depending of the payment status (late payer/on time payer) in the total population – complete period 2004-2017

	On time payers			Late payers			
	Median	Mean	Std	Median	Mean	Std	Difference
Small firms	1.7	4.9	24.6	-7.9	-8.8	71.5	13.7***
SMEs	1.1	3.3	17.6	-6.8	-8.3	43.8	11.6***
SMEs groups	2.0	5.9	25.0	-4.5	-5.5	60.0	11.4***
ISEs	0.8	2.6	14.4	-2.5	-3.6	35.7	6.1***
Large firms	0.7	2.0	8.8	-0.7	-0.3	24.2	2.3**
Difference Large firms vs.							
Small firms					-8.5***		
SMEs					-8.0***		
SMEs groups					-5.2***		
ISEs					-3.3***		

Source: Banque de France and authors' calculus.

[5] Assuming that the transitions into and from the late payer status follow a Markov-1 process, the stationary proportion of late payers within firms would be 29% (resp. 56.7%) for small (resp. large) firms. These values are overly consistent with the proportions displayed in Figure 1.

Consequently, it appears that the persistence of late payment in merely linked to the time firms remain late payers, which appears to be related to firm size. As the late payer status is defined relatively to the 60 DPOs threshold, exiting from the late payer state requires firms to reduce the DPOs below this level. However, this could happen more or less readily, depending to some extent upon their financial and operational constraints, but also upon their ability to maintain the financial gain of being a late payer, possibly linked to size. To illustrate this issue, Table 2 shows the changes in DPOs across size classes distinguishing between firms paying on time and late payers between 2004 and 2017. It shows considerable differences in the firms' payment behaviour depending of their size. In, particular, it confirms that large firms that are late payers are less prompt to reduce the payment delays, on average.

4. Methodology

As discussed in Section 2, the trade credit literature provides several rationales for suppliers and buyers to agree upon longer payment terms in order to share risks and profits in the supply chains, depending upon the features of the product market competition and the nature of traded goods. In addition, changes in payments terms and payment practices may also reflect the changes in the funding constraints of firms, especially in terms of access to bank short-term credit.

Our approach assumes that a share of a firm's changes in payment delays is not related to these operational and financial constraints and is autonomously linked to being a late payer, reflecting heterogeneous payment behaviour and, possibly, the impact of the customers and suppliers' relative bargaining power in their bilateral relationship. Therefore, in order to investigate the behaviour of firms identified as late payers, we specify a model of changes in payment delays considering the late payer status as an explanatory factor and controlling for operational and financial constraints.

However, this empirical strategy requires the identification of late payers. Here, we take advantage of the existence in the French legal norm of 60 days to identify the sub-population of buyers paying late. More precisely, this limit was enforced in 2009, *i.e.*, after the start of our data. However, we do not try to evaluate the efficiency of the introduction of this legal limit for three main reasons. First, despite being a legal norm, the 60 days' limit has not been stringently enforced. Second, before its implementation in the French legal framework, it was widely acknowledged as a sound business practice. Therefore, the 60 days' limit might be a conventional threshold defining late payment over the entire observation period. We assume that this threshold provides a norm which firms may try (or not) to comply with or at least to get closer if they are identified as late payers. Finally, the scope of

application of the threshold was nationwide, preventing the identification of a non-treated population as in Barrot (2016).

Focusing on the behaviour of firms conventionally defined as late payers allows identifying if being a late payer induces a subsequent effort to reduce payment delays. Accordingly, this leads to the following specification:

$$\Delta P_{i,t} = \alpha + \beta Late_{i,t-1} + \gamma X_{i,t} + \varepsilon_{i,t} \quad (1)$$

The endogenous variable $\Delta P_{i,t}$ is the variation of payables over the year *t* for firm *i* with respect to the end-of-year payables at *t* – 1, expressed in days of purchases. $Late_{i,t-1}$ is a dummy variable equal to 1 if a firm is a late payer defined as any firm with end-of-year DPOs exceeding 60 days in *t* – 1. Formally, late payment is linked to each invoice, which is either payed before or after its contractual terms, given the applicable legal requirements. However, only the end-of-year total payables are observable from the firm accounts. This accounting indicator is the conventional proxy of payment behavior, as a larger inventory of payables more likely reveals late payment practices. Indeed, under the assumption of a uniform distribution of sales over the year, end-of-year payables expressed in days of annual turnover would be equal to the average maturity of payables. Therefore, an average maturity larger than the threshold of 60 days would reflect that, on average, this firm is a late payer. In equation (1), $X_{i,t}$ is a vector of control variables gathering variables known to be operational or financial determinants of payables. Finally, the error term $\varepsilon_{i,t}$ possibly entails time and firm fixed effects. This specification allows testing the hypothesis of an association between the variations of payables that cannot be attributed to structural and operational characteristics of a firm and its late payer status in the preceding year. Therefore, if firms try to respect the 60 days' limit, we expect a negative β parameter, i.e., late payers a given year pay faster the following year.

The error term $\varepsilon_{i,t}$ captures all idiosyncratic and unobserved variables that explain the variation in payables for a firm a given year. However, we cannot exclude that these variables could be correlated with the late payer status. Indeed, if late payment has a behavioral dimension, it is likely that being a late payer would be correlated with unobserved variables associated with changes in payables. This would result in an endogeneity issue leading to a biased estimate of β. To address this issue, we follow the instrumental variables procedure described in Wooldridge (2002, p 623). Consequently, given the previously defined variables and a vector $Z_{i,t}$ of instruments, we perform a binary probit regression:

$$P\left(Late_{i,t} = 1 \middle| X_{i,t}, Z_{i,t}\right) = \Phi\left(X_{i,t}, Z_{i,t}, \delta\right) \quad (2)$$

Regression (2) yields the fitted probability $\widehat{\Phi}_{i,t}$, the probability for firm *i* to be a late payer at time *t*. In order to take into account possible structural changes in the relationship between the instruments

and the late payer status, $\widehat{\Phi}_{i,t}$ is estimated each year separately for all firms present that year in the data. In a second step, a two stages least squares instrumental variable estimation of model (1) is performed using instruments $\widehat{\Phi}_{i,t}$ and $X_{i,t}$. To further control for heterogeneity, we specify this second step as a panel regression with time and firm fixed effects.

We consider the following control variables in the equation (1). First, we introduce changes in payables are likely to be determined by the growth of the firm's operations. We consider two indicators of firm growth: turnover growth and purchases growth. Firms increasing their purchases may alter their payment behavior and pay later. We therefore expect a positive relationship between the growth of purchases and the changes in payables. In addition, the growth of sales may also determine payables. On the one side, growing sales increase the required working capital that may induce delayed payment. On the other side, growing sales may lead to increased cash inflows and facilitate faster payment. These variables are introduced under the form of dummies representing intervals of growth rates, to control for the existence of extreme negative of positive values (see Appendix B for the definitions of variables and summary statistics[6]). Furthermore, some structural characteristics of the firm's operations may also determine payment. More specifically, the ratio of sales to purchases proxies the intensity of the transformation of purchased inputs the firm performs and its position upstream or downstream along the supply chains. The larger the ratio, the smaller the relative importance of purchases. We therefore expect a negative relationship between this ratio and changes in payables. This variable is also introduced under the form of dummies representing intervals of the ratio to control here for extreme positive values reflecting very specific characteristics of firms located in sectors such as the services to businesses sector or the real estate sector, where the payment delays could be by nature very long. Besides these growth and structural indicators, we consider usual variables that reflect the operational cycle of the firm and ultimately determine its cash position. Hence, we introduce both the contemporaneous changes in receivables and inventories (both expressed in days of turnover) as well as the variation of total bank debt, as firms may try to absorb changes in bank debt by altering their payment behavior. We expect a positive association between changes in payables and changes in receivables and inventories and a negative one with changes in bank debt. In addition, the firm liquidity may determine payment behavior. We therefore introduce as additional control variables the lagged cash and liquid assets holdings, on the one hand, and total bank debt, on the other one (both in percentage of total assets). We expect a negative association for both variables with changes in payables, a better access to liquidity potentially facilitating faster payment. We consider also the profit margin, expecting firms more profitable to pay faster. Finally, we introduce

[6] Table B.1 in the Appendix presents the mean, median and standard deviation of the main economic and financial ratios in the firms' population.

the firm credit rating in order to capture the effect of financial strength on changes of payables, assuming that weaker firms may delay payment to relieve partially their financial constraints or, on the contrary, may be required to pay faster by their suppliers.

In the first stage logistic regression - equation (2) -, we have chosen the following instruments. First, we introduce a set of variables that reflect environmental and structural features, which could affect the current payment terms agreed by the trade partners. We therefore consider broad characteristics as industry, size classes, and year effects, as variables that are likely to be associated with the late payer status while being independent from the unobservable factors determining changes in payables. We also add the ratio of sales to purchases, which could also determine the level of current payment delays along the production process. In the same vein, we also consider the lagged median value of payables (in days of purchases) in each "bucket" built by crossing the firm's sector and its size class, which provide a firm independent assessment of the payment practices among the firm's peers. Second, we introduce as instruments the lagged values of the changes in the two main components of the firm working capital, *i.e.,* receivables and inventories, over the last two years, and expressed in days of turnover. Finally, we introduces the lagged net cash reserves ratio, defined as the sum of cash and liquid financial assets minus short-term debt expressed in days of turnover. These variables may determine the late payer status while being independent of current management decisions of working capital.

Our main regression considers late payment defined as payables exceeding 60 days of purchases, as this threshold has been considered for long by practitioners as a sound business practice and has been incorporated in the French law in 2009. Therefore, we expect a negative relationship between late payment and changes in payables, firms exceeding the 60 days' threshold at one moment being expected to try to pay faster subsequently. We extend this approach in two dimensions. A first extension consists to consider an alternative 90 days' threshold to identify specific patterns among firms with are presumed to be the worst payers. Indeed, the 60 days' limit cannot be considered as binding in our data for at least two reasons: i) the norm was introduced in the French law only in 2009 while our data start in 2004, ii) it was not stringently enforced as late payers were not penalized until very recently[7]. Therefore, despite its wide acceptance as defining sound business practices, the choice of the 60 days' threshold remains somehow arbitrary. Indeed, late payers could be indifferent to the 60 days' norm while nevertheless trying to reduce DPOs over 90 days, considered as overly excessive.

[7] Since 2016, the department of the French Ministry of Economics and Finance that is in charge of the follow-up of competitive practices has implemented (non-systematic) surveys on the firms' payment delays and applied penalties up to €3 million to delinquent companies.

However, firms with payables exceeding 90 DPOs could also be in situations, e.g., financial distress, making any reduction impossible, all things being equal.

A second extension consists to replace the late payment dummy by the lagged end-of-year DPOs. Indeed, a significant effect associated to the late payment dummy could just reflect a more general correlation between changes of payables over one year and the level of payables at the end of the previous year. This third specification is similar to the partial adjustment models commonly used in the analysis of capital structure and dividend policies of firms. These models link changes in a variable of interest to its past value, controlling for a set of structural characteristics. A negative association between these two variables is deemed reflecting an adjustment behavior around a target value (leverage, payout ratio ...). Applied to late payment, this logic implies that firms with larger DPOs would tend to decrease DPOs the following year, or the reverse. While this approach does not allow determining the optimal amount of DPOs at the firm level, it nevertheless provides an assessment of the average adjustment behavior of firms. Nevertheless, if firms specifically adjust their payment behavior with respect to a conventional (or legal) 60 days' norm, we expect firms exceeding it to reduce more their DPOs than the other firms. This approach therefore allows testing for the specificity of the 60 days' threshold in terms of payment. The estimation of this third model does not require the first stage probit regression and relies only on the two stage least square IV estimation, using the same set of instruments.

5. Results

Baseline regression: Complete sample

First, we estimate the system of equations (1) and (2) for the whole population over the entire period 2004-2017, and the late payer status defined as DPOs larger than 60 days. Table 3 gathers the estimation results of the probit regressions for the two thresholds (60 and 90 days) for all firms belonging to the complete sample and for the year 2004[8]. Table 4 gathers the results of the various specification of equation (1) for the same population.

[8] The probit model has been estimated for each year of the period under study, providing annual probability to be late which are integrated in the estimation of the equation 1.

Table 3 Probit regression results

	(1) Over 60 days	(2) Over 90 days
Lag. median DPOs	0.058***	0.045***
Sales to purchases ratio		
Intermediate	0.576***	0.384***
High	0.417***	0.205***
Lag 1Y var. receivables	0.013***	0.01***
Lag 2Y var. receivables	0.004***	0.005***
Lag 1Y var. inventories	0.003***	0.003***
Lag 2Y var. inventories	0.002***	0.003***
Lag cash ratio	0.001***	0.005**
SME single entity	0.160***	0.121***
SME groups	0.447***	0.328***
ISE	0.413***	0.335***
Large firms	0.734***	0.402***
Intercept	-3.93***	-4.81***
Industry FE	Yes	Yes
Annual FE	Yes	Yes
Pseudo R-square	17.3%	8.6%
Somer's D	0.422	0.363
% concordant	71.1	68.1
N	75751	75751

Table 3 shows the estimation results of the binary probit model of a firm being a late payer for 2004. These regressions are performed annually.

The case of the 60 days' threshold

Results in Table 3 show that being a late payer is positively related to the median value of payables in each buyer peer group built by crossing its sector and its size class. Hence, for each buyer, on average, the median trade credit use by its peers act as an anchor of its own payment behavior, which reflects the role of structural factors in the determination of the probability to pay late. Next, the payment on due date is less frequent in firms with medium or high levels of the sales to purchases ratio which reflects the position of the firm in the production process. Thus, firms are more likely late payers in upstream markets characterized by higher values of the Sales/Purchases ratio. This could reflect higher inventory costs, which could favor a lengthening of payment delays. In the same line of arguments, the late payer status is positively associated to the lagged values (with lags of one and two years) of the variations of the inventory turnover and accounts receivable (both expressed in days of annual

turnover). The lagged values of these variables reflect the permanent reliance of firms on trade credit. Results show that if trade credit is a source of liquidity to finance firm operations and cover operations risks, the probability to pay on time decreases. Finally, the probability to be a late payer increases sharply with firm size (using very small SMES as the reference category), consistent with the facts showing a rising proportion of late payers with firm size (see Figure 1).[9]

Table 4 Instrumental Variables regression results

	(1) IV 2SLS	(2) OLS	(3) IV 2SLS	(4) IV 2SLS
Over 60 days	-5.10***	-19.43***	-	-
Over 90 days	-	-	-0.97**	-
Lag. DPOs	-	-	-	-0.016**
Purchases growth				
Low	0.38***	0.26***	0.37***	0.37***
Intermediate	0.92***	0.71***	0.92***	0.92***
High	1.31***	1.28***	1.28***	1.28***
Sales growth				
Low	-1.08***	-0.85***	-1.1***	-1.10***
Intermediate	-1.39***	-1.03***	-1.42***	-1.42***
High	-2.48***	-1.79	-2.54***	-2.54***
Sales to purchases ratio				
Intermediate	-1.69***	-1.56***	-1.73***	-1.72***
High	-2.31***	-2.13***	-2.36***	-2.35***
Credit rating				
Intermediate	0.07	0.52***	0.12**	0.12**
Poor	0.82***	2.24***	0.93***	0.92***
Cash ratio	-0.04***	-0.04***	-0.04***	-0.04***
Lag. profitability	-4.56***	-5.90***	-5.23***	-5.20***
Lag. bank debt	0.002***	0.002***	0.002***	0.002***
Var. bank debt	-0.006***	-0.003***	-0.006***	-0.006***
Var. receivables	0.29***	0.25***	0.29***	0.29***
Var. inventories	0.10***	0.09***	0.09***	0.10***
Firms FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
R-square	33.2	23.9	28.7	32.5
N	1.161.405	1.161.405	1.161.405	1.161.405

[9] In the regressions by size classes realized later, the size dummies are excluded from the first stage binary probit regressions.

Turning to the results of the main IV two-stage least squares panel regression in Table 4, Model (1) shows that being a late payer a given year is significantly associated with a reduction of about 5 days in DPOs the following year. Model (2) shows the results of the same specification using OLS, which yields a reduction in DPOs of more than 19 days. These results suggest the importance of the link between the late payer status and the unobservable specific factors explaining changes in DPOs at the firm level. Therefore, when controlling for this endogeneity bias by using IV 2LS method, late payers appear to reduce their DPOs of about 5 days, the model taking account for the buyers' working capital and financial constraints.

Consider now the control variables in the main regressions, starting with the operational constraints of the firms. First, a higher growth of purchases is associated with positive variations of DPOs. Simultaneously, sales growth is negatively associated with DPO changes. This result could be related to the increase of cash provided by the buyers' activity and the relaxation of financial constraints the economic growth generally induces. Moreover, the reference category in the regression is zero or a negative growth of sales. This may reflect the fact that less adverse constraints in the development of firms is associated to lower DPOs levels, once having controlled for the growth of purchases. Results confirm also that the position upstream or downstream of the buyer (reflected in the Sales/Purchases ratio) determines the capacity of buyers to change their trade credit use. Upstream buyers, located in the upper classes of the ratio, seem to be more prompt to reduce delays than downstream ones, located in lower classes of the ratio (here, the lower class of the ratio, with values lower than 1.25, serves as reference).

Results show also that financial health may help the buyer to reduce the length of DPOs. First, a higher level of cash and liquid assets reserves or a higher profitability (gross margin) reduce the use of trade credit, as these firms are less financially constrained. Moreover, a higher level of bank debt appears to supplement the use of trade credit. However, changes in bank debt are negatively related to changes in DPOs, reflecting a substitution in the short run between the two sources of external funding. Moreover, we observe a positive relationship between the trade credit use and a poor rating grade. This may reflect the larger reliance of less solvent firms on trade credit. To summarize, our results verify that both the availability of internal resources and the firm's credit quality contribute to the reduction of outstanding payables.

Then, the ability to reduce the payment delays is sensitive to the contemporary change in the firm's changes in the components of the required working capital, as reflected here in the changes in inventory turnover and receivables (both expressed in days of annual purchases). A positive change in

the two variables tend, quite logically, to be associated to significant increases of outstanding payables, reflecting a higher pressure on the buyer liquidity.

Alternative specifications of being a late payer

The payment ceiling of 60 days cannot be considered as formally binding for firms in our data for two reasons. First, it was introduced in French commercial law only in 2009 while our data start in 2004. Second, it was not stringently enforced as late paying firms were not penalized until very recently[10]. Therefore, despite its wide acceptance as defining sound business practices, choosing the 60 days' thresholds remains somehow an arbitrary choice. In order to check the robustness of our approach, we, first, consider the 90 days' threshold as an alternative. Indeed, late payers could be indifferent to the 60 days' limit while nevertheless trying to reduce DPOs over 90 days, considered as overly excessive. However, firms with payables exceeding 90 DPOs could also be in situations, e.g., distress, making a reduction of payables more difficult. Model 3 in Table 4 shows the regression results for the 90 days' threshold. Being a (very) late payer turns out to be negatively with changes in DPOs. However, the average reduction in DPOs turns out to be limited, i.e., about 1 day. Therefore, it seems in first analysis that firms have only a limited ability (or willingness) to reduce outstanding payables when they are in a position of large delay. This contrasts with the results observed for the 60 days' threshold. Turning to the control variables, we observe results very similar to our baseline regression.

Moreover, estimation results (Model 4 in Table 4) show a negative and significant parameter for the lagged DPO variable. Accordingly, firms with larger DPO levels a given year indeed reduce DPOs the following year (and vice versa), possibly reflecting adjustments around some target level. However, the economic significance of the estimated effect appears to be relatively small. Hence, a one standard deviation's change in DPOs (26.5 days) as observed in the total sample turns out to a decrease of 0.43 days in payables, much smaller than the almost 4 days estimated for late payers exceeding the 60 days' threshold. This further suggests that the negative effect is concentrated on firms with larger DPOs, i.e., defined here as late payers. These first results suggest that late payers on average subsequently adjust their payment behavior, validating our first hypothesis. However, this result seems to hold provided their DPOs are not too high, here larger than 90 days.

[10] Since 2018, the French Finance Ministry thoroughly applies the financial penalties legally defined and follows a "name and shame" strategy, organizing the publicity around prosecuted firms, especially the larger ones.

Regressions by size classes

Following our second hypothesis, we expect firms with a greater bargaining power compared to their suppliers to be in position to extract cash from the latter through higher DPOs. Here, quite conventionally, we associate bargaining power to firm size. Therefore, we expend our baseline model by replicating estimations for five size classes in order to identify systematic differences in the effect of the late payer status over changes in payables. Separate regressions per size class also allows taking into account the size-driven specific effects of the control variables on changes in payables. Within our estimation framework, we therefore expect differing effects associated to the late payer variable, i.e., larger relative reduction in DPOs for smaller firms.

The results confirm our hypothesis. The regressions by size classes show significant differences in the firms' reaction to be a late payer in terms of changes in DPOs. Table 5 gathers the main results of these regressions (for the sake of simplicity, we only report results for the variables of interest, the late payer thresholds. Appendix C shows the detailed results, i.e., including the control variables). Consider, first, the 60 days' threshold. The value of the parameter estimates varies with the firm size. Very small firms and single unit SMEs that are late payers reduce significantly payables, by 9 days and nearly 5 days, respectively. Similarly, SME organized in groups and ISE decrease payables, but to a lower extent, respectively by more than 1 day and about 4 days. However, the change in payables appears to be non-significant for the large firms, although the estimated parameter is also negative. Thus, large firms do not adjust their average payment practices when they are late payers, thereby keeping the liquidity provided by their suppliers. Our results are consistent with the idea that larger firms use their bargaining power to retain the liquidity provided by their suppliers. Overall, access to cash provided by suppliers through trade credit appears to be a substantial channel of liquidity reallocation that benefits to larger firms and penalizes smaller firms. The consequence is a distortion of the supply chain finance at the benefit of the largest customers.

Considering the 90 days' threshold, we observe a similar and indeed amplified result for the smaller firms with a reduction of 12 days in DPOs. Moreover, SMEs and ISEs exceeding the 90 days' threshold do not reduce their DPOs and even further increase their delays when focusing on SMEs organized in groups. At this stage, we cannot explain why these SMEs expand the cash level there extract from their suppliers, i.e., distinguish an uncontrolled potential effect of financial distress from a strategic intent to collect additional excess amounts of cheap funding. Nevertheless, considering larger levels of payables, the size contrast across small SMEs and SMES in groups and ISE appears to be amplified. However, the results for large firms do not confirm the approximately monotonic size effect observed for the 60 days' threshold. Indeed, larger late payers at the 90 days' threshold subsequently reduce

their DPOs of about 1 week. Thus, large firms appear to take into account the 90 days' level while ignoring the 60 days' level in their management of trade relationships.

Overall, considering the 60 days' threshold as the identification level of late payers, our first hypothesis is largely confirmed as smaller firms tend to reduce their payables to a larger extent when they are late compared to other firms, and beyond the expected variation of payment delays which is linked to their operational and financial characteristics. However, this observation is not entirely confirmed when considering the alternative threshold of 90 days. Especially, large firms appear to react to this higher level by significantly reducing their DPOs. This confirms the non-binding dimension of the legal 60 days' level for these firms, which may decide to adjust payment policies only for larger values of delays. Recalling that we further control for the economic and financial characteristics of firms as well as for time and individual heterogeneity, this results suggests that large firms indeed behave differently from the population of firms. Finally, considering lagged DPOs instead of the late payer dummies, we see from the results gathered in Table 5 that an adjustment behavior (i.e., a negative effect) only holds for small firms. On the contrary, we observe a positive effect, significant or not, for all the other size classes.

Table 5: Changes in payables delays for late payers (in days of purchases outstanding) by size classes

	All firms	Small firms	SMEs	SMEs groups	ISEs	Large firms
Late, over 60 days	-5.09***	-9.38***	-4.61***	-1.38*	-3.82***	-2.90
R^2adjusted (%)	33.2	37.4	36.0	34.9	33.3	32.0
Late, over 90 days	-0.97**	-12.09***	-0.52	5.28***	1.56	-7.09***
R^2adjusted	33.2	34.5	32.4	30.2	29.4	37.2
Lag. DPOs	-0.016**	-0.118***	0.01	0.11***	0.18***	0.03
1 std change	-0.43	-3.04	0.27	2.87	4.69	0.62
R^2 adjusted	29.1	37.1	31.5	27.3	17.4	31.7
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firms FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
N	1.161.405	544.193	414.819	175.316	24.869	2.208

Table 5 gathers the parameter estimates associated to the late payer status for the entire data and by size class. We consider three possible definitions of the late payer status: payables larger than 60 days of purchases, larger than 90 days of purchases, and the level of payables in days of purchases outstanding (DPOs). For the first two specifications, the late payer status being characterized by a dummy, the parameter estimate yields directly a change in payables measured in days of purchases. For the DPOs variable, the effect on the endogenous variable $\Delta P_{i,t}$ is computed from the parameter estimates considering a change of one standard deviation of DPOs in $t-1$.

Source: Banque de France and authors' calculus

Results by sub-periods

However, the adjustment behavior highlighted so far may not have been constant all over the time period considered. More specifically, the implementation of the LME in 2008 may have altered the payment behavior of French firms. In order to investigate the stability of our results over time, we extend the previous estimations by interacting the explanatory variables with sub-period dummies. This allows accounting both for changes in the intensity of the adjustment performed by late payers as for changes over time of the sensitivity of DPOs to our control variables.[11] We divide our data along three sub-periods: 2004-2007, 2008-2012, and 2013-2017. The intermediate sub-period encompasses the introduction of the legal payment ceiling of 60 days, which occurred in 2009. However, we consider a broader period, allowing both its potential anticipation as for an only progressive taking into consideration. Table 6 gathers the results. Considering the entire population of firms, we first observe that before the introduction of the LME, the marginal reduction of DPOs of late payers, although statistically significant, is limited in economic terms (slightly larger than 1 day), while it clearly increases from the introduction of the legal ceiling, reaching about 1 week. . However, this sub-period is also the period of the 2009 financial crisis. Besides the deterioration of the situation of many firms, the crisis could also have led to a general decrease in outstanding delays. This impact is captured in our model through the operational and financial characteristics of firms. Then, the effect associated to the late payer status variable may mainly capture the effect of the change of the legal environment, keeping in mind that we further control through annual fixed effects. Accordingly, a large part of changes in DPOs for late players in the 2009-2012 years relates to the implementation of the LME. Moreover, the estimated changes over time in DPOs for late payers show more important reductions at the end of the period relative to the first years of observation which contributed to the reduction of the share of late payers in the French economy.

Considering regressions by size classes, we further observe the size effect previously observed (see Table 5). First, small firms being late payers have increased their efforts to reduce DPOs from approximately 1 week before 2008 and about 11 days after. We observe a similar effect for SMEs,

[11] As an alternative specification, we also perform regressions where the parameters associated to the control variables are constrained to be equal across sub-periods. The results, not shown here but available upon request, are very similar regarding the effects associated to the late payer status, which remain unconstrained across sub-periods. Therefore, our results are not affected by the specific assumption about the stability (or lack thereof) through time of the link between the operational and financial characteristics of firm and the observed changes in payables.

while the effect appears to be insignificant (with a parameter value close to zero) before the introduction of the LME. Results are also similar for SMEs operating as groups and ISEs, with a significant decrease from 2008 and onwards. However, although we observe a change in parameters values for large firms from positive to negative, the estimated values remain statistically non-significant. Hence, large firms paying late do not adjust systematically their behavior, i.e. do not decrease their outstanding DPOs, neither before or after the introduction of the LME.

Table 6: Changes in DPOs for late payers by sub-periods and size classes

	All firms	Small firms	SMEs	SMEs groups	ISEs	Large firms
2004-2007	-1.18***	-6.52***	-0.79	4.12***	0.25	2.65
2008-2012	-7.87***	-11.65***	-7.09***	-4.57***	-5.30**	-7.40
2013-2017	-6.88***	-10.31***	-7.28***	-3.64***	-7.38***	-4.03
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firms FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj-R2 (%)	32.57	37.37	36.14	35.07	33.34	35.37
N	1.161.405	544.193	414.819	175.346	24.869	2.208

Table 6 gathers the parameter estimates associated to the late payer status (DPOs larger than 60 days) by sub-periods and size classes.

Source: Banque de France and authors' calculus

The reallocation of cash associated to late payments

The preceding results underline the heterogeneity across size classes of the adjustment of DPOs for firms being late payers. Moreover, the reduction of DPOs exerts a marginal cash constraint on buyers, all things being equal. Therefore, the heterogeneous response of late payers induces differences across size classes in the implied reallocation of cash within supply chains. In order to highlight the economic magnitude of this effect, we use the results of the preceding sections in order to provide a simulation of the cash transfers implied by the adjustment (or lack thereof) done by late payers. Eventually, our results help addressing this issue by allowing measuring the amounts of cash reallocated through the buyers' reaction to a late payment situation. To proceed to this simulation, we use the last year (2017) data of our database. The focus is here on amounts more than on delays expressed conventionally in days of purchases. Even if the levels of DPOs could look close from one size class to another one (see Table 1 in the introduction), the amounts of payables and purchases differ substantially among size classes. To this aim, we multiply the DPOs change of Table 5 by the total amount of 1 day of purchases

for late payers to compute the amounts of cash reallocated by late payers reducing (or not) their delays across the size of firms relative to firms paying on time and controlling for their operational and financial characteristics. The resulting figures hence provide an aggregate monetary valuation of the marginal adjustment effort realized (or not) by late payers.

Table 7: The amounts of cash reallocated in accordance to the firms' reaction to late payment by size class (2017 data, in million euros)

	Small firms	SMEs	SMEs groups	ISE	Large firms
Amount of 1 day of payables for late buyers (in million euros)	42	131	325	599	1508
Adjustment in DPOs of late payers (from Table 5)	-9.38	-4.61	-1.38	-3.82	0
Amount reallocated in reaction to late payment (in million euros)	-395	-603	-448	-2288	0
Amount reallocated in % of cash and liquid assets holdings	-15,2%	-8,0%	-1,6%	-3,1%	0,0%

Note: the amount of cash reallocated is computed by multiplying the estimated change in DPOs presented in Table 5 by the total amount of 1 day of purchases for late payers.

Source: Banque de France and authors' calculus

Table 7 gathers the results of this simulation. They show significant differences in the aggregated amounts of cash reallocated through late payer adjustments. While the aggregated amount returned by small firms is about 400 million euros, late paying SMEs (single entities and groups) returned around one billion euros to their suppliers (in 2017) and ISEs returned more than twice this sum (around 2.3 billion euros). On the contrary, the absence of a significant adjustment for large firms, we set the level of cash reallocated by these firms at zero. However, these amounts may merely reflect the size distribution of firms in the economy. Therefore, we relate these amounts to the aggregated cash and liquid assets holdings. Hence, the marginal adjustment effort of late payers appears to be limited for ISEs and SMEs operating as groups (and null for large firms), single entity SMEs and small firms devote respectively 8% and 15% of cash and liquid assets to the adjustment. Overall, while large buyers paying late retain all the liquidity provided by suppliers, small firms return an amount of cash representing 15% of their total cash and liquid assets and the percentage of cash reserves returned to the suppliers is very significant for other SMEs and ISE.

Conclusion and policy implications

Despite the legal implementation of a ceiling of 60 days of outstanding purchases, late payments stay as a subject of concern. In France, a large proportion of buyers continues to be identified as late payers at the end of the 2010s, as their DPOs exceed the norm. Moreover, being a late payer appears to be systematically related to firm size. This is the case, in particular, for the fringe of the largest buyers, which represent the vast majority of late payables in France. Using the accounting data of a large database of French firms provided by the Banque de France and covering the 2004-2017 period, this paper investigates the adjustment of payment behavior of late buyers by measuring the change of payables delays these firms decide to implement from one year relative to firms paying on time. Our results verify that the decision to reduce late payment significantly depends on the firm size. While large firms do not reduce significantly delays and consequently maintain the retention of cash from their suppliers, small firms paying late return significant amounts of cash to their suppliers, even after controlling for operational and financial characteristics. This is consistent with the observed changes in the share of late payers across size classes..

Our results are likely to explain the slowness of the reduction of payment delays and the persistence of a significant fringe of late payers in the 2010s. Moreover, they suggest that the relationship between the late payers' decision to reduce payables delays and firm size could be related to the relatively weak bargaining power of small suppliers within the supply chain in comparison with large buyers. Thus, our results are consistent with the hypothesis in the supply chain literature that larger buyers use their bargaining power either to retain permanently the liquidity provided by their suppliers. Overall, the access to cash provided by suppliers through trade credit causes of substantial reallocation of cash within supply chains, to the profit of the larger firms. While public policies have traditionally emphasized the need to facilitate the access of firms to alternative sources of liquidity than payment delays in order to reduce late payment, our results emphasize the importance of firm behavior. Due to the apparent low cost of trade credit from the buyers' perspective, firms that are able to extract liquidity from their suppliers take advantage of their position, possibly due to their bargaining power within supply chains. Thus, our results argue in favor of a stricter application of the legal framework defined by the LME in France and the European Directive of 2011 in all members' countries of the European Union, especially towards large firms. A first step in this direction is the "name and shame" policy implemented since 2018 by the French Ministry of Economy, which publicizes the fines imposed on late payers, mainly larger firms.

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Appendix A: the firms' population

Table A.1. Population distribution by sector (in %)

	Starting population (except foreign groups)	Less firms with DPO > 120 days or 15O days depending of the sector	Less firms with sales/purchases ratio < 2.5 or < 7.5 depending of the sector	Combined
Real state	3,0	2,0	1,8	1,8
Construction	17,1	17,3	17,2	17,2
Transportation	4,7	4,9	4,6	4,7
Manufacturing industry	16,7	16,7	16,5	16,1
Trade and accommodation and food services	44,5	45,8	46,4	46,9
Information, communication and business support activities	10,3	9,6	9,7	9,5
services to households	3,7	3,7	3,8	3,8

Source: Banque de France and authors' calculus

Table A.2. Population distribution by rating (in %)

	Starting population (except foreign groups)	Less firms with DPO > 120 days or 15O days depending of the sector	Less firms with sales/purchases ratio < 2.5 or < 7.5 depending of the sector	Combined
1 good	64,41	67,19	66,37	67,09
2 risky	29,76	28,7	29,21	28,79
3 very poor risky	5,83	4,11	4,41	4,11

Source: Banque de France and authors' calculus

Table A.3. Population distribution by sector and size (in %)

	Starting population				Study population			
	Firm Size			Total	Firm Size			Total
	ISE	Large Firms	SME		ISE	Large Firms	SME	
Sector								
Real estate	0,1	0,0	2,9	3,0	0,1	0,0	1,7	1,8
Construction	0,1	0,0	17,0	17,1	0,1	0,0	17,1	17,2
Transportation	0,2	0,0	4,5	4,7	0,2	0,0	4,5	4,7
Manufacturing Industry	0,5	0,0	16,2	16,7	0,6	0,0	15,5	16,1
Trade and Hotels Restaurants	0,7	0,0	43,9	44,5	0,7	0,0	46,1	46,9
Services to businesses	0,3	0,0	9,9	10,3	0,3	0,0	9,2	9,5
Services to households	0,1	0,0	3,6	3,7	0,1	0,0	3,7	3,8
Total	1,9	0,1	98,0	100,0	2,0	0,1	97,9	100,0

Source: Banque de France and authors' calculus

Appendix B: Variables definitions and statistics

Table B.1 Variables definitions

Name	Definition	Classes							Reference
Ratio Sales/Purchases	Turnover/Purchases in days	≤ 1.25	1.25 to 1.5	1.5 to 2.5					≤ 1.25
Size		Very small SMEs (turnover < €2 million)	SMES operating a single legal entity	SMEs operating several legal entities in a group	Intermediate-sized firms ISE	Large firms			Very small SME
Sector		Manufacturing	Trade and HCR*.	Construction	Real estate	Services to businesses	Services to households	Transport	Trade and HCR
Profit margin	income/sales in %								
Cash assets ratio	Cash assets/sales in days								
Change in bank total indebtedness	Total debt bank / sales in days								
Growth in purchases	Annual in %	1 : negative or equal to zero	2 between 0 and 3%	3 between 3 and 10%	4 Higher than 10%				Class 1
Growth in sales	Annual in %	1 : negative or equal to zero	2 between 0 and 1.5%	3 between 1.5 and 3%	4 Higher than 3%				Class 1
Year									2009

*Note: HCR refers to hotels, cafes and restaurants;
Source: authors' calculations.

Table B.2: Mean, median and standard deviation of the main economic and financial ratios in the total population - period 2004-2017

	Median	Mean	Std
Payables delay in days of purchases	49,3	61,7	66,8
Change in payables delays in days of purchases	-0,1	-0,2	41,4
Receivables delays in days of turnover	42,3	50,1	52,5
Change in receivables delays in days of turnover	0,0	-0,2	34,2
Inventory turnover in days of turnover	19,4	37,8	59,3
Change in inventory turnover in days of turnover	0,0	0,5	32,2
Sales / Purchases ratio	1,5	2,1	6,2
Bank debt in days of turnover	16,5	80,7	444,2
Change in bank debt in days of turnover	-1,2	-6,4	270,2
Total assets/Turnover ratio	196,2	298,4	765,3
Profit margin	2,4	3,0	8,8
Equity ratio	35,3	33,4	57,9
Cash and liquid assets ratio	25,0	50,6	81,9
Net liquidity ratio	22,3	41,7	181,1
Turnover growth	2,08	4,96	47,1
Purchases growth	2,07	6,46	219,1

Table B.2 presents the average and median values and the standard deviation of the main economic and financial ratios in the total sample population and for the complete period under study (2004-2017). Source : Banque de France and authors' calculus

Appendix C: Results by size classes; 60 days' threshold

Table C.1 shows the detailed results of IV regressions by size classes using the 60 days threshold criteria for late payment.

	Small firms		SMEs		SMEs groups		ISEs		Large firms	
Late	-9.38116	***	-4.60621	***	-1.37706	*	-3.81998	***	-2.89528	
Purchases growth										
low	0.375430	***	0.572543	***	0.169625		-0.87303	***	0.537299	
medium	0.888497	***	1.204543	***	0.555720	***	-0.81281	***	0.346743	
high	1.554714	***	1.507777	***	1.012029	***	-1.64973	***	-0.21364	
Sales growth										
low	-1.02928	***	-0.90412	***	-1.11529	***	-0.14860		0.630495	
medium	-1.23995	***	-1.37121	***	-1.48841	***	-0.32571		-1.00959	
high	-2.32562	***	-2.50206	***	-2.17216	***	-0.06874		-1.27964	
Sales / Purchases ratio										
medium	-1.76744	***	-1.72769	***	-1.44847	***	0.932848	**	1.866315	**
high	-2.66674	***	-2.07245	***	-1.71339	***	0.592780		4.945982	***
Credit rating										
medium	0.025896		-0.27929	**	0.115858		-0.11353		-0.06933	
poor	0.551294	***	0.138328		0.909083	***	1.032807		3.853291	
lag_cash_reserves	-0.05977	***	-0.06276	***	-0.01617	***	-0.00122		-0.00437	
lag_gross_income	-2.71854	***	-1.26421	**	-7.82264	***	-1.47874		-6.51012	
lag_bank_debt	0.002074	***	-0.00082		0.003007	***	-0.00621	***	0.003171	
var_bank_debt	-0.00252	***	-0.03660	***	-0.00597	***	-0.00821	***	0.013019	***
var_receivbls_delays	0.280364	***	0.335923	***	0.274752	***	0.304380	***	0.341886	***
var_inventor_turnover	0.115255	***	0.114301	***	0.067662	***	0.066109	***	0.031910	**
Time fixed effects	Yes		Yes		Yes		Yes		Yes	
R2 adjusted	37.4		36.0		34.9		33.0		32.0	