FIRMS' RECOURSE TO TRADE CREDIT
AND THE RELATIONSHIP WITH BANK CREDIT IN SPAIN

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Abstract

This article examines the main characteristics of trade credit in Spain and the changes therein in the period from 2008 to 2023. In 2023, commercial borrowing represented 21% of Spanish firms' total liabilities. In the same year, the average payment period (APP) was slightly above 60 days, sharply down from the nearly 90 days recorded in 2009, partly as the result of regulatory changes. These figures vary significantly across production sectors. The findings show that one way in which some firms fund themselves in response to problems in gaining access to bank credit is by lengthening their APP. This strategy is particularly prevalent among firms with worse credit quality, which generally face greater constraints in accessing this type of financing. Nevertheless, lags in paying suppliers could also indicate a deterioration in credit quality, as reflected in defaults on bank loans. Hence, the correlation between probability of default on bank loans and APP is not linear and also depends on credit quality. Specifically, financing through trade credit with comfortable but not excessive repayment periods helps all kinds of firms reduce defaults on banking sector loans inasmuch as it acts as a liquidity buffer. By contrast, when there are severe payment delays, the correlation between probability of default and APP turns positive and increases in the case of firms with worse credit quality, probably because firms that fall behind in paying their suppliers are also often late in paying their bank creditors.

Keywords: trade credit, average payment period, probability of default, liquidity.

1 Introduction

Trade credit is a form of financing in which non-financial corporations defer payment on purchases or collection on sales in order to, in net terms, raise funds from, or grant financing to, other firms or sectors. In 2023, trade finance accounted for 21% of non-financial corporations' total liabilities, nearly 2 percentage points (pp) higher than in 2008.[1] Accounting information can be used to calculate two indicators that approximate the average payment period (APP) to suppliers and average collection period (ACP) from customers, and thus to estimate the average number of days that a firm takes to pay its suppliers or collect from its customers.[2] Still, the values obtained with the indicators are mere approximations. Although they are useful for analysing changes, they should not be taken as a benchmark to verify to what extent the legal limits on payment periods are being complied with.

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1 Central Balance Sheet Data Office integrated database (CBI).

2 Specifically, the APP to suppliers, expressed in days, is calculated as the ratio of the supplier balance (net of advances) to annual purchases (plus work performed by other firms and VAT borne by suppliers for domestic transactions), multiplied by 365. The ACP from customers is calculated in a similar manner [ratio of the customer balance (net of advances) to annual sales (plus VAT charged to customers for domestic transactions), multiplied by 365].

This article analyses some characteristics of trade credit in Spain, and in particular the APP to suppliers, given that this is the indicator on which firms, in principle, have decision-making capacity and, in addition, on which there are legal limits. These limits have been progressively reduced since 2000 when Directive 2000/35/EC on combating late payment in commercial transactions was enacted. Since then, payment periods have gradually been reduced in Spain, leading to the establishment of a maximum period of 60 days for payments between enterprises and 30 days for transactions with government agencies. In addition, rules have been issued to strengthen creditors' rights and combat late payment.[3] In line with these regulatory changes and the gradual economic rebound following the global financial crisis, the estimated APP has gradually decreased, with the number of days peaking in 2009 (nearly 90 days) to slightly more than 60 days in 2023. In recent years, the APP has fallen in other euro area countries as well, such as France and Portugal, but not across the board.[4] In the case of Spanish firms, the decrease was accompanied by a drop in the ACP. This trend, largely resulting from the stimulus to trade finance from regulatory changes, is also believed to have had the positive effect of giving suppliers greater certainty that they will be paid on time.[5]

In addition, there is evidence that one way some firms fund themselves in response to problems in gaining access to other financial resources, such as bank credit, is by lengthening their APP. This is especially prevalent among firms with worse credit quality, which generally face greater constraints on accessing this type of financing. This finding is in line with various studies showing that enterprises replace bank credit with trade credit especially during periods of crisis, which has been seen among both Spanish firms (Carbó-Valverde, Rodríguez-Fernández and Udell, 2016) and among European firms (Casey and O'Toole, 2014, and Palacín-Sánchez, Canto-Cuevas and di-Pietro, 2019, among others). In addition, such authors as McGuinness and Hogan (2014) have found that during the global financial crisis, trade credit played an even more important role as a source of financing for vulnerable small and medium-sized enterprises (SMEs). According to Garcia-Appendini and Montoriol-Garriga (2013), firms that had high levels of liquidity before the global financial crisis increased the amount of trade credit they offered to other corporations facing constraints on access to bank credit. All of this evidence, confirmed for Spain in this article, suggests that the firms with the most liquidity build up cash reserves out of precaution. Moreover, this allows them to provide trade finance to their customers, for whom it is particularly useful when they have difficulties accessing bank credit.

In terms of methodology, this article adds to the existing literature on restrictions on accessing credit and the recourse to trade credit through the use of credit application data to identify restricted firms (that is, those whose bank credit balance decreases even though they apply for new loans). This also enables a better identification of the effect that we intend to analyse over an extended period (2008-23), including phases of both contraction and expansion of bank lending.

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3   See the annex for more details on these rules.

4   Micro Bank for the Accounts of Companies Harmonized (iBACH).

5   In addition to these regulatory changes, we should stress the role played by credit insurance in protecting and validating trade credit, and thus serving as an incentive for suppliers to provide more such credit. This is possible thanks to greater information on customers' payment behaviour and the more extensive experience and analytical capabilities of credit insurers compared with the suppliers that contract their services. For more details, see Crédito y Caución (2025).

Although by delaying supplier payments firms can mitigate the adverse effects of restrictions on their access to bank credit, this can also lay bare a deterioration in their credit quality, which would translate into defaults on their bank loans and, possibly, their non-bank debts. The findings of this article point to a positive, significant correlation between the APP and the probability of default on bank loans only when the firms with worse credit quality fall far behind in their supplier payments. The little empirical evidence that there is on these effects in general shows only that trade credit has a positive impact on firms' likelihood of survival (McGuinness, Hogan and Powell, 2018). Nevertheless, corporate restructurings through a formal mechanism such as insolvency proceedings are an extreme, infrequent event in Spain (García-Posada and Mora-Sanguinetti, 2014; García-Posada Gómez, 2020) and generally are not seen by researchers when they are carried out through private debt renegotiations. For this reason, this article analyses the correlation between APPs and the existence of some type of difficulty in the repayment of bank loans.

For these analyses, we used the CBI's annual database, consisting of a broad sampling of some 900,000 firms, although it is released with a certain lag (about 11 months) after the end of each year. The period analysed is from 2008 (year of entry into force of the Spanish General Chart of Accounts, which requires firms to provide detailed information that previously did not exist and with which the variables of interest for this article can be calculated) until 2023, which is the last year for which complete information is available. By including a large number of firms in this database we are able to analyse in depth various sources of heterogeneity, differentiating by firm characteristics such as sector of activity, size and credit quality.
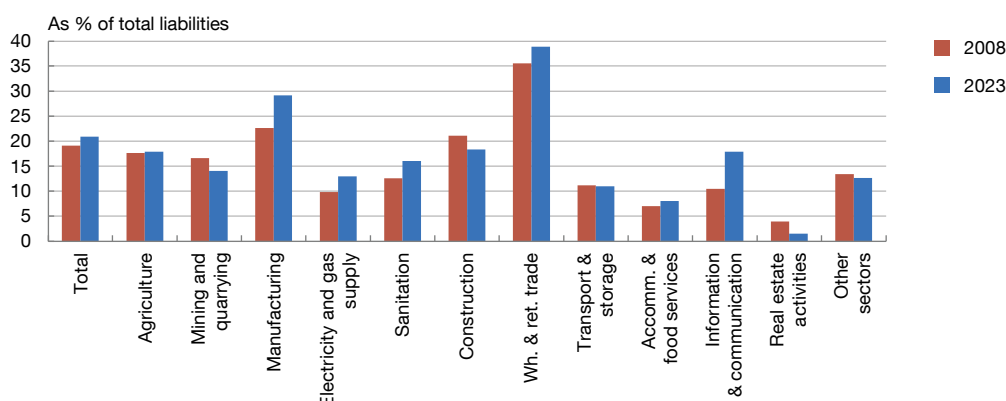
The rest of this article is structured as follows: The second section analyses changes in trade credit and the APP from 2008 to 2023 and studies in depth the aforementioned sources of heterogeneity; the third section gives the findings from econometric analyses of the characteristics of firms with high and low APPs, examines the correlation between increases in APP and growth of bank credit and analyses the correlation between risk of default on bank loans and the APP, taking into account heterogeneity at the productive sector level and credit rating; and lastly the appendix describes regulations on trade credit in Spain, with a special emphasis on recent regulatory changes.

2 Commercial borrowing and average payment periods in Spain

As indicated in the introduction, trade borrowing (also called "supplier balance") on firms' balance sheets increased by nearly 2 pp from 2008 to 2023, to 21% (see Chart 1). The sectoral breakdown shows that the weight of supplier balance has increased in most sectors, in particular in information and communication and in manufacturing (by 7.4 pp and 6.6 pp, respectively). This greater relative importance of trade credit resulted from the increase in such credit (associated with firms' higher output) and a decrease in other sources of external financing (especially financial debt).[6]
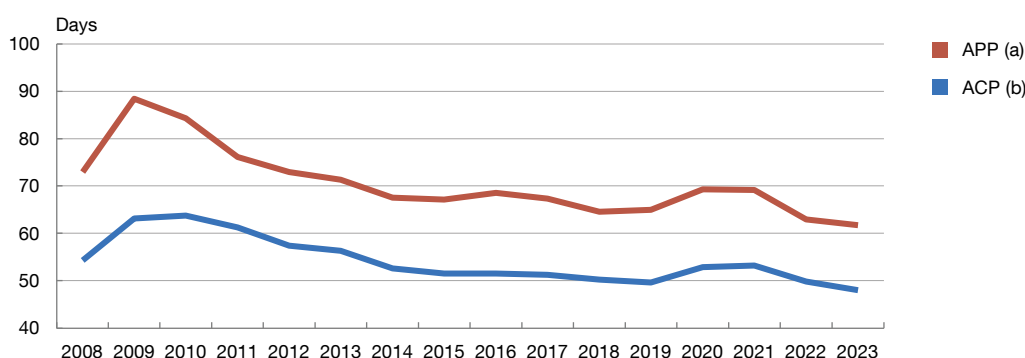
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6 Mainly, bank loans, credit lines and, in the case of firms of a certain size, fixed-income securities.

Chart 1
Trade credit

As % of total liabilities

Legend: 2008, 2023

Categories: Total, Agriculture, Mining and quarrying, Manufacturing, Electricity and gas supply, Sanitation, Construction, Wh. & ret. trade, Transport & storage, Accomm. & food services, Information & communication, Real estate activities, Other sectors

SOURCE: Banco de España.

Chart 2
APP and ACP. Aggregate ratios

Days

Legend: APP (a), ACP (b)

Years: 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023

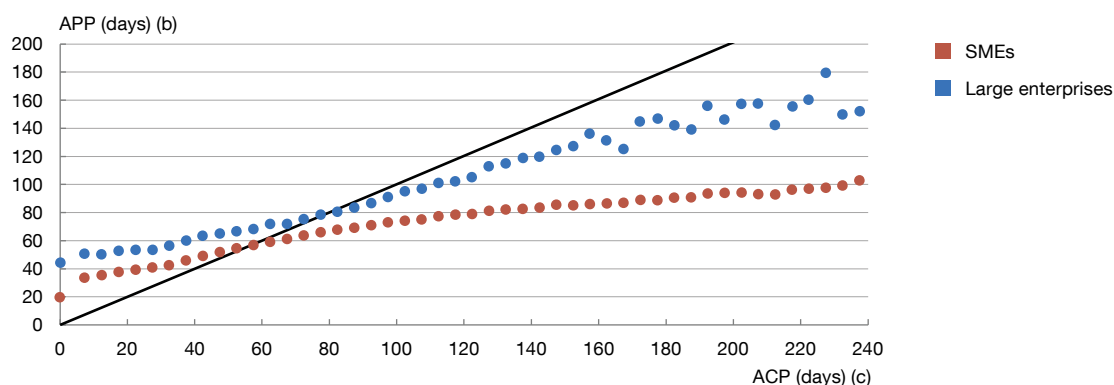**SOURCE:** Banco de España.

a Calculated as [(Year-end balance non-current trade payables + Supplier balance, net of advances to suppliers, for firms for which this item is available) / (Amount of purchases + Work performed by other firms + VAT borne by suppliers for domestic transactions)] x 365.
b Calculated as [(Year-end balance non-current trade receivables + Customer balance, net of customer advances, for firms for which this item is available) / (Net revenue + VAT charged to customers for domestic transactions)] x 365.

The increased weight of trade credit in proportion to total liabilities in recent years is believed to be compatible with a progressive reduction in the number of days that, on average, firms were taking to pay their suppliers. Hence, after peaking in 2009 at nearly 90 days, it stood at slightly above 60 days in 2023 (see Chart 2). This downward trend was driven both by regulatory changes establishing maximum deadlines for commercial transactions, as explained in the introduction, and by the economic rebound since the end of the global financial crisis and the sovereign debt crisis. This appears to have had a positive impact on the supply of such financing by giving suppliers greater certainty that they would be paid on time. In addition, this increased speed in trade payments has logically translated into a shortening of the collection periods. Hence, Chart 3 confirms the positive correlation between firms' APPs and ACPs, as they rise or decline in tandem. The breakdown by size also shows that large enterprises have
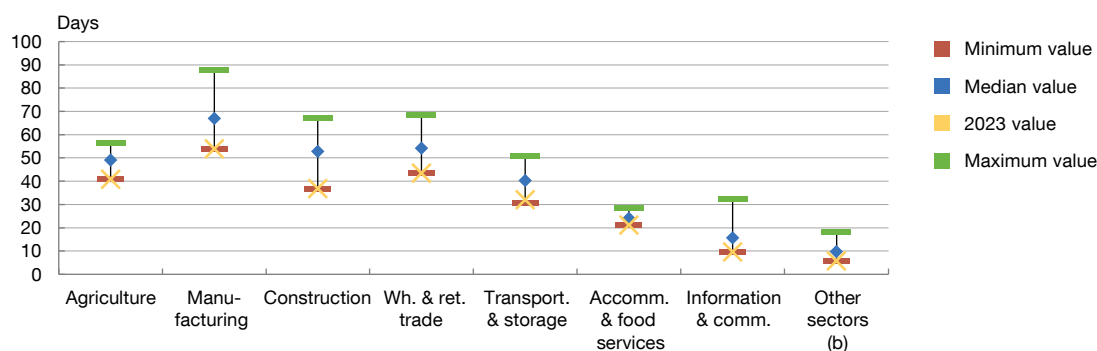
APP compared with ACP. Breakdown by firm size (a)

APP (days) (b)

Legend:
- SMEs
- Large enterprises

ACP (days) (c)

SOURCE: Banco de España.

a The dots represent the average of the median APPs and ACPs for 2008 until 2023, calculated for five-day segments of the ACPs.
b Calculated as [(Year-end balance non-current trade payables + Supplier balance, net of advances to suppliers, for firms for which this item is available) / (Amount of purchases + Work performed by other firms + VAT borne by suppliers for domestic transactions)] x 365.
c Calculated as [(Year-end balance non-current trade receivables + Customer balance, net of customer advances, for firms for which this items is available) / (Net revenue + VAT charged to customers for domestic transactions)] x 365.

Distribution of median APPs by sector, between 2008 and 2023 (a)

Days

Legend:
- Minimum value
- Median value
- 2023 value
- Maximum value

Agriculture | Manu-facturing | Construction | Wh. & ret. trade | Transport. & storage | Accomm. & food services | Information & comm. | Other sectors (b)

SOURCE: Banco de España.

a APP calculated as [(Year-end balance non-current trade payables + Supplier balance, net of advances to suppliers, for firms for which this item is available) / (Amount of purchases + Work performed by other firms + VAT borne by suppliers for domestic transactions)] x 365.
b Includes mining and quarrying; electricity and gas supply; sanitation; real-estate activities; professional, scientific and technical activities; and administrative and support service activities; education; health and social work activities; arts, amusement and recreation; and other services.

higher APPs than do SMEs for a given collection period, possibly because large firms have greater negotiating power than the latter. In addition, according to Love, Preve and Sarria-Allende (2007) and McGuinness and Hogan (2014), firms with a sounder financial situation are the ones that offer more trade credit to their customers, especially during periods of crisis.

As for sectoral information, Chart 4 points, first, to an across-the board decline in the APP from 2008 to 2023. The median value for this indicator in 2023 fell to its minimum in all sectors,

Firm characteristics according to their APP

	Firms with a high or low APP (a)			Firms with an APP of more or less than 60 days		
	High	Low	Difference (b)	More than 60 days	Less than or equal to 60 days	Difference (b)
	(1)	(2)	(3)	(4)	(5)	(6)
Indicators in t-1. Averages						
Finance expense / Sales	0.021	0.013	0.008***	0.021	0.013	0.008***
Own funds / Total assets	0.179	0.312	-0.134***	0.194	0.303	-0.109***
Cash and cash equivalents / Total assets	0.143	0.194	-0.051***	0.142	0.199	-0.057***
Net profit / Total assets	-0.023	0.007	-0.030***	-0.020	0.006	-0.027***
Gross value added / Total assets	0.453	0.596	-0.143***	0.438	0.621	-0.183***
Sales / Total assets	1.390	2.028	-0.638***	1.361	2.097	-0.737***
Logarithm of total assets	5.942	5.716	0.226***	5.997	5.642	0.355***
Logarithm of ACP, in t. Averages	3.328	2.837	0.492***	3.446	2.679	0.767***

SOURCE: Banco de España.

a A firm's APP is considered high (low) if it is higher than (less than or equal to) the median APP for its sector corresponding to the NACE Rev.2 two-digit classification.
b Difference between the average for firms with a higher APP less the average for firms with a lower APP. Statistical significance is calculated through a mean difference test in which the null hypothesis is that there are no differences in the averages of the respective populations and the variances of the two are not assumed to be equal. * p-value < 0.10; ** p-value < 0.05; *** p-value < 0.01

except for transportation and storage, where it rebounded slightly that year. However, the chart also shows that median APPs varied greatly depending on the sector in which a firm operates, ranging from 16 days in information and communication to 67 in manufacturing.

3 Econometric analysis

3.1 Firm characteristics according to average payment period

This section examines the correlation between the APP, growth of bank credit and probability of default on bank loans using statistical techniques and firm-level data. We begin with a descriptive analysis in order to examine the main differences between firms with high APPs and those with low APPs. Table 1 gives the averages for the various characteristics[7] of these two types of firms, as well as the differences between them, with an indication of whether these differences are statistically significant. Columns (1)-(3) relate to firms with high or low APPs (above or below the median for their sector, in accordance with the Spanish National Classification of Economic Activities (NACE Rev.2) two-digit classification).[8]

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7 All of these variables, other than those expressed in logarithms, are winsorised to 1% to reduce the impact of outliers on the calculation of averages and on the estimate of subsequent regressions.

8 Very similar results are obtained when a firm's APP is considered high (low) if it is greater than (lesser than or equal to) the median APP for its sector in a given year.

As shown, firms with a high APP have less financial strength, given that on average their ratio of finance expense to sales is higher, they are less capitalised (own funds to total assets), less profitable (net profit to total assets) and have less activity (approximated with the ratios of gross value added and sales to total assets) than firms with a low APP. Likewise, firms with a high APP have a lower current ratio (cash and cash equivalents to total assets), which could be associated with a longer lag in paying suppliers, given that this strategy might help them meet their liquidity needs. In addition, they are allowed to delay their supply payments more because their negotiating power is probably greater as they are larger (in terms of total assets) and have a higher ACP. This is consistent with the positive correlation between the two indicators shown above. As indicated in columns (4)-(6), the findings are similar when comparisons are made of firms with an APP above 60 days and those with an APP less than or equal to 60 days.

3.2 The role of trade credit in restrictions on access to bank credit

The evidence presented in sub-section 3.1 shows that the firms with higher APPs have less financial strength. This suggests that the lag in paying their suppliers could be associated with constraints on their access to bank finance owing to their lower credit quality. Consequently, these firms could be using trade credit to mitigate their financing problems.

To assess the validity of this hypothesis, we conduct a regression analysis in which the dependent variable is binary and takes a value of 1 if the APP increases in a given year relative to the previous year, and a value of 0 if it does not change or it decreases. The explanatory variable of interest is the ratio of the change in the firm's bank debt between those two years to its total assets for the previous year.[9] Several additional explanatory variables are taken into consideration to control for other factors that might influence the change in the APP.

Specifically, the controls, one-year lagged, include the ratio of finance expense to sales, own funds to total assets, cash and cash equivalents to total assets, net profit to total assets, gross value added to total assets, sales to total assets and the logarithm of total assets, as well as binary variables that denote the firm's legal form. In addition, to take into account the effect of the change in debt arising from the firm's commercial activity, and given the high correlation between APP and ACP shown above, the logarithm of ACP plus 1 is used, given that greater (smaller) lags in collecting are linked to greater (smaller) lags in paying suppliers and therefore to changes in trade payables. Also included is the contemporaneous performance of the firm's sales (the change therein between the current and the previous year), as this could trigger changes both in the APP and in bank debt. Lastly, sector-province-size-year fixed effects are included, where size refers to microenterprises and small, medium and large enterprises, and sector refers to the NACE Rev.2 two-digit classification. The sample used for the estimate is limited to firms that had bank debt the previous year, since the analysis is intended to determine whether firms deal with a reduction in their bank lending by increasing their APP (that is, by delaying payments to their suppliers).

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9   This variable was also winsorised to 1%.

Correlation between an increase in APP and access to bank finance among more or less creditworthy firms (a)

| | Firms that have increased their APP | | | Firms that request bank loans and have increased their APP | | | | | |
| | | | | Sector-province-size-year fixed effects | | | Year and firm fixed effects | | |
	All (1)	More creditworthy (2)	Less creditworthy (3)	All (4)	More creditworthy (5)	Less creditworthy (6)	All (7)	More creditworthy (8)	Less creditworthy (9)
Bank credit	-0.041***	-0.007***	-0.063***	-0.064***	-0.017***	-0.095***	-0.172***	-0.144***	-0.210***
Standard error	(0.002)	(0.003)	(0.002)	(0.003)	(0.005)	(0.004)	(0.004)	(0.008)	(0.005)
Observations (thousands)	4,053.622	1,375.348	2,645.915	1,160.217	325.283	806.167	994.865	235.625	677.647
R^2	0.059	0.087	0.066	0.091	0.151	0.102	0.278	0.351	0.285

SOURCE: Banco de España.

a Effects estimated through regressions of ordinary least squares in which the dependent variable is the increase in a firm's APP and the explanatory variable of interest is the annual variation in bank credit divided by total assets for the previous year. The sample period is 2009-23. The controls, one-year lagged, are the ratio of finance expense to sales, own funds to total assets, cash and cash equivalents, net profit to total assets, gross value added to total assets, sales to total assets and the logarithms of total assets and the ACP plus 1 (the latter, unlagged) as well as binary variables that denote the firm's legal form. Also included are fixed effects of sector-province-size-year, in which size refers to microenterprises and small, medium and large enterprises, and sector refers to the two-digit NACE Rev. 2 classification. Standard errors are clustered at firm level. The sample includes only firms with bank debt the previous year. The most creditworthy firms are those whose probability of default on their credit obligations is no higher than 0.4%. The less creditworthy are the remaining firms. * p-value < 0.10; ** p-value < 0.05; *** pvalue < 0.01.

The results, which are presented in Table 2, suggest a substitution effect between bank finance and trade credit. In column (1), which shows the results based on the total for the sample, we see that the likelihood of a firm's APP increasing rises by 4.1 pp for each percentage point reduction in its bank debt relative to its total assets. Columns (2) and (3) give the results for the same regression model, but the sample of firms is divided into two sub-samples depending on whether their probability of default is below or above 0.4% (more or less creditworthy, respectively), a threshold that determines whether a loan may be used as collateral at the European Central Bank (ECB).[10] This likelihood is calculated following the methodology of Blanco, Fernández-Ortiz, García-Posada and Mayordomo (2024).[11] These estimates indicate that the APP of less creditworthy firms is nine times more likely to increase when bank credit contracts. This could reflect a substitution arising not only from firms' voluntary decision to delay their payments to their suppliers in order to rely less on bank credit (demand effect), but fundamentally to the decreased supply of credit from banks to less creditworthy firms, given that the latter normally face greater constraints on accessing bank finance owing to their lower credit quality.

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10 Specifically, a loan may be used as collateral at the ECB if its credit quality step (CQS) is less than or equal to 3, which is equivalent to a probability of default within a one-year horizon of up to 0.4%. Even though this limit was relaxed to 1% following the 2020 health crisis, 0.4% was considered because the sample period used in the analysis of this article primarily covers years prior to that event.

11 Based on the definition of default as a firm having doubtful loans for at least three months in a year, the event is modelled in six manners for different combinations of size-firm, which are estimated through logistic regressions. The explanatory variables are various accounting ratios that summarise a firm's financial conditions and the rate of growth of aggregate lending to non-financial corporations.

To corroborate the existence of the second effect, the previous regressions are estimated, albeit limiting the respective samples to firms seeking bank credit.[12] Hence, a decline in these firms' bank debt is more likely to reflect a restriction on the supply of credit, rather than firms' voluntary decision to reduce their reliance on bank credit. The results of these new regressions reported in columns (4)-(6) show that the economic effects are even stronger in the sub-set of firms seeking credit, especially among the least creditworthy of them, underscoring the mitigating effect of trade credit on firms subject to such restrictions. Lastly, as a robustness test, these same sub-samples are used to estimate a regression model in which the sector-province-size-year fixed effects are replaced with firm and year fixed effects in order to control for all firm characteristics that are constant over time and for shocks that are common to all firms (business cycle, monetary policy, etc.). The findings, shown in columns (7)-(9), point to even stronger effects which, in line with the previous evidence, are more pronounced in less creditworthy firms than in more creditworthy ones.

3.3 Correlation between average payment periods and difficulties repaying bank debt

Although by delaying supplier payments some firms can mitigate restrictions on their access to bank finance, this could also indicate a deterioration in their financial situation that, in some cases, might lead to defaults on their bank loans and, possibly, their non-bank debts. We have devised a linear probability model to analyse the link between delays in paying suppliers and defaults on bank debt. The dependent variable is a binary variable that takes the value of 1 if the firm has a troubled loan in a given year (non-performing due to arrears, doubtful or written-off),[13] and the explanatory variables of interest are a set of binary variables that indicate the range, in days, in which that firm's APP is situated in the same year (between 0 and 30 days, between 30 and 60 days, etc.), with the APP reference category being equal to 0 (that is, firms that pay cash). The controls and fixed effects are the same as in the previous analysis. The sample for the estimate includes only firms with bank debt and without troubled loans the previous year, given that the exercise aims to determine the duration of the delay in paying suppliers that is associated with a greater probability of having troubled bank loans. We have therefore excluded firms that have defaulted on their loan obligations before having a high APP. This regression model is estimated for all firms and for more and less creditworthy firms, defined in the same manner as in the analysis in the previous sub-section.
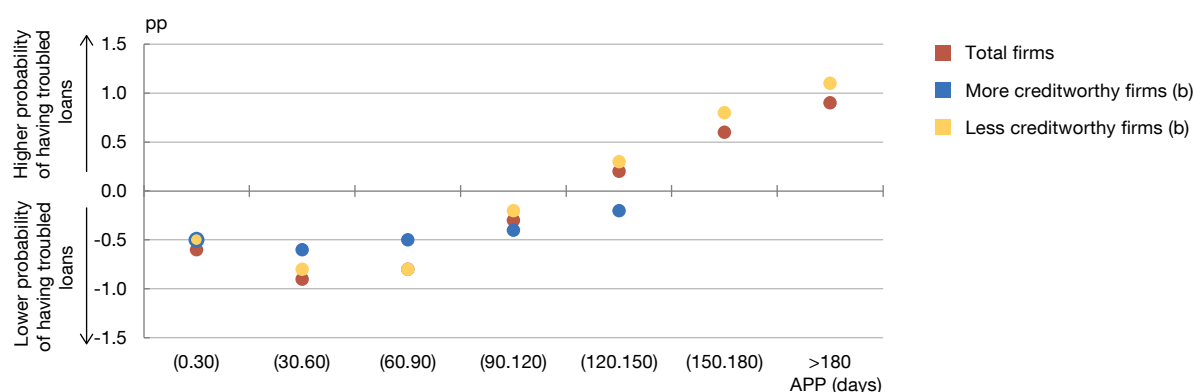
Chart 5 shows, for each binary variable that indicates the range of days in which the APP is situated, the regression coefficient for all firms (red dots), for the most creditworthy firms (blue

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12 To identify the firms that require bank credit, we have used information requests made by the banks to the Banco de España's Central Credit Register (CCR) on potential customers. These requests can be considered loan applications, at least for firms that have no previous relationship with a given bank, since credit institutions receive monthly information from the CCR on their current customers with no need to make new requests.

13 Doubtful loan means the amount of a loan on which, although it is not past-due, there are reasonable doubts regarding its total repayment in the agreed terms, as well as the amount overdue for up to three months whose recovery is considered doubtful. Non-performing due to arrears refers to the amount overdue for more than three months. Lastly, a written-off loan is the amount whose recovery is considered unlikely, for which reason the asset has been derecognised from the balance sheet of the bank that granted it.

Chart 5

Probability of having troubled loans according to the APP (a)

SOURCE: Banco de España.

a Effects estimated through a linear probability model in which the dependent variable is a binary variable that takes the value of 1 if a firm has a troubled loan on its balance sheet (non-performing due to arrears, doubtful or written-off), and the explanatory variables of interest are binary variables that take the value of 1 if the firm's APP is within one of the ranges indicated in the chart, and otherwise 0. The controls, one-year lagged, are the ratio of finance expense to sales, own funds to total assets, cash and cash equivalents, net profit to total assets, gross value added to total assets, sales to total assets, the logarithm of total assets and the logarithm of the ACP plus 1 (the latter, unlagged) as well as binary variables that denote the firm's legal form. Also included are fixed effects of sector-province-size-year, in which size refers to microenterprises and small, medium and large enterprises, and sector refers to the two-digit NACE Rev.2 classification. The sample period is 2009-23. Standard errors are clustered at firm level. The sample includes only firms with bank debt, purchases and no troubled loans the previous year. Only coefficients significant to 5% or less are shown.

b The firms that are more (less) creditworthy are those whose probability of default on their credit obligations is less than or equal to (greater than) 0.4%.

dots) and for the least creditworthy firms (yellow dots). Only coefficients that are significant to at least 5% are shown in order to simplify the chart and make it easier to understand. The findings indicate that the correlation between the probability of having troubled loans and the APP level is not linear:

- Specifically, for an APP that is positive but less than or equal to 120 days, the correlation is negative and significant for all types of firms, which suggests that financing through trade credit with comfortable but not excessive repayment periods is associated with a lower probability of having troubled loans because it acts as a liquidity buffer, helping firms reduce their defaults in the banking sector. For APP values of up to 90 days, the correlation is fairly constant, without losing strength as the APP increases. This appears to indicate that funding through trade credit is a positive and stable sign of credit quality up until that threshold is reached. This could be because 90 days is the legal limit,[14] for which reason having an APP of up to 90 days means being a "reliable payer". For above 90 and up to 120 days, the correlation is still negative and significant, but less so in absolute value, probably because the legal limit is exceeded, although not inordinately so.

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14 Although the law establishes that the maximum repayment period in private-sector commercial transactions of 60 calendar days and 30 days in transactions between firms and government agencies, it allows for up to 90 days provided that the payment is in the form of a document that entails legal action for collection (a legal mechanism that allows the holder of a credit instrument, such as a bill of exchange or a promissory note, to demand payment in court when the payment due date has been missed). For further details, see the following link of the Ministry of Economy, Trade and Business.

- For an APP of between 120 and 180 days, the correlation continues to be negative in the sub-sample of more creditworthy firms, but it turns positive in that of less creditworthy firms and in the total sample. This means that, for this APP range, the "liquidity buffer" effect continues to prevail at firms with a very good credit rating (more creditworthy), while at firms with worse credit ratings (less creditworthy) high APP levels are associated with a greater probability of having troubled bank loans. This may be because firms that are in arrears are habitually late in paying both their suppliers and their bank lenders. It also implies that, in less creditworthy firms and in the total sample, an APP above 120 days is a sign of worse credit quality than not having trade credit (that is, APP equal to 0).

- Lastly, for an APP of more than 180 days, the correlation between the probability of having troubled loans and the level of APP is positive and significant at less creditworthy firms and at all firms, whereas the coefficients are not statistically different from 0 at the firms with higher creditworthiness. Therefore, although from Table 1 suggests that firms with a higher APP are more likely to have troubled bank loans because they are in a less favourable financial position, the second analysis concludes that there is only one positive, significant correlation between these two variables in the case less creditworthy firms that are very late in paying suppliers.

An alternative way to depict the non-linearity of the correlation between the probability of having troubled loans and the APP is through a quadratic specification, in which the regressors of interest are the natural logarithm of the APP and this variable's square. The logarithm of the APP is taken to correct the strong right-skewed asymmetry of this variable, the inclusion of which in levels could generate inconsistent estimates owing to the presence of outliers.[15] In addition, the same controls as in the previous analysis and firm and year fixed effects are included. The results, shown in Table 3, relate to the estimate for the total sample and for the sub-samples of more and less creditworthy firms. Given that the coefficient of the APP logarithm is negative, the coefficient of the square of this variable is positive and both are significant to 1%, this model captures a convex relationship similar to that shown in Chart 5. This is so both for all firms and for more and less creditworthy ones, and the coefficients are higher (in absolute values) for less creditworthy firms, which is also consistent with Chart 5. Therefore, this alternative analysis leads to a similar conclusion: although financing through trade credit with comfortable but not excessive repayment periods is associated with a lower probability of having troubled loans because it acts as a liquidity buffer, high APP values correlate to a higher probability of having troubled bank loans. This may be the result of the fact that firms that fall behind in paying their suppliers habitually do the same with their bank creditors.

Likewise, Chart 6 gives the results of the estimate of the previous regression model, but in sub-samples of firms within the same productive sector. The results are in line with the previous

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15 Specifically, the logarithm of APP plus 1 is taken so as to avoid eliminating observations in which APP is equal to 0, which relate to firms that pay their suppliers in cash.
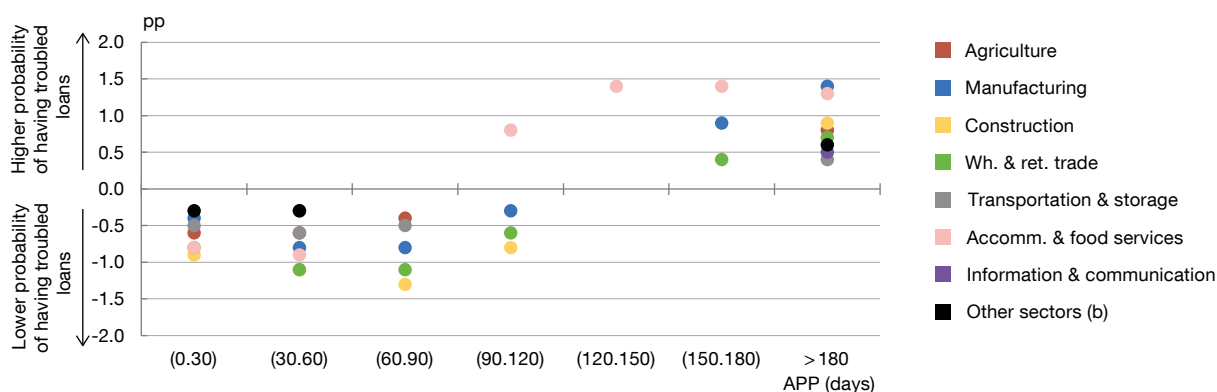
Table 3

Correlation between probability of having troubled loans and APP (a)

	Type of firm		
	All (1)	More creditworthy (2)	Less creditworthy (3)
Ln (APP + 1)	-0.003***	-0.001***	-0.003***
Standard error	(0.000)	(0.000)	(0.000)
Ln (APP + 1)^2	0.001***	0.000***	0.001***
Standard error	(0.000)	(0.000)	(0.000)
Observations	2,275,830	687,803	1,491,865
R^2	0.306	0.356	0.316

SOURCE: Banco de España.

a Effects estimated through a linear probability model in which the dependent variable is a binary variable that takes the value of 1 if a firm has a troubled loan o its balance sheet (non-performing due to arrears, doubtful or written-off), and the explanatory variables of interest are the natural logarithm of the APP plus 1 an the square of that variable. The controls, one-year lagged, are the ratio of finance expense to sales, own funds to total assets, cash and cash equivalents, net profit to total assets, gross value added to total assets, sales to total assets, the logarithm of total assets and the logarithm of the ACP plus 1 (the latter, unlagged) as well as binary variables that denote the firm's legal form. Also included are the year and firm fixed effects. The sample period is 2009-23. Standard errors are clustered at firm level. The sample includes only firms with bank debt, purchases and no troubled loans the previous year. The most creditworthy firm are those whose probability of default on their credit obligations is no higher than 0.4%. The less creditworthy are the remaining firms. * p-value < 0.10; ** pvalue < 0.05; *** p-value < 0.01.

Chart 6

Probability of having troubled loans according to the APP. Breakdown by sector (a)

SOURCE: Banco de España.

a Effects estimated through a linear probability model in which the dependent variable is a binary variable that takes the value of 1 if a firm has a troubled loan on its balance sheet (non-performing due to arrears, doubtful or written-off), and the explanatory variables of interest are binary variables that take the value of 1 if the firm's APP is within one of the ranges indicated in the chart, and otherwise 0. The controls, one-year lagged, are the ratio of finance expense to sales, own funds to total assets, cash and cash equivalents, net profit to total assets, gross value added to total assets, sales to total assets, the logarithm of total assets and the logarithm of the ACP plus 1 (the latter, unlagged) as well as binary variables that denote the firm's legal form. Also included are fixed effects of sector-province-size-year, in which size refers to microenterprises and small, medium and large enterprises, and sector refers to the two-digit NACE Rev. 2 classification. The sample period is 2009-23. Standard errors are clustered at firm level. The sample includes only firms with bank debt, purchases and no troubled loans the previous year. Only coefficients significant to 5% are shown.
b Includes mining and quarrying; electricity, gas, steam and air conditioning supply; water supply and sanitation activities; real-estate activities; professional, scientific and technical activities; administrative and support service activities; education; arts, amusement and recreation; and other services.

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exercise, although the sector coefficients are somewhat heterogeneous. For an APP of up to 90 days, all coefficients are negative or non-significant, which illustrates the "liquidity buffer" effect. For an APP of between 90 and 150 days, the coefficient of the associated variable is

negative or non-significant in all sectors, other than accommodation and food service activities, in which this variable's coefficient is positive and significant. Lastly, for an APP of more than 150 days, all coefficients are positive or non-significant. The latter exercise shows that the correlation between the probability of having a troubled bank loan and the APP has a moderate sectoral heterogeneity and is especially pronounced in the accommodation and food service sector. This suggests that establishing a single legal maximum level of APP for all firms, regardless of sector, is probably not an optimal way of reducing delays in supplier payments.[16]

Lastly, given that the most pronounced changes in the APP and in the probability of having troubled loans arose during the global financial crisis and the sovereign debt crisis, we study whether the mitigating effect on financial difficulties of comfortable, although not excessive, APPs is concentrated in periods of recession, in which a larger proportion of firms often have restrictions on access to credit, or whether this is common to the entire sample period. To this end, we estimate regressions similar to the previous ones[17] in three sub-samples: (i) periods of crisis (2008-13 and 2020); (ii) periods of crisis excluding the pandemic, because ultra-expansionary monetary policy and measures such as State guarantees mitigated the constraints on access to credit (2008-13), and (iii) expansionary periods (2014-19 and 2021-23). The fact that the coefficients of the explanatory variables of interest are much higher in the first case and, especially, in the second than in the third suggests that the mitigating role of trade credit is greater precisely in periods in which the access to bank finance is most difficult. We also study whether this phenomenon is more important in the case of SMEs, which generally find it more difficult to access credit.[18] To this end, the same regression model is estimated in two sub-samples, one composed of SMEs and the other of large enterprises. Given that only in the SME sub-sample is there a significant, negative correlation between relatively low APPs and probability of having troubled loans – whereas in the sample of large firms this correlation is positive and non-significant – this exercise suggests that trade credit plays a mitigating role only in those firms (SMEs) that normally have more constraints on access to bank finance.[19]

4 Conclusions

Trade credit is a type of financing that allows firms to postpone payments and collections. The relative importance of trade financing has increased in recent years, because of both the increase in firms' productive activity and the reduction in the outstanding balance on other, alternative sources of financing, particularly bank loans. This was compatible with a progressive

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16 In addition, an alternative analysis on the correlation between the probability of having troubled loans and the APP was conducted through a quadratic specification, in which the regressors of interest are the APP logarithm and the square of this variable. The results obtained were consistent with those shown in Chart 6.

17 Nevertheless, to obtain more precise estimates, year and firm fixed effects are included rather than sector-province-size-year fixed effects.

18 For a review of the literature on the causes and effects of constraints on access to credit, see García-Posada (2018).

19 The results of the last two analyses are available for interested readers who request them.

decline in APPs, from nearly 90 days in 2009 to slightly more than 60 in 2023, and in ACPs, largely driven by the legal rules enacted over the years to shorten these periods.

The results of the econometric analyses suggest a substitution effect between bank finance and trade credit. This correlation is stronger among firms with worse credit quality. In particular, the evidence indicates that trade credit helps mitigate the constraints on credit faced by some firms.

It was also found that the correlation between probability of default on bank loans and the APP is not linear and also depends on firms' credit quality. Specifically, financing through trade credit with comfortable but not excessive repayment periods is associated with a lower probability of having troubled loans for all types of firms because it acts as a liquidity buffer, helping reduce firms' defaults in the banking sector. Nevertheless, when there are severe payment delays, the correlation between probability of default and APP turns positive in the case of firms with worse credit quality, probably because firms that fall behind in paying their suppliers are also often late in paying their bank creditors. There is a certain sectoral heterogeneity in this correlation between probability of default and the APP.

As for the implications for economic policy, the link between commercial risk and late payments by firms could have repercussions on financial stability through two mechanisms. First, due to the existence of common factors, given that firms which are very late in paying their suppliers normally have a higher propensity to default on their bank loans. Second, as a consequence of spillover effects, since borrower firms that experience significant delays in collecting from their customers may have less capacity to service their own bank debt. This would impair the quality of the banks' credit portfolios, which implies higher non-performing loan ratios. This situation would also expose banks, indirectly, to firms with which they do not have credit relationships. Nevertheless, no detailed information is available on commercial relationships between firms with which to verify these hypotheses.

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On 29 June 2000, the European Parliament enacted Directive 2000/35/EC on combating late payment in commercial transactions. Spain then embarked on a process to strengthen guarantees to creditor and to shorten payment periods. On 29 December 2004 Law 3/2004 was enacted as the transposition of the above Directive, before being amended by Law 15/2010. These laws aimed to protect suppliers, especially SMEs, ensuring that they received payment for their goods or services within a reasonable timeframe. A maximum period of 60 days was established for payments between firms and 30 days for transactions with government agencies. In principle, these periods could not be lengthened by agreement between the parties[20] so as to avoid possible unfair practices. In addition, a transition period was established, with a progressive reduction in the maximum payment periods, in order to reach the aforementioned limits by 1 January 2013.

In 2013, Royal Decree-Law 4/2013 of 22 February 2013 was enacted, consisting of measures to support entrepreneurs and stimulate growth and job creation, reinforcing the measures against late payments introduced by Law 3/2004 and seeking to improve access to financing for SMEs. This law introduces more severe penalties for firms that fail to abide by the established maximum periods and promotes transparency in commercial contracts.

In addition, in 2017 Law 9/2017 of 8 November 2017 relative to public sector contracts was enacted, transposing into Spanish law the Directives of the European Parliament and of the Council 2014/23/EU and 2014/24/EU of 26 November 2014, so as to promote economic growth and improve business competitiveness through various measures, including the regulation of trade credit. This law buttresses creditor rights and establishes additional mechanisms to ensure that payment deadlines are met.

Lastly, Law 18/2022 of 28 September 2022, on the creation and growth of firms, known as the "Create and Grow Law", established for the first time a regulation for electronic invoicing in private transactions, with the aim of combating late payment and facilitating the creation of SMEs. This is one of the key initiatives of the Recovery, Transformation and Resilience Plan within the Government of Spain's strategic framework for receiving European financing, known as Next Generation EU funds. It simplifies and streamlines the procedures for establishing enterprises and making them grow. This makes it possible to quickly create a firm online without the need for sizeable resources. The law also seeks to combat late payment, reduce red tape and provide financial support for SMEs to grow. For example, firms that fail to pay on time are precluded from receiving government subsidies and placed on a list of delinquent debtors. The law implements electronic invoices as a requirement in the private sector (SMEs and self-

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20   For transactions with government agencies, however, the maximum payment period may be lengthened from 30 to 60 days if the parties reach an agreement.

employed). It also strengthens the resources for corporate financing, incentivising the use of alternative methods such as crowdfunding and expanding opportunities within the sphere of venture capital.