

WTS2695

POLICY RESEARCH WORKING PAPER

2695

Trade Credit, Financial Intermediary Development, and Industry Growth

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Where do firms turn for financing in countries with poorly developed financial markets? One source is trade credit. And where formal financial intermediaries are deficient, industries that rely more on this source of financing grow faster.

The World Bank
Development Research Group
Finance
October 2001



Summary findings

Recent empirical work has shown that financial development is important for economic growth, since well-developed financial markets are more effective at allocating capital to firms with high-value projects. This raises the question of whether firms with high-return projects in countries with poorly developed financial institutions are able to draw on alternative sources of capital to offset the effects of deficient (formal) financial intermediaries. Recent work suggests that implicit borrowing in the form of trade credit may provide one such source of funds.

Using the methodology of Rajan and Zingales (1998), Fisman and Love show that in countries with relatively weak financial institutions, industries with greater dependence on trade credit financing (measured by the ratio of accounts payable to total assets) grow faster than industries that rely less on such credit. Furthermore, consistent with the notion that young firms may not use trade credit, the authors show that most of the effect they report comes from growth in preexisting firms rather than from an increase in the number of firms.

This paper—a product of Finance, Development Research Group—is part of a larger effort in the group to study the determinants of access to finance. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Kari Labrie, room MC3-456, telephone 202-473-1001, fax 202-522-1155, email address klabrie@worldbank.org. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The authors may be contacted at rf250@columbia.edu or ilove@worldbank.org. October 2001. (29 pages)

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Trade Credit, Financial Intermediary Development and Industry Growth

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I. Introduction

In recent years, there has been increasing interest in the economics literature in the role of financial intermediaries in promoting economic growth. Recent papers have shown that improved financial market development is associated with growth, using a variety of methodologies and datasets.¹ One of the basic explanations for this pattern is that the financial sector serves to reallocate funds from those with an excess of capital, given their investment opportunities, to those with a shortage of funds (relative to opportunities). Thus, an economy with well-developed financial institutions will be better able to allocate resources to projects that yield the highest returns.

This allocative role of financial institutions in promoting development was the focus of Rajan and Zingales (1998), who found that industrial sectors with a greater need for external finance develop disproportionately faster in countries with more developed financial markets. This then begs the question of whether firms with high return projects in countries with poorly developed financial institutions are able to take steps to mitigate the effects of deficient (formal) financial intermediaries, and if so, how. One answer, implicit in Rajan and Zingales, is that firms will be forced to rely more on internally generated funds. Recent work by Petersen and Rajan (1997), suggests that implicit borrowing from suppliers may provide an additional possibility. They found that, among small firms in the United States, those with less well-established banking relationships held significantly higher levels of accounts payable. Similarly,

¹ Perhaps the earliest work relating financial market development to economic growth is Cameron (1967). More recent work that examines this relationship using cross-country data includes Levine and King (1993) and Demircuc-Kunt and Maksimovic (1996). More sophisticated approaches have been utilized by: Rajan and Zingales (1998), who use within-country variation in industry characteristics; Bekaert et al (2000), who make use of time-series variation in looking at the effect of financial liberalization on growth; and Rousseau and Wachtel (1998), who look at the links between the intensity of financial intermediation and economic performance in five industrialized countries.

firms in MSA's with a relative scarcity of financial institutions carried higher levels of accounts payable. They suggest that their results imply that trade credit is used as a source of 'financing of last resort' by very constrained firms. Nilsen (1999) looks at this issue from another angle, showing that during monetary contractions small firms, which are likely to be more credit constrained, react by borrowing more from their suppliers.

Now, even the most constrained of American firms face far less scarcity of funding from formal institutions than companies in many other countries, where stock markets are in their infancy, and formal lenders are rare. A natural extension of Petersen and Rajan's reasoning is that firms with financing needs in such countries will be more likely to fall back on supplier financing in the form of trade credit as a means of funding growth.

Suppose that it is the case that trade credit is a substitute for institutional financing where financial intermediaries are scarce, and further that it is also true that firms in certain industries find it inherently easier to access trade credit, for reasons that will be discussed in the next section. Then, this would imply a substitutability between 'trade credit suitability' and financial market development. That is, financial market development should matter disproportionately more for firms that cannot make use of trade credit financing, or conversely, firms with access to trade credit financing should face (relatively) fewer difficulties in countries with less developed financial markets.

Using the methodology of Rajan and Zingales (1998), we test this hypothesis, using data from a panel of 37 industries and 44 countries. Consistent with the basic hypothesis outlined above, we find that firms in industries with higher rates of accounts payable exhibit higher rates of growth in countries with relatively weak financial institutions.² We find these results to be

² We wish to emphasize that our conclusions on the substitutability of trade credit and bank credit are based on the within country variation in trade credit usage across industries. Thus, our results imply substitution between these

very strong, and robust to a wide variety of specifications. However, since trade credit, particularly in the absence of effective legal enforcement, requires trust and reputation, start-up firms may have more difficulty in benefiting from trade credit financing, as described above.³ Consistent with this hypothesis, we find that when growth is measured by the creation of new establishments, ‘credit intensive’ industries do not grow significantly more rapidly in countries with underdeveloped capital markets.

The rest of the paper will be structured as follows: Section 2 will review the primary theories of trade credit provision, and discuss why they imply an industry-specific element to trade credit access. In section 3, we discuss the data sets used in the analysis. Our basic results are reported in section 4; and we give our conclusions & discussion in section 5.

II. Theories of Trade Credit Provision

There are numerous theories that provide explanations for the provision of credit by suppliers. These theories often pertain to particular aspects of market structure and/or product characteristics, and suggest that certain industries may have a greater ability to utilize trade credit than others. Since we will be using an industry-specific measure of trade credit intensiveness, we will begin by outlining these basic theories of trade credit provision, with particular reference

two sources of financing at the micro level, which is consistent with previous findings for US firms by Petersen and Rajan (1997), described above. However, since both sources of financing are likely to be positively correlated with contract enforcement, legal or otherwise, in a cross-country regression one might observe a positive correlation between trade credit provision and formal financial intermediation, which could be incorrectly interpreted as representing a complementarity between these two sources of financing. This highlights the importance of utilizing cross-industry differences, which allows us to better control for heterogeneity across countries in factors such as legal enforcement.

³ See, for example, McMillan and Woodruff (2000) for evidence on the relationship between credit access and firm age.

to industry specificity. Most theories of trade credit provision fall into one of the following categories: 1) comparative advantage in liquidation, 2) price discrimination by suppliers, 3) warranty for product quality, and 4) customized products.

First, several authors have suggested that credit provision will be more likely in circumstances where there is easier resale of the product being sold, since this will allow the seller to seize and resell its product if default occurs (see, for example, Mian and Smith (1992) and Frank and Maksimovic (1998)). Ease of resale will clearly be related to a number of characteristics of these inputs: depreciation; firm-specificity; inventory stocks. An implication of this theory is that industries that utilize undifferentiated raw materials, and that are required to hold large amounts of raw materials inventories (relative to finished goods inventories) will be better able to obtain trade credit financing where necessary.⁴

The second theory involves price discrimination as a motive for trade credit provision by suppliers. Brennan, Maksimovic and Zezhner (1988) present this argument, claiming that low competition among suppliers in an input market may create incentives to discriminate among cash and credit customers. This would happen if, first, the demand elasticity (or the reservation price) of credit customers is lower than that of cash customers, and second, if there is adverse selection in the credit market. In addition, trade credit could be used as a strategic instrument in the oligopolistic supplier market. Depending on the degree of competition in the input market, some industries may therefore be more prone to price discrimination by their suppliers. If some industries are 'naturally' concentrated (e.g., because of high fixed costs), and use of inputs are reasonably similar within a given industry, access to trade credit from upstream firms will also

⁴ This hypothesis is, in fact, borne out by our data: we find that, in a between industry regression of accounts payable over assets on raw materials inventories over assets, the coefficient on inventories is positive and statistically significant. Results available from the authors.

be similar. In support of this, an early study by Pryor (1972) finds that the rank ordering of industrial concentration is highly correlated among 12 developed countries.

Some industries may require trade credit as a guarantee for product quality, as in Long, Malitz and Ravid (1994). According to their theory, the supplier will willingly extend credit to allow the customer sufficient time to test the product. Similarly, in Lee and Stowe (1993), and Emery and Nayar (1998), the choice of trade credit terms offered by the supplier can serve as a signal of product quality. Certainly, some products, for example high-tech or newly developed products, need more quality assurance for their inputs than others, such as commodities.

Another theory of credit provision comes from a model in a recent paper by Cunat (2000). In this paper, supplier-customer relationships that have tailor made products, learning by doing, or other sources of sunk costs, will generate a surplus that will increase with the length of the relationship. This will increase amount of credit that suppliers are willing to provide, since it ties firms to particular suppliers, thereby increasing the scope for punishment of nonpayment. Similar to the 'inspection' discussion outlined above, industries with more complex input needs will better fit this argument.

Finally, of particular relevance for this paper, Smith (1987) provides a theory of credit provision that spans several categories, using arguments related to product quality guarantees, market power and sunk costs to generate a model of trade credit terms. She argues that credit terms will be uniform within industries and differ across industries. The empirical support for this model is presented in a recent paper by Ng, Smith and Smith (1999), who document wide variation in credit terms across industries but little variation within industries. This evidence lends some credibility to our assumption about the industry-specific use of trade credit. We

provide further evidence in the Data section below, in support of our claim that there is an industry-specific element to trade credit intensiveness.

We have laid out, in this section, a number of theories of trade credit provision that may have industry-specific components to them. It is worth noting that the purpose of this paper is not to assess which of these theories are primarily responsible for differences across industries in reliance on trade credit. Rather, for us, it is sufficient to note that there are many reasons to believe that such differences should exist, to document that such differences *do* in fact exist in our data, and to show that these differences are consistent and persist over time.

One additional concern related to the theory of credit provision is that many of the enforcement or information problems that may prevent the establishment of financial institutions may potentially affect the ability of firms to obtain trade credit financing. In particular, where rule of law is weak, firms will not have legal recourse in the case of credit nonpayment. This is of concern, since we are claiming that trade credit exists as a substitute for bank financing where the latter is scarce. We will argue, however, that even though weak creditor protection and imperfect information will affect both formal intermediaries and trade credit providers, trade creditors may mitigate these problems better than formal lenders for several reasons. These include advantages in 1) information acquisition, 2) the renegotiation/liquidation process, and 3) enforcement.

The first set of advantages stems from the fact that suppliers are thought to have a cost advantage over banks in acquisition of information about the financial health of the buyers. For example, Mian and Smith (1992) argue that monitoring of credit-quality can occur as a by-product of selling if a manufacturer's sales representatives regularly visit the borrower. Biais and Gollier (1993) assume that suppliers have different signals about the customer's probability

of default than do banks, and furthermore, that the bank will extend more credit if it observes the offering of the trade credit by supplier. Alternatively, Smith (1987) argues that the choice of the trade credit terms made can be used as a screening device to elicit information about buyers' creditworthiness.

The other arguments follow directly from the preceding discussion: because of advantages in the liquidation process, described above, the supplier would lend to a customer even if the bank would not. Finally, sunk costs and repeated interaction (as in the model by Cunat (2000) discussed above) may generate surplus split among the supplier and the customer and this surplus will give supplier an advantage over the bank lending in enforcement.

These models taken together provide theoretical grounds for arguing that in the situations when bank credit is unavailable, trade credit could serve as a (weak) substitute.^{5,6}

III. Data

The data are primarily drawn from Rajan and Zingales (1998) (referred to below as RZ) and are described in detail in their paper. A complete list of the variables used in this paper with the original sources is given in the Table 1. Our primary outcome variable is the real growth in valued added, estimated for each of 37 industries in 43 countries (UNCTAD, 1999). To estimate

⁵ These arguments are also consistent with the cross-country pattern in rates of trade credit provision, which is uncorrelated with financial development. This is presumably because the counteracting effects described above cancel one another out in the aggregate. Results available from the authors

⁶ Note that an alternative theory of trade credit is that it exists to decrease transaction costs of making payments on delivery (Ferris, 1981). According to this explanation, trade credit usage by an industry could be interpreted as the level of transaction costs specific for that industry (for example, some industries need more frequent deliveries of inputs than others and therefore transaction costs will be higher). It is plausible to argue that financial development reduces the transaction costs of payments and therefore will benefit firms (or industries) with high transaction costs disproportionately. This generates the following alternative hypothesis - that industries with higher reliance on trade credit are relatively better off in countries with more developed financial intermediaries. Our results, reported below, strongly reject this alternative hypothesis.

each industry's dependence on external finance, RZ use US firms from the Compustat database. Similarly, we use Compustat to calculate an industry-level "propensity for trade credit". As in RZ, we interpret the US data as 'industry representative' – the actual use of trade credit will vary across countries, and the US firms are likely to represent the desired (optimal) level of trade credit used by firms in a given industry. Using the US trade credit data implicitly assumes that trade credit usage by industries in US is representative of trade credit usage in other countries. This is a strong assumption, borne of necessity, as we do not have adequate cross-country data on trade credit usage. However, it is an assumption that has a strong theoretical rationale. Using each country's individual "dependence on trade credit" would be problematic, for reasons of endogeneity: one of our basic assumptions is that trade credit usage is a response to poor financial development. To capture the underlying 'technological affinity' of an industry for trade credit dependence, it is more appropriate to look at a country with well-developed markets, where trade credit choices are, in some sense, optimal. The United States, which is excluded from our regressions, provides a potential 'exogenous' measure of this.

We use the entire universe of Compustat firms, which is merged with CRSP data to obtain correct industry codes. To be consistent with previous work, we take 1980-1989 as our main sample period, and for robustness tests we use data from 1970- 1998. To improve data quality we remove very small firms with sales, total assets or total liabilities less than \$1 million; this reduces the sample size by about 10 percent.⁷

⁷ In addition to the data quality issues, this restriction is justified by the reasoning that very small firms will not be representative of 'desired' trade credit usage, since it is harder for small firms to obtain trade credit. Also, firms that are mainly equity financed (restriction on total liabilities) are not likely to be representative users of trade credit. An additional 3% of observations were removed because the ratio of total liabilities to total assets was above 1 (likely due to data problems and firms in distress). The final dataset has about 3,200 firms with 21,000 observations.

To obtain industry-level measures of trade credit usage we use the ratio of accounts payable to total assets (APAY), the same measure of the demand for credit used by Petersen and Rajan (1997). To obtain a value for each industry, we then take industry medians of the ratios over all firm-years in the relevant time period. This ratio gives the percentage of total assets that is financed by trade credit, and hence represents an industry's ability to rely on informal credit rather than institutional financing. As an alternative measure, we also use the ratio of accounts payable to total liabilities, and obtain similar results. The correlation between these two measures is 0.84 (see Table 3).⁸ Exact definitions are given in Table 1.

To construct measures of financial development we use several components available in the RZ dataset (the original source of financial development data is International Financial Statistics). Our main measure is the ratio of total credit held by private (non-governmental) organizations to GDP (PRIV). We concentrate on debt, since the theories laid out in the preceding section focus on trade credit financing as an alternative to funding by financial intermediaries, rather than equity or bond market financing. Furthermore, we focus on private (rather than public) debt, since governmental use of credit is often thought to be contaminated by political considerations that would not necessarily lead to optimal resource allocation. We do also report regressions utilizing other measures of financial development such as stock market development (given by market capitalization to GDP), and total (government plus private) credit use; we find that our results are not sensitive to the inclusion/exclusion of these other sources of financing. Finally, in the tests for endogeneity of financial development we use legal origin and accounting standards as instruments (see Table 1 for definitions and sources).

⁸ We also experimented with other industry-level measures such as: accounts receivable (as a measure for the industry's need to provide its customers with the credit); inventories; net credit (difference of accounts payable and accounts receivable); and sales to capital ratio as a measure of capital intensity. The main results on accounts payable were always robust to the inclusion of any of these additional measures (the results are available on request).

Table 2 contains data on the median levels of accounts payable used by industries in the US. The ratios for APAY/TA (accounts payable scaled by total assets) vary from 5% to about 15% with a mean of 9%, and the ratios of APAY/TL (scaled by total liabilities) vary from 12% to 27% with a mean of 19%. Thus, even within the US, trade credit is a significant source of financing. By comparison, the mean of short-term debt to assets is 3.4% and the mean of long-term debt to assets is 16% (scaled by total liabilities the ratios are 7% and 33% respectively).⁹ The industries with the lowest usage of trade credit are: drugs; leather; pottery; and pulp and paper; and the industries with the highest usage are: spinning (a slight outlier and a relatively small category); motor vehicles; and petroleum refineries. These patterns fit, at least anecdotally, with the theories laid out in the previous section. For example, petroleum refineries are raw material intensive, and utilize relatively undifferentiated inputs. At the other extreme, the pharmaceutical industry often makes use of product specific inputs that are difficult to resell. We recognize, however, that it is always possible to come up with post hoc explanations for such patterns in the data. Hence, we prefer to focus on the stability of trade credit ratios across time, by industry, as an indication of the industry specificity of trade credit. If our claim that trade credit is a meaningful and stable industry characteristic is correct, it should to be persistent across time periods.

Table 3 shows correlations of industry-level measures of trade credit use and dependence on external financing across different time periods. Our main variable (APAY) is measured over the 1980's to match the timing of the industry growth data. Indeed, the correlation for APAY between the 1980's and 1990's is 0.83 and between the 1970's and 1980's it is 0.79. By

⁹ Cunat (2000) reports that US is on the low side in the cross-country comparison of trade credit usage, so for most other countries trade credit is even more important as a source of financing.

comparison, the correlation for the RZ measure of dependence on external financing between the 1970's and 1980's is 0.63 (no data on the 1990's was reported by RZ).¹⁰

IV. Results

IV.1. Main results

Our main hypothesis is that industries that are more “dependent” on trade credit will be relatively better off in countries with less developed institutional finance.

The regression implied by this conjecture is the following:

$$\text{GROWTH}_{ci} = \alpha_i + \xi_c + \beta * \text{PRIV}_c * \text{APAY}_i + \varepsilon_{ci} \quad (1)$$

where c denotes country, i denotes industry, and we expect a negative sign on the interaction term $\text{PRIV} * \text{APAY}$. We use industry and country dummies (α_i and ξ_c) to control for all unobservable sources of value added growth specific to each country and each industry, and there is thus no need for PRIV and APAY to enter the regression on their own. The main results are given in Table 4. Model I reproduces the main result from the RZ paper; they find that industries that are more dependent on external financing grow more rapidly in countries with more developed financial markets (a positive coefficient on the interaction term). Throughout the paper we will use the term RZ interaction to stand for the main interaction used in the RZ study, which is the product of the industry's dependence on external financing and financial development (measured as the sum of domestic credit and market capitalization). Model II shows

¹⁰ Another interesting observation, also consistent with the idea of industry-specific ‘propensity for trade credit’, is that in regressions of trade credit intensiveness on firm size, about five times more variation is explained by between industry variation than within industry variation. So, to the extent that size is a predictor of credit access, most of this seems to result from some industries having ‘naturally’ larger firms, and also being naturally suited to credit access.

our main finding - the negative coefficient on the interaction of the industry-level measure of accounts payable scaled by total assets (APAY) and the country-level measure of (private) financial intermediary development (PRIV).¹¹ This coefficient is significant at 1% (all errors in this paper are adjusted for heteroskedasticity), consistent with our main hypothesis that industries that are more dependent on trade credit have a relative advantage in countries with less developed financial intermediaries. The magnitude of the effect of our main interaction on value added growth may be thought of in the following terms: consider a move from the country at the 75th percentile of private financial intermediary development (e.g., Korea) to the country at the 25th percentile (e.g., Egypt). According to our calculations, this will widen the gap in growth rates between the industries at the 25th (Printing and Publishing) and 75th (Plastics) percentiles of trade credit intensity by 1.3 percent. This difference in differences is virtually identical to the effect of the RZ interaction. As noted in RZ, this order of magnitude is similar to other explanatory variables used in the growth regressions such as investment's share of GDP and per capita income.

Model III shows that this finding is robust to exclusion of the fraction of industry's share in total manufacturing, which is used as a control variable in the rest of the regressions. Model IV shows that including our interaction together with the RZ interaction leaves both measures significant at 1%, suggesting that the trade credit channel provides an effect on growth that is independent of the external financing channel.

¹¹ Throughout the paper we refer to this product of APAY/TA and PRIV as "our main interaction".

IV.2. Composition of capital markets

In Table 5 we check for the sensitivity of the results to alternative measures of financial development to explore which of the aspects of financial development are stronger substitutes for trade credit. Model I uses *total* domestic credit to GDP, rather than private domestic credit to GDP as used in our main measure PRIV. The result is still significant at the 1% level, and comparable in magnitude. Next, we add RZ's measure of market capitalization to see whether stock market development or financial intermediary development is a stronger substitute for trade credit. The interaction with market capitalization is significant, but only at the 10% level; in contrast, measures based on domestic credit or private domestic credit are always significant at 1%. Moreover, the coefficient on market capitalization is less than a quarter of that of private credit, and also has a smaller standard deviation. These results are consistent with our hypothesis that it is financial intermediaries rather than stock markets that primarily act as close substitutes for trade credit.

A few additional regressions highlight the robustness of our primary findings. When we include both total domestic credit and private credit in the same regression (Model IV), the significance of domestic credit disappears. This is effectively capturing the fact that, after controlling for the presence of private credit, additional domestic credit (i.e., credit to public organizations) is irrelevant for explaining our results. Finally, we test whether our main result could be caused by a simple wealth effect, rather than financial institutions' development, by including APAY interacted with log GDP per capita. Model VI shows that this is not the case:

the interaction of APAY with GDP is not significant, while our main interaction is still significant at the 1% level.

IV.3. Growth in average firm size versus growth in number of firms.

In Table 6 we decompose growth in value added into growth in the total number of firms in the industry and growth in the average size of individual firms. This addresses the question of whether trade credit is a more important source of growth for new firms (growth in the number of firms) or for more mature firms. In the regression with the growth in the number of firms as the dependent variable the main interaction is not significant at conventional levels. By contrast, in the regression with the growth in the average size as the dependent variable, the coefficient on our main interaction is significant at 1% (models III and IV). Furthermore, the RZ interaction is no longer significant at conventional levels if our main interaction is also included (model IV, the RZ interaction is significant at 14% in this model). This is consistent with our hypothesis that for young firms, which have not yet had a chance to establish reputations for credit worthiness, trade credit is a less accessible source of substitute financing than it is for mature firms. Furthermore, for mature firms trade credit financing appears to be a more important determinant of growth than the dependence on external financing captured by the RZ interaction.¹²

¹² RZ also report that in the regression with the number of firms, their effect is estimated more precisely: their interaction is significant at 5% in the number regression and only 10% in the average size regression. This finding could be interpreted as suggesting that the RZ measure of external financing actually picks up the fact that young firms, which are likely to be in rapidly growing industries, are more dependent on external financing than firms in mature industries.

IV.4. Robustness

Table 7 explores the robustness of our results to alternative definitions of trade credit dependence and alternative measures of growth. In models I and II we use APAY/TL (accounts payable scaled by total liabilities) as a measure of trade credit dependence, and find that this alternative definition does not affect our results. Models III and IV use APAY/TA measured over the 1970's; the result is slightly less significant – only at 4%, similarly, the RZ interaction is significant only at 4% when measured over the 1970's (this could be accounted for by attenuation bias due to lower quality data). Model V uses APAY/TA measured over the 1990's and finds it to be significant at 1%. Thus, our main result is not sensitive to a different scaling factor or different time horizons.

Next, we address the question of reverse causality in financial development. The argument here is that if the country's economy contains more industries that rely more on trade credit, there will be less need for formal intermediaries to develop. This is a weak argument, since first, the presence of trade credit still leaves a lot of room for formal credit markets to develop. Second, trade credit seems to be a second best option, as firms that have access to bank credit prefer it to the use of trade credit (see Petersen and Rajan (1997)). Nevertheless, following RZ, we run our main regression using instrumental variables with legal origin dummies as instruments for financial development. In model VI we find that our main result is still significant, although now only at 6% level. Finally, we use accounting standards as a proxy for financial intermediary development and still find a negative relationship (model VII). This could be interpreted as evidence in support of information-based theories of trade credit advantages, since with poor accounting standards, less information is available for financial intermediaries,

thereby tilting the balance in favor of supplier financing. However, this result is somewhat weaker than our other results: the significance is only 10%, though this is partially a reflection of the decline in sample size (about 20%).

Finally, in Table 8 we make sure that our results are not driven by a small number of influential observations. The distribution of the main dependent variable, the growth in real value added, has very long tails: while the 10th and 90th percentiles of growth are -5% and +12% respectively (with mean and median of about 3%) the extreme observations go as far as -50% to +100% (observations above 100% were replaced with missing by RZ). All regressions in Table 8 (except model IV) exclude the 1% of observations on each side of the distribution for growth in value added (in effect all observations below -30% and above +27% are excluded). This exclusion does not affect significance of our main interaction, which is still significant at 1%. However, the RZ interaction is more sensitive to influential observations and its significance drops to 5% in the regression by itself (model I) and 10% if APAY is added (model III). The magnitude of the effect on the growth in value added drops from about 1% to 0.52% for our main interaction and 0.38% for the RZ interaction. However, the explanatory power rises to 0.36 from 0.3 suggesting that these outlying observations created considerable noise in the original estimates. Finally, model IV excludes industry with ISIC code 3211 (Spinning), which appears to be an outlier on the APAY/TA measure and model V excludes 1% outliers and Spinning. The significance of our main result is not affected by these exclusions.¹³

¹³ In additional results, not reported, we explored the sensitivity to exclusion of specific countries. For example, we excluded two countries with the highest level of PRIV (Singapore and Japan), and the main interaction was still significant at 1% (not reported).

V. Conclusions

In this paper, we have shown that firms in countries with less developed financial markets appear to substitute informal credit provided by their suppliers to finance growth. Using the methodology pioneered by Rajan and Zingales (1998), we find that industries that are more dependent on trade credit financing grow relatively more rapidly in countries with less developed financial intermediaries. The result is robust to the addition of various industry-level measures, alternative financial development measures, and exclusion of influential observations. We also find that trade credit usage affects growth in the average size of firms rather than the growth in the number of firms. This is consistent with ‘reputation-based’ theories of trade credit, which argue that new firms will have greater difficulties in obtaining trade credit.

This paper uncovers an important and significant role for trade credit as a source of firm financing and growth, thus calling into question claims that trade credit exists only to reduce transaction costs. This certainly does not detract from the importance of financial development as an engine of growth: as we have emphasized, our argument is driven by the assumption that firms view trade credit as a second-best alternative to bank financing. Furthermore, our results on new firm growth imply that, in some sense, trade credit is less ‘democratic’ than bank financing in promoting growth, which may raise concerns about fostering industry competition and may also have distributional implications. Still, our work highlights the fact that in the face of adverse circumstances, firms are effective in finding substitutes to poorly developed institutions. The substitution of trade credit for formal bank financing is just one example, and we leave similar analyses along other dimensions as possibilities for future work.

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Table 1. List of variable abbreviations, definitions and sources.

Abbreviation	Description
I. Variables from Rajan and Zingales:	
1) Industry-level variables, original source Compustat:	
EXTFIN	Dependence on external financing, industry-level median of the ratio of capital expenditures minus cash flow over capital expenditures (the numerator and denominator are summed over all years for each firm before dividing). This variable measures the portion of capital expenditures not financed by internally generated cash. Cash flow is defined as the sum of funds from operations, decreases in inventories, decreases in receivables, and increases in payables. This variable is measured over 1980-1989 includes all firms, EXTFIN 70's is measured over 1970-1980.
2) Country-Industry level variables, original source United Nations Statistics:	
Industry growth	Main measure is growth in value added; it is annual compounded growth rate in real value added estimated for the period 1980-1990 for each ISIC industry in each country. Growth in number equals to the difference in the log of ending period firm number less the log of firm number in the beginning of period. Growth in average size equals the difference in logs of the average size, which is defined as total value added in the industry divided over the number of firms in the industry.
Fraction	Fraction of the industry's value added in total manufacturing value added for 1980.
3) Country-level variables:	
Domestic credit	Ratio of domestic credit held by monetary authorities and depositary institutions (excluding interbank deposits) scaled by GDP for 1980. Original source is International Financial Statistics (IFS).
Private credit	Ratio of private domestic credit held by monetary authorities and depositary institutions (excluding interbank deposit) scaled by GDP for 1980. Original source is International Financial Statistics (IFS).
Market cap.	Ratio of stock market capitalization to GDP in 1980. IFS.
Log GDP PC	Log of GDP per capita in US dollars in 1980. IFS
Legal origin	Dummies for English, French, German or Scandinavian origin of the legal system. La Porta et al. (1996)
Accounting Standards	Amount of disclosure of companies's annual reports in each countries. La Porta et al.(1996)
II. Additional variables constructed from Compustat:	
APAY, APAY/TA	Accounts payable scaled by total assets, industry medians of firm-level measures. Main variable is measured over 1980-1989, additional variables are measured over 1970-1979 and 1990-1998.
APAY/TL	Accounts payable scaled by total liabilities, industry medians of firm-level measures over 1980-1989.
S/K	Sales scaled by capital (ppent - property plant and equipment net of depreciation)

Table 2. Trade credit use by industry

Median levels of Accounts Payable by industry, APAY/TA is scaled by total assets APAY/TL is scaled by total liabilities. Sources Compustat and CRSP for industry codes.

ISIC code	Description	APAY/TA 1980's	APAY/TA 1990's	APAY/TL 1980's
311	Food products	11.4%	8.7%	21.2%
313	Beverages	9.1%	6.4%	17.4%
314	Tobacco	6.8%	4.8%	12.6%
321	Textile	10.1%	7.6%	22.4%
3211	Spinning	14.9%	15.1%	29.3%
322	Apparel	11.2%	11.5%	24.6%
323	Leather	5.8%	7.9%	14.3%
324	Footwear	9.3%	7.4%	23.4%
331	Wood Products	8.9%	6.5%	17.8%
332	Furniture	9.2%	8.3%	20.6%
341	Paper and Products	8.2%	7.1%	17.7%
3411	Pulp, paper	6.4%	5.8%	13.2%
342	Printing and Publishing	7.6%	7.1%	16.1%
3511	Basic chemicals excl. Fertil.	8.3%	7.1%	17.2%
3513	Synthetic resins	8.8%	8.4%	18.0%
352	Other Chemicals	9.9%	9.0%	22.1%
3522	Drugs	5.6%	5.0%	15.9%
353	Petroleum refineries	11.8%	10.2%	21.3%
354	Petroleum and coal products	9.5%	8.9%	21.5%
355	Rubber products	9.0%	8.0%	20.0%
356	Plastic products	9.9%	10.2%	20.1%
361	Pottery	6.7%	5.7%	15.3%
362	Glass	9.3%	8.9%	17.9%
369	Non metal products	6.5%	6.8%	14.2%
371	Iron and Steel	9.5%	9.9%	18.0%
372	Non-ferrous metal	7.9%	7.3%	18.3%
381	Metal products	8.7%	8.7%	19.1%
382	Machinery	8.7%	9.1%	18.4%
3825	Office, computing	8.5%	9.5%	22.6%
383	Electric machinery	8.3%	9.3%	19.4%
3832	Radio	7.7%	7.9%	19.3%
384	Transportation equipment	10.6%	9.9%	21.1%
3841	Ship	10.2%	8.1%	17.8%
3843	Motor veichle	11.5%	11.5%	21.4%
385	Professional goods	7.2%	6.5%	18.0%
390	Other ind.	8.9%	8.4%	19.3%
	Mean	8.9%	8.3%	19.1%
	Median	8.9%	8.2%	18.7%
	Standard deviation	1.9%	2.0%	3.3%

Table 3. Correlations of industry-level measures.

Correlations of industry-level medians. See Table 1 for variable definition and sources. If not specified implicitly, the variable is measured over 1980's. All correlations are based on 36 observations, except EXTFIN measured over 70's which has only 35 observations. P-values are in parenthesis (0 stands for lower than 0.01), * denotes significance at 5%.

	APAY/TA 70's	APAY/TA 80's	APAY/TA 90's	APAY/TL	EXTFIN	EXTFIN 70's
APAY/TA 80's	0.79* (0)					
APAY/TA 90's	0.64* (0)	0.83* (0)				
APAY/TL	0.71* (0)	0.84* (0)	0.78* (0)			
EXTFIN	0.11 (0.51)	-0.13 (0.46)	-0.01 (0.93)	0.07 (0.66)		
EXTFIN 70's	0.09 (0.59)	0.02 (0.89)	0.15 (0.37)	0.08 (0.62)	0.63* (0)	
S/K	0.20 (0.25)	0.04 (0.79)	0.15 (0.37)	0.28 (0.09)	-0.16 (0.34)	-0.06 (0.71)

Table 4. Accounts Payable and Industry Growth

Dependent variable is real growth in value added. Fraction is fraction of industry Value Added in total manufacturing in 1980, RZ Interaction is interaction of industry's dependence on external financing with Financial development, PRIV is Financial Intermediary development in 1980 (the ratio of total credit held by private (non-governmental) organizations to GDP), APAY/TA is industry's dependence on trade credit measured by Accounts Payable over Total assets. All variables are from RZ except for APAY/TA which is from Compustat 1980-1989. All models include country and industry dummies. Standard errors appear in parentheses, and are adjusted for heteroskedasticity. Significance levels ***, ** and * correspond to 1%, 5% and 10% respectively.

	1	2	3	4
Fraction	-0.91 (0.246) ***	-0.88 (0.247) ***		-0.95 (0.248) ***
RZ Interaction	0.069 (0.023) ***			0.064 (0.022) ***
Interaction APAY/TA and PRIV		-2.01 (0.597) ***	-1.64 (0.604) ***	-1.79 (0.568) ***
N	1217	1217	1217	1217
R2	0.29	0.29	0.27	0.30

Table 5. Composition of Capital Markets and GDP

Dependent variable is real growth in value added. Fraction is fraction of industry Value Added in total manufacturing in 1980, APAY/TA is industry's dependence on trade credit measured by Accounts Payable over Total assets. Domestic credit is the ratio of total credit to GDP in 1980; PRIV is Financial Intermediary development in 1980 (the ratio of total credit held by private (non-governmental) organizations to GDP); Market cap is the ratio of stock market capitalization to GDP in 1980; FD RZ is the financial development measure used by RZ (the sum of domestic credit and market capitalization). All variables are from RZ except for APAY/TA which is from Compustat 1980-1989. All models include country and industry dummies. Standard errors appear in parentheses, and are adjusted for heteroskedasticity. Significance levels ***, ** and * correspond to 1%, 5% and 10% respectively.

	1	2	3	4	5	6
Fraction	-0.84	-0.85	-0.89	-0.89	-0.86	-0.88
	(0.25) ***	(0.25) ***	(0.25) ***	(0.25) ***	(0.25) ***	(0.25) ***
Interaction of APAY/TA with:						
Domestic credit	-1.44	-1.44		-0.21		
	(0.53) ***	(0.52) ***		(0.57)		
PRIV			-2.02	-1.84		-1.97
			(0.60) ***	(0.66) ***		(0.60) ***
Market Cap.		-0.48	-0.48	-0.48		
		(0.27) *	(0.25) *	(0.25) *		
FD						
FD RZ					-0.78	
					(0.29) ***	
Log GDP PC						-0.01
						(0.05)
N	1217	1192	1192	1192	1217	1217
R2	0.29	0.29	0.29	0.29	0.28	0.29

Table 6. Growth in Number and Size

Dependent variable is growth in number of establishments in models 1 and 2 and growth in average size of establishments in models 3 and 4. Fraction is fraction of industry Value Added in total manufacturing in 1980, APAY/TA is industry's dependence on trade credit measured by Accounts Payable over Total assets. PRIV is Financial Intermediary development in 1980 (ratio of total credit held by private (non-governmental) organizations to GDP) RZ Interaction is interaction of industry's dependence on external financing with Financial development. All models include country and industry dummies. Standard errors appear in parentheses, and are adjusted for heteroskedasticity. Significance levels ***, ** and * correspond to 1%, 5% and 10% respectively.

Dependent Variable:	Growth in Number of Establishments		Growth in Average Size of Establishments	
	1	2	3	4
Fraction	-0.19 (0.140)	-0.23 (0.150) *	-0.77 (0.330) **	-0.81 (0.330) **
Interaction of APAY/TA and PRIV	-0.47 (0.380)	-0.41 (0.370)	-1.97 (0.580) ***	-1.92 (0.580) ***
RZ interaction		0.028 (0.012) **		0.026 (0.018)
N	1073	1073	1047	1047
R2	0.45	0.45	0.43	0.43

Table 7. Robustness I - Alternative Measures

Dependent variable is real growth in value added. Fraction is fraction of industry Value Added in total manufacturing in 1980, RZ Interaction is interaction of industry's dependence on external financing with Financial development, PRIV is Financial Intermediary development in 1980 (ratio of total credit held by private (non-governmental) organizations to GDP). Models 1 and 2I use APAY/TL (accounts payable scaled by total liabilities) measured over 1980's; models 3 and 4 use APAY/TA (accounts payable scaled by total assets) and RZ interaction measured over 1970's; model 5 uses APAY/TA measured over 1990's; model 6 is estimated by instrumental variables with legal origin used as instruments for PRIV -financial intermediary development. Model 7 is interaction of APAY/TA with accounting standards. All models include country and industry dummies. Standard errors appear in parentheses, and are adjusted for heteroskedasticity. Significance levels ***, ** and * correspond to 1%, 5% and 10% respectively.

	1	2	3	4
Fraction	-0.86 (0.25) ***	-0.94 (0.25) ***	-0.84 (0.25) ***	-0.90 (0.25) ***
Interaction APAYand PRIV	-0.86 (0.30) ***	-0.89 (0.30) ***	-1.31 (0.48) **	-1.49 (0.50) **
RZ interaction		0.07 (0.02) ***		0.12 (0.05) **
N	1217	1217	1217	1179
R2	0.29	0.3	0.28	0.28

	5	6	7
Fraction	-0.83 (0.24) ***	-0.85 (0.25) ***	-0.61 (0.21) ***
Interaction APAYand PRIV	-1.53 (0.58) ***	-0.94 (0.54) *	-0.013 (0.01) *
RZ interaction			
N	1217	1207	1067
R2	0.29	0.29	0.34

Table 8. Robustness II -Excluding Outliers

Dependent variable is real growth in value added. Fraction is fraction of industry Value Added in total manufacturing in 1980, RZ Interaciton is interaciton of industry's dependence on external financing with Financial development, PRIV is Financial Intermediary development in 1980 (ratio of total credit held by private (non-governmental) organizations to GDP), APAY/TA is industry's dependence on trade credit measured by Accounts Payable over Total assets. All variables are from RZ except for APAY/TA which is from Compustat 1980-1989. Models 1-3 exclude 1% of obseravtions on each side for the dependent variable, model 4 excludes industry 3211 (Spinning), and model 5 excludes industry 3211 in addition to 1% outlier on each side. All models include country and industry dummes. Standard errors appear in parentheses, and are adjusted for heteroskedasticity. Significance levels ***, ** and * correspond to 1%, 5% and 10% respectively.

	1	2	3	4	5
Fraction	-0.43 (0.11) ***	-0.43 (0.11) ***	-0.46 (0.11) ***	-0.92 (0.27) ***	-0.43 (0.12) ***
Interaction of APAY/TA and PRIV		-0.86 (0.26) ***	-1.22 (0.40) ***	-2.19 (0.77) ***	-1.36 (0.51) ***
RZ Interaction	0.029 (0.013) **		0.025 (0.013) *		
N	1202	1202	1202	1187	1172
R2	0.36	0.36	0.36	0.29	0.36

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