The Impact of Financial Development on the Relationship between Trade Credit, Bank Credit and Firm Characteristics. A Study on Firm-Level Data from Six MENA Countries

Jézabel Couppey-Soubeyran, Jérôme Héricourt

Jézabel Couppey-Soubeyran* and Jérôme Héricourt

The Impact of Financial Development on the Relationship between Trade Credit, Bank Credit, and Firm Characteristics: A Study on Firm-Level Data from Six MENA Countries

Abstract: Using a database of more than 1,300 firms from six countries in the MENA region, we study the impact of financial development on the relationship between trade credit on the one hand and bank credit access and firm-level characteristics, especially financial health, on the other hand. Trade credit use increases with the difficulty for gaining access to bank credit, and indicators of the quality of the firm's financial structure negatively influence the use of trade credit. Additional investigations tend to suggest that increased financial development significantly reduces the substitution relationship between trade credit and bank credit and more generally decreases the influence of most firm-level determinants for trade credit usage. These results are plausibly explained by a demand-driven story: when bank credit access gets increasingly difficult, or when financial health deteriorates, the demand for trade credit increases. Similarly, when financial development increases, firms have better access to bank credit, and impact of this variable (or financial health proxies) on the demand for trade credit becomes less or not significant.

Keywords: trade credit, bank credit, financial constraints, financial development

***Corresponding author: Jézabel Couppey-Soubeyran,** University of Paris 1, Centre d'Economie de la Sorbonne, Paris, E-mail: couppey@univ-paris1.fr
Jérôme Héricourt, EQUIPPE-Universités de Lille, Lille, Centre d'Economie de la Sorbonne – Université de Paris 1 and CEPII, Paris, France, E-mail: jerome.hericourt@univ-lille1.fr

1 Introduction

The financial crisis started in 2008 and the subsequent Great Recession of 2008–2009 represent the most recent examples of the real effects of a systemic banking crisis. World GDP decreased by 1.3% while global trade collapsed by 20% in real terms following the sudden financial arrest, which froze global credit markets. Access to bank credit rapidly went increasingly difficult for firms, in a context where liquidity became extraordinarily scarce. This renewed the

academic interest in trade credit, a preferential payment period granted by a supplier to its client or a loan granted by a firm to another one. Some very recent analyses suggest that, facing an unprecedented bank credit crunch, constrained firms switched to trade credit to finance their activity (see, in particular, Garcia-Appendini and Montoriol-Garriga 2013, on a panel of US firms between mid-2005 and the end of 2010; Carbo-Valverde, Rodriguez-Fernandez, and Udell 2012, on a panel of over 40,000 Spanish firms from 1994 to 2008). Many previous articles also suggest that trade and bank credit are substitutes. Meltzer (1960) is one of the very first to put forward the theory that during periods of monetary restriction, companies replace bank credit by trade credit. Breig (1994) emphasizes that firms use trade credit more and more extensively as bank/company relationships become more distant. Petersen and Rajan (1997) and Carbo-Valverde, Rodriguez-Fernandez, and Udell (2008) also relate the demand for trade credit with the difficulty of access to bank credit. Wilner (2000) and Cuñat (2007) put forward another explanation, whereby suppliers may provide liquidity to customers whenever they experience an idiosyncratic liquidity shock; therefore, trade credit acts as a safety valve substituting other types of loans. Following Biais and Gollier (1997), Demirgüc-Kunt and Maksimovic (2001) observe that the trade credit offering is explained above all by an informational advantage among suppliers with regard to their clients, leading vendors to extend credit to buyers on terms that they would not be able to receive from financial intermediaries. Similarly, other researchers support the complementarity of trade and bank credit[1] (Cook 1999; Ono 2001). In particular, Garcia-Appendini (2011) finds evidence of a certification role of trade credit: banks are more likely to lend to firms that have been granted trade credit by their suppliers and to firms that pay higher proportions of their trade credit debts on time.

Whether trade and bank credit are complements or substitutes is a recurring debate in the literature. This question is important, because the way firms can access external finance to fund their growth has crucial macro-implications. After Levine (2005), Aghion (2008) surveys empirical evidence regarding the link between finance and growth and highlights that financial development has a positive and significant influence on economic growth,[2] probably because

1 Complementarity between bank and trade credits implies positive correlations between their variations or at least, that, the decrease in one (because of, for example, a more difficult access to bank credit) does not necessarily induce an increase in the other one (in that case, a more intensive use of trade credit).

2 The positive link between finance and economic growths is challenged in recent contributions (Arcand, Berkes, and Panizza 2012; Rousseau and Wachtel 2011). But the level of financial development in countries of interest in our study is much lower than the threshold at which Arcand et al. (2012) find that financial development starts having a negative effect on growth.

financial development reduces the external financing constraints on firms. In this article, we precisely study the impact of financial development on the relationship between trade and bank credit relying on a sample of more than 1,300 firms from six Middle East and North Africa (MENA) countries: Algeria, Egypt, Lebanon, Morocco, Oman, and Syria. To our knowledge, no study has yet been devoted to MENA countries, which, however, provide an excellent field of coverage: the banking penetration rate (percentage of the population that have at least one bank account) is still low (around 30% on average) and the share of bank loans in the external financing of businesses barely exceeds 20%, even though the productive structure is characterized by a high proportion of financially constrained small and medium enterprises. Most MENA economies have fairly undeveloped financial systems and are still growing in terms of banking penetration. The World Bank's Investment Climate Survey confirms the difficulty of access to credit for firms in this area: the percentage of businesses with a bank loan was only 24% in 2009 (against 48% for firms in East Asia and Pacific countries, 44% for those in Eastern European and Central Asia countries, 45% for those in Latin America and the Caribbean, and 27% for those in South Asia).

Our findings can be summarized as follows: at first sight, results show that the difficulty of gaining access to bank credit positively influences the use of trade credit and thus demonstrate the substitutability of bank credit and trade credit; similarly, the indicators of the quality of the firm's financial structure negatively influence the use of trade credit, emphasizing the utility of this form of credit for companies in precarious financial health. However, additional investigations tend to suggest that increased financial development significantly reduces (and can even make disappear) the substitution relationship between trade credit and bank credit and more generally decreases the influence of most firm-level determinants for trade credit usage.

The interpretation of these aggregate results presents a familiar identification issue in the trade credit literature: the observed trade credit is an equilibrium result of supply and demand. One does not know *a priori* if the difference in the use of trade credit could reflect the difference in demand or supply of trade credit. In their study of the effect of financial crisis on trade credit in six emerging economies, Love, Preve, and Sarria-Allende (2007) find that firms with weaker financial conditions are more likely to reduce trade credit after the crisis. They argue that the results are in favor of the supply-driven story, since it is quite unlikely that the decrease in demand for trade credit after the crisis would be related to a supplier's financial condition. Our own conclusions in this article reflect more a demand-driven phenomenon, as suggested by the results on our credit access variable: when bank credit access gets increasingly difficult, the use of trade credit also increases. Similarly, the signs on our two indicators of

financial health are negative, implying that firms with higher cash flow or equity will use less trade credit. This is more in favor of a demand-driven story (firms trying to compensate bank credit with trade credit) than a supply-driven one, since one does not see why suppliers would spontaneously provide more trade credit, because bank credit is scarce, or because firms display a damaged financial health (the opposite link would be much more plausible). This also fits well with our main result regarding financial development: when the latter increases, firms have better access to bank credit, and impact of this variable on the demand for trade credit becomes less or not significant.

Our article is, therefore, related to the literature suggesting that both views (trade and bank credit substitutes vs trade and bank credit complements) can be reconciled when financial constraints (which are, all things equal, related negatively to financial development) are taken into account. Burkart and Ellingsen (2004) develop a contract model allowing bank and trade credit to be either complements or substitutes. Among others, an important finding is that the importance of trade credit compared to bank credit should be greater in less-developed credit markets, where creditor protection is often weaker, and firms are undercapitalized due to entrepreneurs' lack of wealth. In that sense, our results can be understood as an empirical test of this specific conclusion of their model. An important contribution of our article is, therefore, to provide micro-evidence of the impact of financial development on the bank/trade credit relationship.

Our results are also consistent with the few articles which have explored the link with financial development (see Breig 1994, who compares France and Germany; Fisman and Love 2003, who show that businesses use trade credit more extensively in countries with undeveloped banking systems; Ge and Qiu 2007, on China). More generally, our article expands the relatively small literature that have studied the importance of trade credit in emerging economies, in particular, the transition countries of Eastern and Central Europe (Coricelli 1996; Cook 1999; Berglöf and Bolton 2002; Hammes 2003; Delannay and Weill 2004) and those of Asia (Love, Preve, and Sarria-Allende 2007) and sub-Saharan Africa (Fafchamps, Pender, and Robinson 1995; Biggs, Raturi, and Srivastavac 2002; Isaksson 2002).[3]

3 One should note that trade credit is a form of financing that is not specific to developing or emerging countries. It is a widespread source of short-term external financing in the United States and Europe. In fact, most empirical studies addressing this question focus on developed countries, often using data from the United States (Elliehausen and Wolken 1993; Petersen and Rajan 1994, 1997; Nilsen 2002) or Europe (Crawford 1992a, 1992b; Breig 1994; Deloof and Jegers 1996, 1999; Marotta 1997, 2001; Wilson, Singleton, and Summers 1999; Wilson and Summers 2002), and mainly highlighting problems of financial constraints, and advantages in terms of transaction costs or cash flow to explain the demand for trade credit.

In the next section, we present our database and the variables of interest, before discussing our general empirical methodology in Section 3. In Section 4, we study the robustness of our empirical specifications to various subsamples and estimation methods (especially, controlling for endogeneity). Section 5 presents our core results regarding the impact of financial development. Finally, Section 6 contains robustness checks, and Section 7 provides concluding remarks.

2 Data and choice of variables

2.1 Database

The database of the World Bank's survey on enterprises in developing countries (World Bank's Investment Climate Survey[4]) is particularly well suited to our study, since it gives information on the use of trade credit, access to credit, and the financial health of businesses. The data include accounting information such as turnover, intermediate consumption, payroll, capital stock, investments, and other expenditure; more general information is also available about shareholding structure, characteristics of the workforce, relations with competitors, clients, and suppliers, innovation, and the business climate. In each country, industries were selected non-randomly in order to focus on the main producing sectors. Within each industry, firms were chosen randomly and their composition is, therefore, representative of the population.

From this database, we extracted the MENA countries for which the accounting data that we needed were all available. From the 11 MENA countries[5] surveyed by the World Bank, six countries in the MENA region satisfied this availability and reliability constraint: Algeria, Egypt, Lebanon, Morocco, Oman, and Syria. The periods covered differed from one country to the next, but were always between 1999 and 2004, that is 1999–2001 for Algeria, 2002–2003 for Egypt, 2003–2004 for Lebanon, and 2000–2002 for Morocco, Oman, and Syria. World Bank surveys have admittedly been updated for Algeria and Morocco in 2007, Egypt in 2008, and Lebanon and Syria in 2009.[6]

4 These surveys are available at http://www.enterprisesurveys.org/

5 Algeria, Egypt, Iraq, Jordan, Lebanon, Morocco, Oman, Saudi Arabia, Syria, West Bank of Gaza, and Yemen.

6 No new survey is available for Oman.

However, these surveys could not allow extending the dataset. Regarding Algeria, Egypt Morocco, and Syria, the balance-sheet data required by our study were either missing or insufficient (especially, information on the liabilities side is absent). Concerning Lebanon, required balance-sheet data were available for around 75 firms in 2007 and 2008, but other firm-level information was missing.[7] Therefore, restricting the sample to the 1999–2004 period over six countries emerged as the best option to maximize the number of observations and the reliability of the results. Table 1 displays a few key indicators which allow assessing the representativeness of the six countries of our sample. Altogether, they represent on average 27% of MENA's GDP and almost half of its population. GDP per capita and, more importantly, ratio of private credit over GDP (our measure of financial development, cf. Section 2.2) display a significant heterogeneity, both within the sample and compared to MENA as a whole. Last but not least, there does not seem to be any major transformation of the financial system over the considered period: ratios of domestic credit over GDP stay most of the time in the same order of magnitude; significant increases are observed for Algeria and Syria, but financial development remains at very low levels (respectively, 16 and 22.5%).[8] Therefore, the results we are going to extract over the 1999–2004 period appear to be fully reliable and relevant.

To control for the potential influence of outliers, we restricted the sample to firms that had declared positive figures for turnover and assets and positive or null figures for debt and interest payments. We also excluded observations in the 1% from the upper and lower tails of the distribution in the regression variables. These cut-offs are aimed at eliminating extraordinary firm shocks or coding errors. At the end, we obtain a database of 1,314 private firms[9] for a maximum of 3,002 observations. All data collected in national currencies are converted into Euros (by means of annual exchange rates extracted from the International Financial Statistics (IFS)).

7 The location was missing, and more importantly, the industrial categories were very rough, causing matching problems with the rest of the database.

8 Qualitatively identical trends can be observed for banking intermediation (i.e. the ratio of domestic credit provided by banking sector over GDP) and financial market development (i.e. the ratio of market capitalization over GDP). More details on these additional financial indicators are available upon request to the authors.

9 There were very few state-owned companies in the initial database (hardly more than 1.5% of the total, or around 40 firms). It was, therefore, not possible to conduct a sound empirical analysis of this subsample. For this reason, we withdrew them from the database.

Table 1: Macroeconomic indicators, 1999–2010.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Share of MENA countries GDP (%)												
Algeria	6.02	5.84	5.89	6.04	6.14	6.06	6.05	5.83	5.71	5.57	5.61	5.55
Egypt, Arab Rep.	10.64	10.64	10.83	10.85	10.65	10.40	10.32	10.42	10.62	10.84	11.16	11.23
Lebanon	1.91	1.84	1.88	1.90	1.87	1.88	1.81	1.72	1.76	1.83	1.95	2.00
Morocco	4.09	3.94	4.17	4.22	4.27	4.19	4.10	4.18	4.08	4.11	4.23	4.20
Oman	2.12	2.12	2.24	2.25	2.14	2.08	2.05	2.05	2.08	2.24	2.22	2.21
Syrian Arab Rep.	2.11	2.06	2.13	2.21	2.11	2.12	2.14	2.12	2.13	2.12	2.21	2.19
All sample	26.89	26.44	27.14	27.47	27.18	26.73	26.47	26.31	26.39	26.72	27.38	27.36
Share of MENA countries population (%)												
Algeria	9.82	9.77	9.72	9.67	9.62	9.58	9.53	9.47	9.42	9.36	9.31	9.27
Egypt, Arab Rep.	21.68	21.64	21.61	21.59	21.56	21.53	21.49	21.43	21.37	21.30	21.24	21.21
Lebanon	1.20	1.20	1.19	1.19	1.19	1.18	1.17	1.16	1.15	1.13	1.12	1.11
Morocco	9.28	9.21	9.14	9.06	8.98	8.89	8.80	8.71	8.61	8.52	8.43	8.35
Oman	0.74	0.72	0.72	0.71	0.70	0.70	0.70	0.71	0.71	0.72	0.72	0.73
Syrian Arab Rep.	5.08	5.11	5.16	5.22	5.27	5.32	5.35	5.35	5.34	5.34	5.34	5.34
All sample	47.80	47.66	47.54	47.43	47.33	47.21	47.05	46.83	46.60	46.37	46.17	46.01

(*continued*)

Table 1: (*Continued*)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
GDP per capita (constant US dollars, 2000)												
All MENA	2,905.26	3,002.15	2,994.67	2,999.14	3,091.67	3,230.56	3,331.90	3,454.03	3,552.45	3,650.71	3,640.81	3,731.47
Algeria	1,781.14	1,794.41	1,814.42	1,871.92	1,971.51	2,043.14	2,115.19	2,124.96	2,155.49	2,173.79	2,192.70	2,231.98
Egypt, Arab Rep.	1,425.76	1,475.84	1,500.52	1,507.93	1,527.27	1,560.38	1,600.32	1,678.95	1,765.87	1,858.86	1,911.96	1,975.55
Lebanon	4,615.53	4,612.20	4,718.17	4,794.65	4,865.71	5,147.69	5,129.40	5,103.49	5,436.65	5,895.08	6,350.33	6,745.66
Morocco	1,267.80	1,271.81	1,351.27	1,379.69	1,450.12	1,502.88	1,530.85	1,632.13	1,658.86	1,733.53	1,797.41	1,844.35
Oman	8,342.81	8,774.93	9,369.33	9,511.06	9,404.44	9,550.96	9,723.22	10,006.30	10,392.29	11,385.64	11,191.81	11,345.43
Syrian Arab Rep.	1,207.87	1,208.73	1,235.56	1,269.27	1,238.40	1,286.01	1,330.32	1,368.93	1,418.05	1,452.26	1,508.64	1,525.81
Domestic credit to private sector (% of GDP)												
All MENA	40.23	38.46	41.90	42.45	41.28	40.63	41.69	41.57	45.88	46.63	52.74	53.19
Algeria	5.39	5.97	8.00	12.24	11.36	11.16	12.11	12.34	13.36	13.17	16.50	15.56
Egypt, Arab Rep.	52.00	51.95	54.93	54.66	53.90	54.04	51.17	49.29	45.52	42.80	36.09	33.07
Lebanon	82.27	87.90	86.02	82.57	78.64	75.87	68.51	70.48	73.43	73.84	73.02	81.34
Morocco	47.70	51.00	44.55	43.38	42.41	42.60	46.15	48.65	58.39	63.24	64.74	68.65
Oman	46.09	36.78	39.13	39.08	36.94	34.35	30.83	31.07	35.71	35.32	48.21	42.93
Syrian Arab Republic	9.20	8.30	7.74	7.87	10.10	11.65	14.76	14.88	15.11	17.56	19.65	22.51

Source: World Development Indicators.

2.2 Variables of interest

We want to explain the determinants of trade credit usage by the firms in our sample and to shed light on the relationship between bank and trade credits. The observed variable we use is the ratio of accounts payable over total assets[10] (or its binary counterpart, see below).

The cross-country dimension of our database allows us to study the relationship between financial development and the use of trade credit, and especially to study how the level of financial development influences the nature of the relationship between trade credit and firm-level determinants. In this respect, the financial development indicator we choose (focusing on the financial intermediation aspect) is the ratio of credit to private sector to GDP. This indicator is the most frequently used in the literature.[11]

The surveys used did not provide any information about the volume of bank credit on the balance sheets of the firms surveyed (only the global debt of the firms). However, a qualitative variable was available about the difficulty of access to bank credit; this variable takes a value between 0 and 4 according to whether the answer to the question "Is access to bank loans an obstacle to business?" was "not at all, minor, moderate, major, or severe". Therefore, this variable records the respondent's opinion about accessing bank credit. Hence, concern may be raised regarding the subjectivity of this answer, which may not reflect properly the enterprise's productivity and its capacity to obtain finance. To tackle this issue, we compute the coefficients of correlation between our credit access variable and measures of productivity and financial strength directly observable by the respondent (namely, labor productivity, defined as the ratio of sales over the number of employees and firm's equity and cash flows). All three correlation coefficients are significant at the 5% level, and they highlight that reported credit access difficulty is positively related to productivity and negatively to equity and cash flows (see also descriptive statistics in Table 2). To sum up, the firms reporting a difficult access to bank credit are the most performing ones but also the ones with small internal finance, that is, all things equal, the firms crucially needing external finance for development purpose. Hence, these reported difficulties in accessing bank credit seem to reflect an objective need for it, and this variable provides a relevant measurement of the degree to which firms are constrained in their access to bank credit.

10 Results are robust to alternative definitions of the dependent variable, like the ratio of payables over sales or the log of payables.

11 See, among others, Beck, Demirgüç-Kunt, and Levine (2000) and Beck (2002). Fisman and Love (2003) also use this ratio as an indicator of financial development.

Table 2: Descriptive statistics.

Variable	Obs.	Mean	SD	Q1	Median	Q3	
All observations							
1 if Accounts payable/Assets > 0, 0 otherwise	3,002	0.83	0.37	1	1	1	
Accounts payable/Assets	3,002	0.17	0.23	0.00	0.11	0.27	
Accounts receivable/Assets	3,002	0.24	0.34	0.04	0.19	0.36	
1 if settled in the capital city, 0 otherwise	2,899	0.12	0.33	0	0	0	
Ln(1+Age)	2,924	3.12	0.52	2.71	3.09	3.47	
Size (Sales/Assets)	3,002	1.11	1.48	0.40	0.90	1.44	
Labor productivity (Sales/Employee)	2,967	7.38	3.78	3.01	8.96	10.17	
Credit access	3,002	2.59	1.62	1	3	4	
Cash flow/Assets	2,341	0.46	2.90	0.01	0.03	0.12	
Equity/Assets	2,908	0.62	3.50	0.20	0.38	0.64	
Firms without trade credit							
Accounts payable/Assets	516	0.00	0.00	0.00	0.00	0.00	
Accounts receivable/Assets	516	0.09	0.20	0.00	0.00	0.08	
1 if settled in the capital city, 0 otherwise	505	0.25	0.43	0	0	0	
Ln(1+Age)	513	3.07	0.55	2.64	3.04	3.47	
Size (Sales/Assets)	500	0.90	1.80	0.01	0.17	1.11	
Labor productivity (Sales/Employee)	510	3.15	3.36	1.01	1.76	3.32	
Credit access	516	1.73	1.77	0	2	4	
Cash flow/Assets	241	5.12	38.49	0.13	0.61	2.00	
Equity/Assets	488	1.40	8.35	0.24	0.62	0.98	
Firms with trade credit							*Difference*
Accounts payable/Assets	2,566	0.21	0.23	0.05	0.16	0.30	–44.02***
Accounts receivable/Assets	2,566	0.27	0.35	0.09	0.22	0.39	–16.12***
1 if settled in the capital city, 0 otherwise	2,470	0.10	0.30	0	0	0	7.29***
Ln(1+Age)	2,487	3.13	0.51	2.71	3.09	3.47	–2.33**
Size (Sales/Assets)	2,502	1.15	1.40	0.54	0.96	1.46	–2.99***
Labor productivity (Sales/Employee)	2,515	8.24	3.27	8.08	9.25	10.37	–31.03***
Credit access	2,566	2.76	1.53	2	3	4	–12.08***
Cash flow/Assets	2,149	0.34	3.15	0.01	0.02	0.08	5.39***
Equity/Assets	2,494	0.47	0.80	0.19	0.36	0.58	2.33**

Source: Authors' computations from the World Bank Enterprise Surveys. Mean, standard deviation (SD) and first (QI), second (Median), and third (Q3) quartiles of the distribution of the following variables: a binary indicator coded 1 if the firm owes accounts payable, 0 otherwise; the ratio of accounts payable over total assets; the presence in the capital city (a binary variable taking the value of 1 if the firm is based in the capital city, 0 otherwise; the age of the firm (the logarithm of age plus one), the size of the firm (the ratio of total sales over total assets); an indicator of labor productivity (the ratio of total sales over the number of employees); the stock to total assets ratio; the accounts receivable to total assets ratio; the ratio of cash flow over total assets; the ratio of shareholders' equity over total assets; a bank credit access indicator taking a value between 0 and 4 according to whether the answer to the question "Is access to bank loans an obstacle to business?" was "not at all, minor, moderate, major, or severe". The column "Difference" reports *t*-statistics for differences in the means of firm characteristics for firms without trade credit and those with trade credit. *** and ** represent significance at the 1 and 5% level, respectively.

If bank and trade credits are substitutable, this variable should, therefore, positively impact trade credit. Conversely, if bank and trade credits are complementary, this variable should negatively impact trade credit.

Similar to other trade credit studies which also use firm-level data, we include the age of the firm (measured by the logarithm of age plus one), its size (represented by the ratio of total sales over total assets[12]), and its presence in the capital city (a binary variable taking the value 1 if the firm is based in the capital city, 0 otherwise).[13] The literature also typically estimates models where the firm's behavior (generally, its investment choices) is a function of the firm's cash flow. A significant impact of cash flow is generally attributed to the imperfections of the financial markets, thus suggesting the presence of financial constraints.[14] We, therefore, use the ratio of *cash flow over total assets*, which can be interpreted as an indication of the volume of funds that can be mobilized on a very short-term basis by the firm. This indicator is widely used in the literature (see Kashyap, Stein, and Wilcox 1993). Secondly, we use the ratio of *shareholders' equity over total assets*, which can be interpreted as the firm's capacity to absorb losses and is, thus, more an indicator of long-term financial soundness. Lastly, we also include two proxy variables for the volume of transactions, the stock to total assets ratio, and the accounts receivable to total assets ratio.

Settling expected signs *a priori* is not an easy task for some variables, because of a well-known identification problem in the trade credit literature: the difference in the use of trade credit could reflect the difference in demand or supply of trade credit. Regarding the age, on the demand side, new companies have limited access to bank credit (owing to information asymmetry problems), and thus tend to seek more trade credit (see Berger and Udell 1995, 1998). At the same time, on the supply side, older firms will also have greater chances to access trade credit (because of reputation effects). The ambiguity is identical for size: on the demand side, large companies enjoy a better (and/or) higher

12 Our results are robust to the use of alternative measures for firm size, such as the number (in natural logarithm) of employees or the logarithm of total sales. All results are available upon request to the authors.

13 See, among others, Delannay and Weill (2004) and Ge and Qiu (2007). Hadlock and Pierce (2010) show that age and size are useful predictors of financial constraints, and more exogenous than the widely used balance-sheet variables. The presence in the capital city is actually another proxy for information research costs and information asymmetry issues: the firms based in the capital city are closer to a larger set of banks (especially in developing countries, where banks are very concentrated in the main cities) and should, therefore, have less difficult access to bank credit

14 See, among others, the survey by Hubbard (1998).

reputation and offer better guarantees, and so have an easier access to external financing and less need for trade credit (Berger and Udell 1998, 2002; Delannay and Weill 2004; Ge and Qiu 2007); but for the very same reasons (reputation, better guarantees), suppliers may be inclined to provide more credit to these large companies, also granted with such a market power that is difficult to refuse them trade credit when they ask for it (Brennan, Macksimovic, and Zechner 1988; Mian and Smith 1992).[15] The same line of reasoning applies to our proxies for financial health: an increase of cash flow or equity over assets can impact positively the supply of trade credit (trade credit suppliers are more confident of financially sound firms) or negatively the demand of trade credit (a better financial health decreases the need for financing through trade credit, and therefore the demand for this form of financing).

Similarly, the location in the capital city may impact positively or negatively the use of trade credit: if there is a substitutability (resp. complementarity) relationship between bank and trade credits, then these firms should use less (resp. more) trade credit. In addition, there is another effect to take into account: firms located in the capital city are more likely to offer trade credit (Klapper and Randall 2010). Regarding transactional variables, however, the prediction is pretty clear: inventories and special payment deadlines granted to clients both increase with the volume of transactions, positively influencing use of trade credit.

Table 2 presents the descriptive statistics, first those on the total sample, then those on firms that do not use trade credit and lastly on those that do. Reported in the column "Difference", tests of means equality highlight the relevance of this division: *t*-statistics show that the null of equality is strongly rejected in all cases. The anecdotal evidence they show is interesting. Firstly, firms using trade credit are on average (slightly) older and bigger, consistently with supply-driven effects. They are also (much) more labor productive than firms which do not use trade credit. In financial terms, these firms also show much lower average cash flow and equity to assets ratios (respectively, 0.34 vs 5.12 and 0.47 vs 1.40) and state that they have much greater difficulty gaining access to bank credit than the others (2.76 vs 1.73). Appearing to be likely demand-driven (cf. below), these effects would seem to support the hypothesis of substitution between trade credit and bank credit which will be more formally tested in our econometric analysis.

15 Authors such as Petersen and Rajan (1997), Summers and Wilson (2002) and Gama, Mateus, and Teixeira (2008) for developed countries and Fafchamps, Pender, and Robinson (1995), Biggs, Raturi, and Srivastavac 2002 and Isaksson (2002) for developing countries in sub-Saharan Africa have shown that the use of trade credit increases with the size of the firm.

3 Empirical setting

3.1 Baseline estimated model

We start by studying the impact of previously mentioned determinants on both the probability of owing trade credit and the volume of trade credit used relying on the two base specifications presented below. Besides, the combination of both equations will help us to identify potential selection problems, if any (see Section 3.2).

As the fact of owing trade credit is a discrete variable by definition equal to 0 or 1, the probit model is appropriate. Hence, we define $(\text{TC/Assets})_{\text{bin } i,t}$ as a binary variable taking the value 1 if the firm owes trade credit, 0 otherwise. Using maximum likelihood, we estimate the probability of owing trade credit for firm i (belonging to sector k) during year t based on the following equation:

$$\left(\frac{\text{TC}}{\text{Assets}}\right)_{\text{bin } i,t} = \begin{cases} 1 & \text{if } \alpha_1 D_i + \beta_1 A_i + \chi_1 S_{i,t} + \lambda_{1,i} T_{i,t} + \chi_1 C_i + \gamma_1 \Omega_{i,t} + \eta_k + \theta_t + c_1 + \varepsilon_{i,t} > 0 \\ 0 & \text{otherwise} \end{cases} \quad [1]$$

where $\varepsilon_{i,t}$ follows a normal distribution.

The impact of the explanatory variables on the volume of trade credit owed is estimated by replacing the dependent variable in eq. [1] by the ratio of accounts payable over total assets $(\text{TC/Assets})_{i,t}$. The estimated relationship is a standard linear equation which can be written as follows:

$$\left(\frac{\text{TC}}{\text{Assets}}\right)_{i,t} = \alpha_2 D_i + \beta_2 A_i + \chi_2 S_{i,t} + \lambda_{2,i} T_{i,t} + \kappa_2 C_i + \gamma_2 \Omega_{i,t} + \eta_k + \theta_t + \nu_i + c_2 + \mu_{i,t} \quad [2]$$

where D_i corresponds to the firm's presence in the capital city, A_i to its age, and $S_{i,t}$ to the ratio of total sales over total assets as a proxy for its size; $T_{i,t}$ is a vector containing the transaction variables (receivables to total assets and stock to total assets), whereas C_i is the access to credit indicator. $\Omega_{i,t}$ alternatively corresponds to one of the two variables representing the firm's financial health, cash flow/total assets and equity/total assets. η_k and θ_t are dummy variables designed to capture unobservable characteristics at the sectoral[16] and time levels,

16 These are especially important, since the use of trade credit may vary substantially across sectors. The sample distribution of firms across 2-digit industries is available upon request to the authors. One could argue that trade credit terms are also country-specific. In Table 6, we report estimates with country dummies (see columns (c), (e), and (g)), with results identical to the ones produced by our main specification.

respectively. Lastly, v_i is an i.i.d. random term designed to capture unobservable heterogeneity at the firm level.[17] This formulation offers continuity with the studies by Elliehausen and Wolken (1993) and Wilson and Summers (2002) and is very similar to other empirical work on the subject (see Delannay and Weill 2004; Ge and Qiu 2007).

Note that the presence in the capital city is not provided for firms in Algeria and Oman; age and the ratio of cash flow over assets are also unavailable for Syria and a significant number of Egyptian firms. Since we need all six countries of the database to provide a sound answer to our key concern (i.e. the impact of financial development on the bank/trade credit relationship), the estimates implying financial development will be performed on a specification without age and the presence in the capital city in the right-hand side variables. Preliminary regressions will show that estimates on other explanatory variables are robust to different specifications and subsamples.

3.2 Econometric issues

The empirical specifications that we selected contain several explanatory variables which were entered identically for all the years at our disposal: presence in the capital city, age of the firm, and access to credit. These variables are, thus, time-invariant. Additionally, the unobserved individual heterogeneity at the firm level raises the problem of the choice between fixed and random effects. The first choice raises a problem of perfect multicollinearity with the time-invariant regressors and is anyway impossible to implement in the context of eq. [1].[18] The choice of a random effect probit circumvents this problem, but proved to be unreliable again in eq. [1].[19] We, therefore, decided to estimate eq. [1] mainly with a pooled probit including year- and sector-level dummies; a robustness check based on Generalized Least Squares (GLS) with firm-level random effects, controlling for unobservable heterogeneity at the firm level, is also performed. Likewise, eq. [2] is estimated using GLS with firm-level random effects.

The possibility of an endogeneity issue coming from a simultaneity bias between the dependent variable and some right-hand side variables is an

17 Note that this term is included in eq. [2], but not in eq. [1], due to insufficient variability. See the following subsection for further details.

18 This is because of the incidental parameters problem, see Wooldridge (2002, 484) for more details on this matter.

19 Since our sample contains 2 or 3 years per firm (cf. Section 2.1), we are left with an insufficient time variance to perform a reliable random effect panel probit estimation. Basically, convergence is not achieved.

important potential problem. The exogeneity of age and presence in the city is not in doubt. Similarly, our measure of access to bank credit is a response to a survey question and not the amount of bank credit in a firm's balance sheet. This qualitative measure of financial constraints is much less subject to endogeneity problems compared to other common used measures in the literature like bank debt on firm's balance sheet.[20] However, the hypothesis of reverse causality for the size, transaction, and financial structure should not be neglected. The use of trade credit and the amount of sales, stocks, trade credit granted, and indicators of financial health are likely to be simultaneously driven by common shocks. Empirical literature uses Instrumental Variables (IV) techniques to solve the endogeneity bias, using mostly lags of regressors as instruments. Finding instruments that are both exogenous and sufficiently correlated with the endogenous regressors can, however, prove to be a difficult task.

We believe that our database contains sufficient information to overcome these problems. We decide to opt for a set of instruments mixing second-order lags of continuous regressors, Rajan and Zingales (1998) sectoral financial dependence indicator interacted with the level of financial development at the national level and a dummy indicating if the manager of the firm is also its main shareholder. Considering the short panel we have, the second lags of current period regressors appear as sufficiently far in the past to be truly exogenous to the dependent variable and still strongly correlated to the potentially endogenous regressors. The two additional instruments we use were selected for the strong influence they have on the financial structure. Strongly correlated with financial constraints (Rajan and Zingales 1998), the dependence on external finance at the sectoral level interacted with financial development at the country level is *per se* exogenous to firm-level behavior. Indeed, these indicators are computed using data on all publicly traded U.S. companies. Rajan and Zingales (1998) have pointed out that the United States have one of the most advanced and sophisticated financial systems, so that the values for US firms reflect the technology-specific component of external finance needs, or what can be called the finance content of an industry. It is likely that measuring these indices in the MENA countries context would lead to different values, reflecting the fact that

20 We thank one referee for bringing this point to our attention. In unreported estimates (available upon request), we did instrument the credit access variable with the same set of instruments than other regressors (second lags of continuous regressors, sectoral financial dependence*financial development and a dummy indicating if the manager of the firm is also the main shareholder, see below). In most cases, this led to smaller Durbin–Wu–Hausman statistics and higher *p*-values, indicating an even greater impossibility of rejecting the null of exogeneity. Therefore, the diagnostics regarding endogeneity reported in the article must be considered as rather strict and careful.

firms organize production differently in a credit-constrained environment. Thus, such measures would be endogenous to financial development in these countries, whereas measures based on US firms' data appear by construction exogenous in this respect.

Regarding the ownership of the firm by its manager, entrepreneurial firms (where entrepreneur and manager is actually the same person) are not monitored by external investors and are not constrained by disclosure obligations. In this perspective, these firms are more prone to undertake risky projects (DeLoof and Jegers 1999) and should be more credit constrained. Once again, it is very unlikely that this variable should be concerned by reverse causality from the dependent variable, since the use of trade credit has no reason to influence the ownership structure of the firm. To sum up, we have all the reasons to believe that our instruments are theoretically valid.

Since we want to ensure that our results are free from any simultaneity bias, we, therefore, perform IV estimation, relying on IV probit for eq. [1] and two-stage least squares (2SLS) for eq. [2]. More precisely, we have three to four first-stage equations, depending on the specification, where sales over assets, stock over assets, accounts receivable over assets, cash flow over assets, and equity over assets are alternatively the dependent variables, regressed on the other right-hand side variables (included instruments) and on the set of (excluded) instruments described above. As our sample contains 2 or 3 years per firm, both IV probit and 2SLS are, therefore, performed over a single year.[21]

We also check the robustness of our baseline estimates to another source of endogeneity, namely, a potential selection bias regarding the volume of trade credit used, due to a factor that would be absent from our estimation. Indeed, some firms may, all things being equal, use more trade credit due to a specific characteristic. For the above-mentioned reasons, one can easily think of the sectoral financial dependence interacted with financial development as a selection variable: firms in more financially dependent sectors may need, all things equal, more trade credit; symmetrically, when financial development increases, firms in more financially dependent sectors have a better access to bank credit, needing less trade credit. Both phenomena should influence the probability of having trade credit, but not the total amount. For similar reasons, the fact that the manager is also the firm's main shareholder that may similarly create a problem of non-random sampling: because they are more prone to undertake

21 As an additional robustness check for the endogeneity of the credit access variable in eq. [2], we also implemented a treatment effects model for studying the effect of an endogenous treatment (here, the credit access) on another endogenous continuous variable (the volume of trade credit owed). Results are qualitatively identical to the ones presented here.

risky projects (DeLoof and Jegers 1999), these firms should be more constrained in their access to bank credit. All things equal, their probability of relying on trade credit should be higher, but not necessarily their amount of trade credit payables over assets.

In both cases, the problem can be solved by a two-step Heckman procedure, using these two variables (namely, "sectoral financial dependence × private credit/GDP" and a dummy variable taking the value 1 if the manager of the firm is also its main shareholder, 0 otherwise) as selection variables, one after the other. On the statistical side, these variables display the necessary features of selection variables (cf. Wooldridge 2002; see Table 5): they influence only the selection equation (i.e. the probability of owing trade credit (eq. [1]) and not the equation of interest (i.e. the volume of trade credit owed (eq. [2]).

Besides, the structure of our data confronts us with the problem of error clustering. As well as the usual White correction for heteroskedasticity, we also correct for the correlation of errors within firms using the Froot (1989) correction.

Finally, to check for potential multicollinearity among regressors, we compute the Variance Inflation Factor (VIF) for each regressor. The VIF shows how the presence of multicollinearity inflates estimator variance. The larger the VIF value, the more collinear the variables will be. A common rule is to consider a VIF exceeding 10 as an indicator of high collinearity of the considered variable (Gujarati 2004). For all our variables, the VIF is, on average, 1.58, confirming that our variables do not have any multicollinearity problems.

4 On the determinants of the use of trade credit

4.1 Credit access, financial structure, and trade credit: baseline estimates

Table 3 presents the results of the baseline estimations of eq. [1], that is, the impact of firm-specific control variables (presence in the capital city, age, and size), and transaction, quality of financial structure, and access to credit variables on the probability of owing trade credit. Columns (a)–(d) show the results without using our financial variables; columns (e), (f), and (i) use the first financial proxy, that is the ratio of cash flows over total assets; columns (g), (h), and (j) contain the estimations using the second proxy, that is, the ratio of equity over total assets. Reported coefficients on columns (a)–(h) are estimated

Table 3: Credit access, financial structure, and the probability of using trade credit.

Dep. Var: Pr (TC/Assets>0)	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Capital city		−0.091***		−0.096***		−0.034**		−0.102***	−0.109***	−0.122***
		(0.029)		(0.030)		(0.015)		(0.031)	(0.031)	(0.031)
Age			0.025*	0.026**		0.012*	0.028**	0.030**	0.029	0.039**
			(0.013)	(0.013)		(0.007)	(0.013)	(0.013)	(0.019)	(0.019)
Sales/Assets	0.000	0.001	0.001	0.001	0.003	0.003	0.003	0.003	0.007	−0.008
	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.007)	(0.005)
Stock/Assets	−0.001	−0.000	−0.001	−0.000	0.003	0.001	−0.004	−0.003	0.015	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.009)	(0.008)	(0.003)	(0.003)	(0.019)	(0.018)
Receivables/ Assets	0.293***	0.284***	0.294***	0.279***	0.128***	0.118***	0.301***	0.287***	0.105***	0.104***
	(0.048)	(0.046)	(0.049)	(0.045)	(0.024)	(0.023)	(0.047)	(0.045)	(0.023)	(0.023)
Credit access (0–4)	0.017***	0.017***	0.018***	0.017***	0.007***	0.007***	0.017***	0.016***	0.031***	0.034***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.002)	(0.002)	(0.004)	(0.004)	(0.006)	(0.006)
Cash flow/ Assets					−0.004**	−0.003*			−0.013***	
					(0.002)	(0.002)			(0.004)	
Equity/Assets							−0.013**	−0.012**		−0.008***
							(0.006)	(0.005)		(0.002)
Observations	3,002	2,899	2,924	2,897	2,341	2,313	2,830	2,803	2,313	2,248
Number of firms	1,314	1,265	1,279	1,264	1,167	1,151	1,239	1,224	1,151	1,121
Estimation	Pooled probit				Pooled probit				GLS-RE	

Amemiya–Lee–Newey stat.	0.128			0.326	0.102	0.109	0.006	0.143		
p-Value	0.938			0.849	0.749	0.947	0.997	0.931		
Wald stat. of exogeneity	5.40			5.51	3.09	3.13	10.03	9.92		
p-Value	0.145			0.138	0.543	0.537	0.040	0.042		
Pseudo-R^2/R^2	0.24	0.26	0.25	0.27	0.29	0.30	0.27	0.29	0.20	0.20

Notes: Columns (a)–(h): All coefficients estimates are maximum likelihood estimates of a pooled probit model. Marginal effects computed at means for continuous regressors. Columns (i) and (j): All coefficients estimates are GLS estimates with firm-level random effects. In all estimations, the dependent variable is a binary indicator coded 1, if the firm owes accounts payable, 0 otherwise. Right-hand side variables include: the presence in the capital city (a binary variable taking the value of 1 if the firm is based in the capital city, 0 otherwise); the age of the firm (the logarithm of age plus one), the size of the firm (the ratio of total sales over total assets); the stock to total assets ratio; the accounts receivable to total assets ratio; a bank credit access indicator taking a value between 0 and 4 according to whether the answer to the question "Is access to bank loans an obstacle to business?" was "not at all, minor, moderate, major, or severe". Columns (a)–(d) show the results without using our financial variables; columns (e), (f), and (i) use the first financial health proxy, that is, the ratio of cash flows over total assets; columns (g), (h), and (j) contain the estimations using the second proxy, that is, the ratio of equity over total assets. Specifications without capital city (columns (a), (c), (e), and (g) and age ((a), (b), and (e)) are also estimated. All estimations include year and sector dummies. Cluster-robust standard errors in parentheses. Intercept not reported. Froot (1989) correction for firm-level cluster correlation. Time-varying regressors instrumented with second-order lags, a dummy variable taking the value 1 when the manager of the firm is also the main shareholder and sectoral financial dependence (cf. Rajan and Zingales, 1998) $\times$ financial development (private credit/GDP) for computing overidentifying and exogeneity statistics in columns (a) and (d) to (h). The Amemiya–Lee–Newey statistic is distributed as Chi-square with degrees of freedom equal to the number of other identifying restrictions (=number of instruments minus the number of regressors), under the null that the instruments are valid. The Wald statistic is distributed as Chi-square with degrees of freedom equal to the number of regressors tested, under the null hypothesis of exogeneity. Significance levels: *10, **5, and ***1%.

using maximum likelihood and are marginal effects computed at means for continuous regressors. Columns (i) and (j) report GLS-random effect estimates. Finally, specifications without capital city (columns (a), (c), (e), and (g)) and age ((a), (b), and (e)) are also estimated. Estimates on other variables remain identical or very close in all cases, showing that our results are robust to sample variations.[22]

Estimated coefficients display signs that are fully consistent with the hypothesis of substitutability between bank and trade credits: the more difficult the credit access, the higher the probability of using trade credit. Besides, coefficients on our financial-structure quality indicators are negative and significant in all estimations. This reflects the fact that firms with higher cash flow or equity will use less trade credit. Both results seem to reflect a demand-driven phenomenon: when bank credit access gets increasingly difficult, or when financial health deteriorates, firms try to compensate the lack of internal (cash flow or equity) or external (bank credit) finance with trade credit. Additionally, firms located in the capital city have a lower probability of using trade credit. Size does not seem to play a significant role, whereas the supply-side reputation effect (positive impact of age) seems to dominate for accessing trade credit. Only one of the two transaction variables has a significant influence: unlike the stock to assets variable, the ratio of receivables to assets has a significant and positive influence on the use of trade credit. One of the most decisive factors in the use of trade credit is also quite simply the fact that firms are themselves also trade creditors (the measured marginal effect is by far the highest).

Table 4 shows the results on the volume of trade credit used, that is, for eq. [2]. Columns (a)–(d) present the results without using our financial proxies; columns (e)–(h) add the ratio of cash flow over assets, and columns (i)–(l) present the ratio of equity over assets. Columns (b), (f), and (j) include the presence in the capital city, and columns (c), (g), and (k) include the age. Regarding reverse causality concerns, columns (d), (h), and (l) present 2SLS estimates, which will be commented on the next subsection.

These estimates display very similar features with the ones described above. It can be noted that effects are qualitatively identical for the capital city, credit access, and financial health variables, confirming both the substitutability relationship between bank and trade credits and the relevance of a demand-side story in understanding these effects. Similarities are also very strong concerning the transaction variables: only the receivables to assets ratio has a robustly significant and positive impact, even stronger than for eq. [1].

22 This also shows that our results are not driven by a particular country, which was also confirmed on by estimates dropping each country one by one.

Table 4: Credit access, financial structure, and the volume of trade credit.

Dep. Var: TC/Assets	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
Capital city		−0.065***				−0.073***				−0.069***		
		(0.014)				(0.016)				(0.014)		
Age			−0.015*				−0.019*				−0.014	
			(0.008)				(0.011)				(0.009)	
Sales/Assets	0.013**	0.013**	0.013**	0.061***	0.024***	0.024***	0.023***	0.103***	0.013***	0.013***	0.013***	0.091***
	(0.005)	(0.005)	(0.005)	(0.017)	(0.007)	(0.007)	(0.007)	(0.022)	(0.005)	(0.005)	(0.005)	(0.020)
Stock/Assets	−0.001	−0.001	−0.001*	0.133***	0.059	0.064	0.060	0.114**	−0.001	0.000	−0.000	0.082*
	(0.001)	(0.001)	(0.001)	(0.043)	(0.046)	(0.048)	(0.046)	(0.049)	(0.004)	(0.004)	(0.004)	(0.049)
Receivables/Assets	0.290***	0.290***	0.289***	0.305***	0.272***	0.271***	0.273***	0.278***	0.292***	0.291***	0.290***	0.205***
	(0.094)	(0.094)	(0.094)	(0.055)	(0.080)	(0.080)	(0.081)	(0.058)	(0.094)	(0.095)	(0.095)	(0.062)
Credit access (0–4)	0.015***	0.015***	0.015***	0.012**	0.010***	0.010***	0.010**	0.012**	0.015***	0.016***	0.016***	0.007*
	(0.003)	(0.003)	(0.003)	(0.005)	(0.004)	(0.004)	(0.004)	(0.005)	(0.003)	(0.004)	(0.004)	(0.004)
Cash flow/Assets					−0.012***	−0.011***	−0.012***	−0.439**				
					(0.004)	(0.004)	(0.004)	(0.211)				
Equity/Assets									−0.002*	−0.003*	−0.002*	−0.235***
									(0.001)	(0.001)	(0.001)	(0.038)
Observations	3,002	2,899	2,924	568	2,341	2,314	2,340	516	2,908	2,805	2,830	513
Number of firms	1,314	1,265	1,279	568	1,167	1,152	1,166	516	1,274	1,225	1,239	513
Estimation	GLS-RE	GLS-RE	GLS-RE	2SLS	GLS-RE	GLS-RE	GLS-RE	2SLS	GLS-RE	GLS-RE	GLS-RE	2SLS
Hansen stat.				0.208				0.044				0.081
p-Value				0.901				0.833				0.776
Kleibergen–Paap stat.				64.64				12.30				41.86

(*continued*)

Table 4: (*Continued*)

Dep. Var: TC/Assets	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
Critical value (5%)				12.20				12.20				12.20
Critical value (10%)				7.77				7.77				7.77
Critical value (20%)				5.35				5.35				5.35
Durbin–Wu–Hausman stat.				3.982				6.198				6.800
p-Value				0.263				0.185				0.147
R^2	0.38	0.39	0.38	0.16	0.31	0.32	0.31	0.14	0.39	0.40	0.39	0.23

Notes: Columns (a)–(c), (e)–(g) and (i)–(k): All coefficients estimates are GLS estimates with firm-level random effects and year dummies. Columns (d), (h), and (l): All coefficients estimates are 2SLS estimates. In all estimations, the dependent variable is the ratio of accounts payable over total assets. Right-hand side variables include: the presence in the capital city (a binary variable taking the value of 1 if the firm is based in the capital city, 0 otherwise); the age of the firm (the logarithm of age plus one), the size of the firm (the ratio of total sales over total assets); the stock to total assets ratio; the accounts receivable to total assets ratio; a bank credit access indicator taking a value between 0 and 4 according to whether the answer to the question "Is access to bank loans an obstacle to business?" was "not at all, minor, moderate, major, or severe". Columns (a)–(d) present the results without using our financial proxies; columns (e)–(h) add the ratio of cash flow over total assets, and columns (i)–(l) the ratio of shareholders' equity over total assets. Columns (b), (f), and (j) include the presence in the capital city, and columns (c), (g), and (k) include the age. All estimations include sector dummies. Cluster-robust standard errors in parentheses. Intercept not reported. Froot (1989) correction for firm-level cluster correlation. Time-varying regressors instrumented with second-order lags, a dummy variable taking the value 1 when the manager of the firm is also the main shareholder and sectoral financial dependence (cf. Rajan and Zingales 1998) × financial development (private credit/GDP) for computing over-identifying and exogeneity statistics in columns (d), (h), and (l). Therefore, 2SLS are estimated over a single year and firms' individual effects cannot enter the estimation. The Hansen statistic is distributed as Chi-square with degrees of freedom equal to the number of other identifying restrictions (=number of instruments minus the number of regressors), under the null that the instruments are valid. The Kleibergen–Paap F-statistic for weak instrumentation with critical values based on a 5, 10, and 20% 2SLS bias at the 5% significance level (see Stock and Yogo, 2005). The Durbin–Wu–Hausman statistic is distributed as Chi-square with degrees of freedom equal to the number of regressors tested, under the null hypothesis of exogeneity. Significance levels: *10, **5, and ***1%.

However, the age of the firm does now negatively influence the volume of trade credit used, with a weak significance, however. This can be interpreted from the demand side: older companies suffer less financial constraints and have easier access to other forms of external finance, and therefore need less trade credit. Besides, whereas it was previously not significant, the size of the firm now significantly and positively impacts the use of trade credit. The interpretation in terms of demand- or supply-driven effects is not straightforward, but the result may be a consistent with supply-driven story: suppliers are more prone to grant trade credit to bigger companies, which enjoy a better reputation and have more collateral to offer as security.

4.2 Robustness to endogeneity (simultaneity and selection bias)

For both equations, endogeneity concerns were tackled using IV. Several standard tests of statistical robustness are reported in columns (a), (d), (e) (f), (g), and (h) in Table 3, and in columns (d), (h), and (l) in Table 4, with diagnostics on the specification tested in each considered column. We systematically check the validity of our instruments by testing the null hypothesis that the overidentifying restrictions are valid, using the Amemiya–Lee–Newey statistic for eq. [1] and the heteroskedastic and clustering robust Hansen's J-statistic for eq. [2]. In all cases, test statistics are largely insignificant, indicating that the orthogonality of our instruments and the error terms cannot be rejected, and thus that our choice of instruments is appropriate in this respect. We also report the F-stat form of the Kleibergen–Paap statistic, the heteroskedastic and clustering robust version of the Cragg–Donald statistic suggested by Stock and Yogo (2005) as a test for weak instruments. All statistics are situated above the 5% critical value, confirming that our set of instruments is not afflicted by the weak instrument problem. Turning to exogeneity concerns, both Wald (eq. [1]) and Durbin–Wu–Hausman (eq. [2]) tests cannot reject the null of exogeneity in almost all specifications, casting some doubts on the possibility of reverse causality in the data at hand. Actually, the only specification raising concerns is eq. [1] when including the ratio of equity over assets. We do not consider this as a major concern, since results are not qualitatively affected for this specification when using alternative estimators, based on predetermined values for instance (see Table 11 in Section 6.3). Under these circumstances, it seems highly debatable to rely only on IV estimates, since they are less efficient than standard estimates (cf. Pagan 1984). Based on standard pooled probit and GLS estimations in order

to preserve degrees of freedom, the results presented in the next subsections should, thus, be considered as fully reliable.

Table 5 tests the robustness of eq. [2] in the framework of a two-step Heckman selection model.[23] The latter considers the possibility of another type of bias, coming from an omitted factor affecting only eq. [1], in our case, the sectoral financial dependence interacted with financial development (columns (a)–(f)) and the fact that the firm manager is also the main shareholder (columns (g)–(l)). Columns (a), (d), (g), and (j) show the estimates of the probit-selection equation (i.e. eq. [1]), including the selection variable, and columns (b), (e), (h), and (k) report the estimates of the equation of interest (i.e. eq. [2]), still with the selection variable. Together, these estimates show that the two variables we chose for testing selection were appropriate on the statistical ground: both are always significant in the selection equation, and almost never in the equation of interest (cf. Wooldridge 2002) – only in column (e), the sectoral financial dependence interacted with financial development appears weakly significant at the 10% level.

Columns (c), (f), (i), and (l) display the estimates of eq. [2] including the (inverse of) Mills Ratio. The latter is systematically non-significant when the selection variable is the dummy "manager = main shareholder" and is significant in one specification over two (the one including the cash flow over assets ratio) when the selection variable is the sectoral financial dependence interacted with financial development. This result is not robust on the enlarged subsample including the equity over assets ratio. Evidence in favor of selection (conditionally to the exclusion restrictions) appears, therefore, rather weak, confirming that the estimations previously shown are reliable in that respect.

5 On the impact of financial development[24]

So far, our results have shown that better financial health tended to reduce the use of trade credit, while the latter increased with the difficulty of access to bank

23 Estimates were performed on complete specifications in order to minimize the possibility of an additional omitted variable bias, in a context where firm-level effects cannot be implemented. Results on specifications without the presence in capital city and age were not reported for the sake of space, but remain available upon request to the authors. They are qualitatively identical to those herein.

24 As previously indicated, the estimates implying financial development are performed on a specification without age and the presence in the capital city in the right-hand side variables in order to ensure that our analysis involves all six countries of the sample. We checked that our results remained robust when adding the presence in the capital city and the age of the firm. This check is available upon request to the authors.

Table 5: Trade credit, credit access, and financial structure: Heckman selection model.

Dep. Var.	Pr(TC/Assets>0) (a)	TC/Assets (b)	TC/Assets (c)	Pr(TC/Assets>0) (d)	TC/Assets (e)	TC/Assets (f)	Pr(TC/Assets>0) (g)	TC/Assets (h)	TC/Assets (i)	Pr(TC/Assets>0) (j)	TC/Assets (k)	TC/Assets (l)
Capital city	−0.027**	−0.082***	−0.070***	−0.089***	−0.077***	−0.061***	−0.022*	−0.082***	−0.077***	−0.082***	−0.080***	−0.079***
	(0.013)	(0.016)	(0.017)	(0.030)	(0.015)	(0.019)	(0.012)	(0.015)	(0.015)	(0.031)	(0.013)	(0.015)
Age	0.008	−0.036***	−0.039***	0.022*	−0.019*	−0.024**	0.009	−0.040*	−0.043***	0.018	−0.020**	−0.022**
	(0.006)	(0.012)	(0.012)	(0.012)	(0.011)	(0.011)	(0.006)	(0.012)	(0.012)	(0.012)	(0.010)	(0.010)
Sales/Assets	0.002	0.045***	0.044***	0.002	0.022**	0.021**	0.001	0.043***	0.043***	0.001	0.024**	0.024**
	(0.003)	(0.008)	(0.008)	(0.004)	(0.010)	(0.010)	(0.003)	(0.008)	(0.008)	(0.003)	(0.011)	(0.011)
Stock/Assets	−0.001	0.041	0.041	−0.004	−0.004	−0.002	0.000	0.082***	0.081***	−0.005	0.003	0.004
	(0.006)	(0.044)	(0.043)	(0.004)	(0.007)	(0.006)	(0.007)	(0.029)	(0.029)	(0.004)	(0.009)	(0.009)
Receivables/Assets	0.123***	0.216***	0.191***	0.342***	0.190**	0.156*	0.131***	0.263***	0.243***	0.366***	0.251***	0.242***
	(0.022)	(0.062)	(0.069)	(0.039)	(0.080)	(0.091)	(0.023)	(0.033)	(0.038)	(0.040)	(0.029)	(0.038)
Credit access (0–4)	0.005***	0.007**	0.005	0.015***	0.012***	0.008**	0.004**	0.006	0.004	0.012***	0.009***	0.010***
	(0.002)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.002)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)
Cash flow/Assets	−0.002	−0.019***	−0.016***				−0.002	0.017***	0.015***			
	(0.002)	(0.004)	(0.004)				(0.001)	(0.003)	(0.003)			
Equity/Assets				−0.010**	−0.019***	−0.015				−0.008*	−0.021***	−0.021***
				(0.005)	(0.006)	(0.007)				(0.005)	(0.007)	(0.007)
Sect.dep. *priv. cred/GDP	−0.235*	−0.075		−0.433***	−0.235*							
	(0.077)	(0.131)		(0.123)	(0.118)							
Manager = main shareholder							0.028**	0.006		0.058***	0.022	
							(0.012)	(0.013)		(0.019)	(0.013)	
Mills ratio			−0.440			−0.392			−0.268			−0.086
			(0.187)			(0.248)			(0.171)			(0.127)

(*continued*)

Table 5: (*Continued*)

Dep. Var.	Pr(TC/Assets>0) (a)	TC/Assets (b)	TC/Assets (c)	Pr(TC/Assets>0) (d)	TC/Assets (e)	TC/Assets (f)	Pr(TC/Assets>0) (g)	TC/Assets (h)	TC/Assets (i)	Pr(TC/Assets>0) (j)	TC/Assets (k)	TC/Assets (l)
Observations	2,269	2,269	2,269	2,731	2,731	2,731	2,237	2,237	2,237	2,670	2,671	2,672
Number of firms	1,107	1,107	1,107	1,184	1,184	1,184	1,075	1,075	1,075	1,150	1,151	1,152
Estimation	Heckman two-step selection model						Heckman two-step selection model					
Selection variable	Sectoral Index of financial dependence × private credit/GDP						1 if the manager of the firm is also the main shareholder, 0 otherwise					
Pseudo-R^2/R^2	0.33	0.17	0.18	0.32	0.21	0.21	0.34	0.17	0.17	0.33	0.22	0.22

Notes: Columns (a), (d), (g), and (j): the dependent variable is a binary indicator coded 1 if the firm owes accounts payable, 0 otherwise; coefficients estimates are maximum likelihood estimates of a pooled probit model. Marginal effects computed at means for continuous regressors. Columns (b), (c), (e), (f), (h), (i), (k), and (l): the dependent variable is the ratio of accounts payable over total assets; estimations are based on ordinary least squares. Right-hand side variables include: the presence in the capital city (a binary variable taking the value of 1 if the firm is based in the capital city, 0 otherwise); the age of the firm (the logarithm of age plus one), the size of the firm (the ratio of total sales over total assets); the stock to total assets ratio; the accounts receivable to total assets ratio; a bank credit access indicator taking a value between 0 and 4 according to whether the answer to the question "Is access to bank loans an obstacle to business?" was "not at all, minor, moderate, major, or severe". Columns (a)–(c) and (g)–(i) also include the ratio of cash flow over total assets, and columns (d)–(f) and (j)–(l) add the ratio of shareholders' equity over total assets. Columns (a), (b), (d), and (e) include also in the RHS the sectoral financial dependence (cf. Rajan and Zingales 1998) × financial development (private credit/GDP). Columns (g), (h), (j), and (h) include in the RHS a dummy variable taking the value 1 when the manager of the firm is also the main shareholder. Columns (c), (f), (i), and (1) add in the RHS the inverse of Mills ratio computed from the first step probit estimates of columns (a), (d), (g), and (j). All estimations include year and sector dummies. Cluster-robust standard errors in parentheses. Intercept not reported. Froot (1989) correction for firm-level cluster correlation. Significance levels: *10, **5, and ***1%.

credit. In this context, a reduction in financial constraints at national level, for example by raising the level of financial development, should reduce the role of financial health and the difficulty of access to bank credit in terms of its determination.

In order to assess the relevance and importance of these effects, Table 6 presents estimations from eq. [2] including alternatively country dummies (columns (c) and (e)) and financial development (columns (a), (b), (d), and (f)),[25] and interaction terms between this indicator and the size (columns (b) and (c)), credit access (all columns), and financial health variables (cash flow over assets in columns (d) and (e) and equity over assets in columns (f) and (g)).

Financial development significantly reduces the use of trade credit. Several other results appear to be particularly interesting: the positive influence of difficulty of access to credit on the use of trade credit is no longer significant when financial development is introduced among the explanatory variables. Nor is it significant when access to bank credit is interacted with financial development. We also observe that the interacted terms between our indicators of financial health and financial development (positive and significant) give an interesting insight: they mean that firms with better financial health use relatively *more* trade credit when financial development is higher.

We took the analysis further by splitting the sample around the median of financial development and formally testing the equality of coefficients over the two subsamples (one "high", above the financial development median, and the other "low", below this same median).[26] Columns (a)–(d) focus on the basic specification, columns (e) and (f) include the cash flow over assets ratio, and columns (g) and (h) add the equity over assets ratio. Tests of equality strongly reject in almost all cases, both for the equation as a whole and for our variables of interest, the null of equality.

On the whole, it appears that most variables have a weaker influence in more financially developed countries (i.e. in the subsample above the financial development median) than in less financially developed one (i.e. the subsample below the financial development median): the ratio of stock over assets, the size (sales over assets) and interestingly, both proxies for financial health have much stronger quantitative impact in the lower part of the sample. Interestingly, this is also true for the difficulty of access to bank credit for specifications in columns

25 These estimations are, thus, made without time dummy variables, since these are perfectly collinear with the private credit/GDP ratio.

26 These tests (standard tests based on Chi-square statistics) are shown solely for the key variables of interest, namely size, credit access, and financial variables. Tests of equality for other variables remain available upon request to the authors.

Table 6: Credit access, financial structure, and financial development (I).

Dep. Var. TC/Assets	(a)	(b)	(c)	(d)	(e)	(f)	(g)
Stock/Assets	−0.001**	−0.001**	−0.001*	0.019	0.022	−0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.017)	(0.018)	(0.004)	(0.004)
Receivables/Assets	0.291***	0.278***	0.259***	0.196***	0.182***	0.272***	0.259***
	(0.090)	(0.070)	(0.070)	(0.053)	(0.052)	(0.087)	(0.092)
Sales/Assets	0.013***	−0.009	−0.023	0.019***	0.018***	0.013***	0.011**
	(0.005)	(0.047)	(0.048)	(0.006)	(0.006)	(0.005)	(0.004)
(Sales/Assets)*priv. cred./GDP		0.000	0.000				
		(0.000)	(0.000)				
Credit access	−0.011	−0.009	−0.020	−0.008	−0.004	−0.019	−0.029
(0–4)	(0.020)	(0.018)	(0.017)	(0.023)	(0.022)	(0.020)	(0.019)
Credit access*priv.	0.000	0.000	0.000	0.000	0.000	0.000	0.000
cred./GDP	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Cash flow/Assets				−0.087*	−0.090*		
				(0.048)	(0.048)		
Cash flow/Assets*priv. cred./GDP				0.0007*	0.0007*		
				(0.0004)	(0.0004)		
Equity/Assets						−0.163*	−0.181*
						(0.090)	(0.096)
Equity/Assets*priv. cred./GDP						0.0015*	0.002*
						(0.0008)	(0.001)
Priv. cred./GDP	−0.002**	−0.002**		−0.002*		−0.002***	
	(0.001)	(0.001)		(0.001)		(0.001)	
Observations	3,002	3,002	3,002	2,341	2,341	2,908	2,908
Number of firms	1,314	1,314	1,314	1,167	1,167	1,274	1,274
Estimation		GLS-RE			GLS-RE		GLS-RE
R^2	0.40	0.40	0.43	0.32	0.34	0.42	0.44

Notes: All coefficients estimates are GLS estimates with firm-level random effects and year dummies. In all estimations, the dependent variable is the ratio of accounts payable over total assets. Right-hand side variables include: the size of the firm (the ratio of total sales over total assets); the stock to total assets ratio; the accounts receivable to total assets ratio; a bank credit access indicator taking a value between 0 and 4 according to whether the answer to the question "Is access to bank loans an obstacle to business?" was "not at all, minor, moderate, major, or severe"; the ratio of cash flow over total assets in columns (d) and (e); the ratio of shareholders' equity over total assets in columns (f) and (g). Interacted terms are also included in columns (b), (c), (d), (e), (f), and (g) between the credit access, the ratios of cash flow and equity over assets on the one hand, and the ratio of total credit granted to private sector over GDP on the other hand. The latter is also included as an explanatory variable in columns (a), (b), (d), and (f); alternatively, country dummies are included in columns (c), (e), and (g). Robust standard errors in parentheses. Intercept not reported. Froot (1989) correction for firm-level cluster correlation. Significance levels: *10, **5, and ***1%.

(c)/(d) and (e)/(f). The only exception is the impact of the receivables to assets ratio, which is quantitatively more important for countries with a high level of financial development.

All these results are confirmed and strengthened by a further splitting of the sample around the quartiles of financial development. Table 8 presents the results for these subsamples: columns (a), (d), and (g) for the highest quartile; columns (b), (e), and (h) on the *intermediate* quartiles;[27] and columns (c), (f), and (i) for the lowest quartile. Once again, Chi-square statistics for equality of coefficients are provided for the all model and main coefficients of interest: in columns (a), (d), and (g), the null tested is the equality of the coefficients estimated on the highest quartile with those estimated on the intermediary and lowest quartiles; in columns (c), (f), and (i), the null tested is the equality of the coefficients estimated on the lowest quartile with those estimated on the intermediary and highest quartiles. The null of global equality is rejected in all cases but one.

The results are consistent with the ones presented in Table 7. In a nutshell, they confirm that the impact on trade credit of firm-level specific characteristics including size, stock over assets, and financial health indicators substantially decreases when financial development is high enough (i.e. over the subsample of observations located in the highest quartile of financial development). This is also true for the bank credit access indicator, which is never significant anymore in the highest quartile of financial development. Therefore, the result already perceptible in columns (c), (d), (e), and (f) in Table 7 is fully confirmed: the difficulty for accessing bank credit has a significant influence on the volume of trade credit used among firms in the less financially developed countries, but this influence is no longer significant with regard to usage of trade credit among firms in more financially developed markets. This comes down to saying that trade credit substitutes bank credit when the level of financial development is low, but that this substitutability relationship no longer holds when financial development is higher.

Put together, the results reported in Tables 6–8 support the idea that heterogeneity in terms of level of financial development has a significant impact on the relationship between bank credit access and trade credit, and more generally on most other determinants of trade credit use, especially financial health variables. Once again, the only exception is the impact of the receivables to assets ratio, which is slightly more important for countries with a high level of financial development. These findings can consistently be interpreted through a

27 Due to insufficient observations on the third quartile, we decided to perform estimations on both the second and the third quartiles, under the name *Intermediate*.

Table 7: Credit access, financial structure, and financial development (II).

Dep. Var. : TC/Assets	(a) *High*	(b) *Low*	(c) *High*	(d) *Low*	(e) *High*	(f) *Low*	(g) *High*	(h) *Low*
Stock/Assets	−0.002***	0.082***	0.026**	0.075**	0.032***	0.060*	0.028**	0.016
	(0.001)	(0.031)	(0.012)	(0.031)	(0.012)	(0.031)	(0.012)	(0.031)
Sales/Assets	0.013**	0.037***	0.009***	0.035***	0.025***	0.044***	0.009***	0.045***
	(0.006)	(0.008)	(0.003)	(0.009)	(0.005)	(0.010)	(0.003)	(0.009)
Receivables/ Assets	0.331***	0.193***	0.334***	0.178***	0.332***	0.176***	0.334***	0.120***
	(0.119)	(0.034)	(0.017)	(0.033)	(0.017)	(0.032)	(0.017)	(0.032)
Credit access (0–4)	0.015***	0.009**	0.002	0.008**	0.002	0.008**	0.004	0.003
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Cash flow/ Assets					−0.010***	−0.217***		
					(0.003)	(0.053)		
Equity/Assets							−0.000	−0.283***
							(0.001)	(0.033)
Observations	1,556	1,446	1,011	1,330	1,011	1,330	980	1,296
Number of firms	1,124	778	1,011	730	1,011	730	980	716
Estimation	GLS-RE		GLS-RE		GLS-RE		GLS-RE	
R^2	0.48	0.15	0.44	0.15	0.45	0.16	0.45	0.25
Tests of equality of coefficients (χ^2 statistic)								
Chow global equality test	27.47		11.50		15.69		39.09	
p-Value	0.000		0.042		0.015		0.000	
Credit access	5.79		6.05		4.91		2.68	
p-value	0.0161		0.013		0.027		0.102	
Cash flow/ Assets					12.30			
p-Value					0.001			
Equity/Assets							9.83	
p-Value							0.002	

Notes: All coefficients estimates are GLS estimates with firm-level random effects and year dummies. In all estimations, the dependent variable is the ratio of accounts payable over total assets. Right-hand side variables include: the size of the firm (the ratio of total sales over total assets); the stock to total assets ratio; the accounts receivable to total assets ratio; a bank credit access indicator taking a value between 0 and 4 according to whether the answer to the question "Is access to bank loans an obstacle to business?" was "not at all, minor, moderate, major, or severe"; the ratio of cash flow over total assets (columns (e) and (f)); the ratio of shareholders' equity over total assets (columns (g) and (h)). Robust standard errors in parentheses. Intercept not reported. Froot (1989) correction for firm-level cluster correlation. *High* and *Low* mean, respectively, *above* and *below* the median of the sample in terms of financial development. Tests of equality of coefficients are based on Chi-squared statistics with the number of degrees of freedom equal to the number of parameters tested, that is, 5/6 (when including our proxies for financial health) for global equality tests, and 1 for single-coefficient tests. Significance levels: *10, **5, and ***1%.

Table 8: Credit access, financial structure, and financial development (III).

Dep. Var. TC/Assets	(a) *Highest [0.75;1]*	(b) *Intermediate]0.25;0.75[*	(c) *Lowest [0;0.25]*	(d) *Highest [0.75;1]*	(e) *Intermediate]0.25;0.75[*	(f) *Lowest [0;0.25]*	(g) *Highest [0.75;1]*	(h) *Intermediate]0.25;0.75[*	(i) *Lowest [0;0.25]*
Stock/Assets	0.025***	0.130***	0.002*	−0.005	0.122***	0.179***	−0.008	0.056	0.129***
	(0.010)	(0.034)	(0.001)	(0.010)	(0.036)	(0.030)	(0.010)	(0.034)	(0.022)
Sales/Assets	0.012***	0.063***	0.057***	0.017***	0.074***	0.055***	0.005*	0.075***	0.041***
	(0.003)	(0.009)	(0.006)	(0.005)	(0.010)	(0.010)	(0.003)	(0.009)	(0.008)
Receivables/Assets	0.306***	0.287***	0.245***	0.273***	0.279***	0.248***	0.275***	0.201***	0.221***
	(0.016)	(0.034)	(0.017)	(0.027)	(0.036)	(0.026)	(0.027)	(0.034)	(0.023)
Credit access (0–4)	0.003	0.011**	0.005*	0.001	0.010**	0.012**	0.001	0.004	0.011**
	(0.004)	(0.005)	(0.003)	(0.003)	(0.005)	(0.006)	(0.003)	(0.005)	(0.006)
Cash flow/Assets				−0.007***	−0.167**	−0.029**			
				(0.002)	(0.084)	(0.012)			
Equity/Assets							−0.001	−0.291***	−0.042
							(0.001)	(0.028)	(0.026)
Observations	1,120	702	1,180	926	637	713	926	637	713
Number of firms	1,120	702	1,180	926	637	713	926	637	713
Estimation		GLS-RE			GLS-RE			GLS-RE	
R^2	0.43	0.17	0.51	0.30	0.18	0.47	0.29	0.30	0.47
Tests of equality of coefficients (χ^2 statistic)									
Chow global equality test	26.75		40.10	12.76		8.57	31.62		44.24

(*continued*)

Table 8: (*Continued*)

Dep. Var. TC/Assets	(a) *Highest [0.75;1]*	(b) *Intermediate]0.25;0.75[*	(c) *Lowest [0;0.25]*	(d) *Highest [0.75;1]*	(e) *Intermediate]0.25;0.75[*	(f) *Lowest [0;0.25]*	(g) *Highest [0.75;1]*	(h) *Intermediate]0.25;0.75[*	(i) *Lowest [0;0.25]*
p-Value	0.000		0.000	0.047		0.1999	0.000		0.000
Credit access	25.41		6.01	7.76		6.05	28.73		5.16
p-Value	0.000		0.014	0.005		0.014	0.000		0.023
Cash flow/Assets				0.06		0.48			
p-Value				0.814		0.487			
Equity/Assets							1.16		3.91
p-Value							0.282		0.048

Notes: All coefficients estimates are GLS estimates with firm-level random effects and year dummies. In all estimations, the dependent variable is the ratio of accounts payable over total assets. Right-hand side variables include: the size of the firm (the ratio of total sales over total assets); the stock to total assets ratio; the accounts receivable to total assets ratio; a bank credit access indicator taking a value between 0 and 4 according to whether the answer to the question "Is access to bank loans an obstacle to business?" was "not at all, minor, moderate, major, or severe"; the ratio of cash flow over total assets (columns (d), (e), and (f)); the ratio of shareholders' equity over total assets (columns (g), (h), and (i)). Robust standard errors in parentheses. Intercept not reported. Froot (1989) correction for firm-level cluster correlation. *Highest* and *Lowest* mean that estimations have been performed over subsamples of firms belonging, respectively, to the *highest* and *lowest quartiles* in terms of financial development. *Intermediate* means that estimates have been performed over the subsample of the firm belonging to the *second and third quartiles* of financial development. Tests of equality of coefficients are based on Chi-square statistics with the number of degrees of freedom equal to the number of parameters tested, that is, 5/6 when including our proxies for financial health for global equality tests, and 1 for single-coefficient tests. Columns (a), (d), and (g): H0: the coefficients estimated on the highest quartile are equal to those estimated on the intermediary and lowest quartiles; columns (c), (f), and (i): H0: the coefficients estimated on the lowest quartile are equal to those estimated on the intermediary and highest quartiles. Significance levels: *10, **5, and ***1%.

demand-side story: when financial development increases, firms have better access to bank credit, and the impact of this variable on the demand for trade credit becomes less or not significant. The same applies to financial health indicators: when financial development is low, the level of cash flow or equity matters decisively for the demand of trade credit; when financial development increases, the size of the impact substantially decreases or even disappears. This may mean that trade credit acts less as a safety valve for firms in an environment where bank credit is more abundant and becomes more driven by other determinants. However, it is beyond the scope of this article (and the possibilities provided by the data) to tell what they are exactly, even if the consistent high significance of the receivables over assets ratio could indicate that trade relationships themselves keep being an important determinant of trade credit use.

Our results fit well with the literature connecting the (complementarity/substitution) relationship to financial constraints and financial development on emerging markets (see Fisman and Love 2003, who show that businesses use trade credit more extensively in countries with undeveloped banking systems; 1994; and Ge and Qiu 2007, who draw similar conclusions on a panel of Chinese firms). On the theoretical side, our main findings validate the prediction by Burkart and Ellingsen (2004) that trade credit is more prevalent in less-developed credit markets.

6 Robustness analysis

6.1 Alternative specification for the credit assess indicator

In Table 9, we check that our results on our key variable, namely the bank credit access, is robust to a more flexible specification, by replacing the index by four dummies, taking the value 1 if access to bank credit was reported as, respectively, a minor, moderate, major, or severe obstacle to business, 0 otherwise. Columns (a)–(e) report marginal effects computed at means for continuous regressors from a pooled probit estimation of eq. [1]; columns (f)–(j) display the GLS estimates with firm-level random effects of eq. [2].

Whatever the sample or the specification (eq. [1] or eq. [2]) considered, our results remain qualitatively almost identical, both for other variables and for the dummies for access to credit: the relationship for all four dummies is clearly positive and significant in almost all cases. Besides, no robust non-linear relationship emerges for the four credit access dummies. A U-shaped relationship may be observed in some specifications, but standard tests (available upon

Table 9: Alternative specification for the credit access indicator.

Dep. Var.	Pr(TC/Assetss>0)					TC/Assets				
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Capital city			−0.092***	−0.031**	−0.097***			−0.063***	−0.072***	−0.067***
			(0.029)	(0.015)	(0.031)			(0.014)	(0.016)	(0.014)
Age		0.025*	0.026**	0.011*	0.030**		−0.015*	−0.014*	−0.017	−0.013
		(0.013)	(0.013)	(0.007)	(0.013)		(0.008)	(0.008)	(0.010)	(0.009)
Sales/Assets	0.000	0.001	0.001	0.003	0.003	0.013**	0.013**	0.013**	0.023***	0.013***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.005)	(0.005)*	(0.005)	(0.007)	(0.005)
Stock/Assets	−0.001	−0.001	−0.000	0.000	−0.004	−0.001**	−0.001*	−0.001	0.065	0.001
	(0.001)	(0.001)	(0.001)	(0.008)	(0.003)	(0.001)	(0.001)	(0.001)	(0.049)	(0.004)
TD/Assets	0.289***	0.290***	0.276***	0.113***	0.281***	0.290***	0.288***	0.290***	0.272***	0.292***
	(0.047)	(0.048)	(0.045)	(0.023)	(0.043)	(0.094)	(0.094)	(0.094)	(0.080)	(0.095)
1 if credit access is a minor obstacle	0.060***	0.062***	0.056***	0.029***	0.053***	0.071***	0.074***	0.066***	0.044*	0.061**
	(0.017)	(0.018)	(0.019)	(0.007)	(0.018)	(0.024)	(0.025)	(0.024)	(0.026)	(0.025)
1 if credit access is a moderate obstacle	0.046***	0.045***	0.045***	0.020***	0.048***	0.038**	0.043**	0.040**	0.014	0.043**
	(0.014)	(0.015)	(0.014)	(0.007)	(0.013)	(0.016)	(0.017)	(0.017)	(0.022)	(0.017)
1 if credit access is a major obstacle	0.060***	0.060***	0.056***	0.023***	0.051***	0.058***	0.057***	0.055***	0.032*	0.054***
	(0.013)	(0.014)	(0.013)	(0.007)	(0.013)	(0.017)	(0.017)	(0.017)	(0.019)	(0.017)

1 if credit access is a severe obstacle	0.069***	0.070***	0.067***	0.030***	0.064***	0.065***	0.066***	0.065***	0.044***	0.066***
	(0.017)	(0.017)	(0.017)	(0.009)	(0.016)	(0.014)	(0.014)	(0.014)	(0.016)	(0.014)
Cash flow/Assets				−0.003*					−0.011***	
				(0.002)					(0.004)	
Equity/Assets					−0.012**					−0.003*
					(0.005)					(0.001)
Observations	3,002	2,924	2,897	2,313	2,803	3,002	2,924	2,897	2,313	2,803
Number of firms	1,314	1,279	1,264	1,151	1,224	1,314	1,279	1,264	1,151	1,224
Estimation	Pooled probit					GLS-RE				
Pseudo-R^2/R^2	0.24	0.26	0.27	0.31	0.29	0.38	0.38	0.39	0.32	0.40

Notes: Columns (a)–(e): The dependent variable is a binary indicator coded 1 if the firm owes accounts payable, 0 otherwise; all coefficients estimates are maximum likelihood estimates of a pooled probit model. Marginal effects computed at means for continuous regressors. Columns (f)–(j): the dependent variable is the ratio of accounts payable over total assets; all coefficients estimates are GLS estimates with firm-level random effects. All estimations include year and sector dummies. Right-hand side variables include in all specifications the size of the firm (the ratio of total sales over total assets); the stock to total assets ratio; the accounts receivable to total assets ratio; a dummy variable taking the value 1 if access to bank credit was reported as a minor obstacle to business, 0 otherwise; a dummy variable taking the value 1 if access to bank credit was reported as a moderate obstacle to business, 0 otherwise; a dummy variable taking the value 1 if access to bank credit was reported as a major obstacle to business, 0 otherwise; a dummy variable taking the value 1 if access to bank credit was reported as a severe obstacle to business, 0 otherwise. In columns (b)–(e) and (g)–(j) is also included the age; columns (c)–(e) and columns (h)–(j) add the presence in the capital city. The ratio of cash flow over total assets is added in columns (d) and (i), and the ratio of shareholders' equity over total assets appears in columns (e) and (j). Cluster-robust standard errors in parentheses. Intercept not reported. Froot (1989) correction for firm-level cluster correlation. Significance levels: *10, **5, and ***1%.

request) do not reject the null of equality of the different bank credit access elasticities on several occasions. Relying on our discrete bank credit access index appears, therefore, as a reasonable modeling choice.

6.2 Net trade credit as the dependent variable

It is common in the trade credit literature (see, among others, Ge and Qiu 2007 or Love, Preve, and Sarria-Allende 2007) to provide complementary analysis on the net trade credit position, that is, to use the difference between payables and receivables as the dependent variable. As a robustness, we decide, therefore, to perform additional estimations where our preferred dependent variable (accounts payable over assets) is replaced by 1/ a binary indicator coded 1 if the firm has positive net trade credit, that is, accounts payable greater than accounts receivable, 0 otherwise (eq. [1]); 2/ an indicator of the net balance in terms of trade credit, defined as (accounts payable – accounts receivable)/assets (eq. [2]).

Columns (a)–(c) in Table 10 report estimates (marginal effects computed at means for continuous regressors) for the modified version of eq. [1], and columns (d)–(h) display the results for the modified version of eq. [2]; in both cases, the ratio of receivables over assets has obviously disappeared from the right-hand side variables. All our main results are robust to this change, except for the positive relationship between the difficulty for accessing bank credit and net trade credit, that is, the substitution relationship between bank credit and trade credit, which does not appear significant anymore in the linear specification (eq. [2]). Financial health indicators remain significant for both the volume of trade credit and the probability of owing trade credit; no major change appears for other variables, which are significant most of the time – age has now a negative impact in both models.

In order to be completely consistent, however, one would need to compare two net debts and, therefore, to include in the regression the net bank debt of the firm, that is, her bank debt minus her deposits. But, we have no information in the WBES on firms' bank debts or deposits. Our main research question revolves around the relationship between trade and bank credit, and not their net balances. Results presented in Table 10 should, therefore, be interpreted carefully.

6.3 Alternative test for endogeneity

As an alternative methodology for addressing endogeneity issues, we performed an additional set of estimations relying on predetermined values for access to

Table 10: Net trade credit, credit access, and financial structure.

Dep. Var.	Pr(TC/Assets>0)			(TC/Assets)				
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Capital city	−0.141***	−0.105**	−0.148***	−0.100**	−0.102**		−0.117***	
	(0.032)	(0.045)	(0.032)	(0.043)	(0.042)		(0.043)	
Age	−0.070***	−0.126***	−0.061***	−0.034***	−0.045***		0.044***	
	(0.023)	(0.028)	(0.023)	(0.011)	(0.014)		(0.013)	
Sales/Assets	0.009	0.040**	0.014*	−0.007	0.000	0.029*	−0.016**	0.033**
	(0.007)	(0.018)	(0.008)	(0.007)	(0.008)	(0.016)	(0.008)	(0.015)
Stock/Assets	0.002	0.267***	0.010					
	(0.002)	(0.070)	(0.007)					
Credit access (0–4)	0.015**	−0.001	0.016**	0.002	−0.005		−0.001	
	(0.007)	(0.009)	(0.008)	(0.006)	(0.006)		(0.007)	
Cash flow/Assets		−0.075***			−0.011	−0.170***		
		(0.025)			(0.009)	(0.061)		
Equity/Assets			−0.075**				−0.001	−0.288***
			(0.030)				(0.001)	(0.045)
Observations	2,897	2,313	2,803	2,848	2,269	2,269	2,209	2,209
Number of firms	1,264	1,151	1,224	1,252	1,136	1,136	1,109	1,109
Estimation		Pooled probit		GLS-RE	GLS-RE	Within-FE	GLS-RE	Within-FE
Pseudo-$R2/R^2$	0.05	0.05	0.05	0.07	0.08	0.10	0.08	0.14

Notes: Columns (a)–(c): The dependent variable is a binary indicator coded 1 if the firm has positive net trade credit, that is, accounts payable is greater than accounts receivable, 0 otherwise; all coefficients estimates are maximum likelihood estimates of a pooled probit model. Marginal effects computed at means for continuous regressors. All estimations include sector and year dummies. Columns (d)–(h): the dependent variable is the ratio (Accounts payable – Accounts receivable)/Total assets; in columns (d), (e) and (g), all coefficients estimates are GLS estimates with firm-level random effects; in columns (f) and (h), all estimates rely on the within-fixed effects estimator. All estimations include year and sector dummies, except in columns (f) and (h) for the latter. Right-hand side variables include in all specifications: the size of the firm (the ratio of total sales over total assets); the stock to total assets ratio. The presence in the capital city, the age of the firm and the bank credit access indicator appear in all columns but (f) and (h), because they are subsumed in the fixed effects. The ratio of cash flow over total assets is included in columns (b), (e) and (f), and the ratio of shareholders' equity over total assets appears in columns (c), (g) and (h). Cluster-robust standard errors in parentheses. Intercept not reported. Froot (1989) correction for firm-level cluster correlation. Significance levels: *10, **5 and ***1%.

Table 11: Alternative treatment for endogeneity.

Dep. Var.	Pr(TC/Assets>0)					TC/Assets				
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Capital city			−0.084***	−0.045**	−0.085***			−0.070***	−0.069***	−0.058***
			(0.027)	(0.020)	(0.021)			(0.015)	(0.015)	(0.013)
Age		0.023*	0.024**	0.014*	0.027***		−0.016	−0.015	−0.015	−0.008
		(0.013)	(0.012)	(0.008)	(0.009)		(0.011)	(0.011)	(0.011)	(0.009)
Pred_(Stock/Assets)	0.064***	0.053***	0.047***	0.030***	0.047***		0.069***	0.068***	0.068***	0.084***
	(0.013)	(0.012)	(0.011)	(0.008)	(0.009)		(0.017)	(0.017)	(0.017)	(0.023)
Pred_(Sales/Assets)	−0.002	−0.002	−0.001	0.044*	−0.006**	−0.001	0.071*	0.084**	0.086**	−0.005*
	(0.002)	(0.002)	(0.001)	(0.023)	(0.003)	(0.001)	(0.038)	(0.039)	(0.037)	(0.003)
Pred_(Receivables/ Assets)	0.235***	0.225***	0.220***	0.132***	0.213***	0.331**	0.170	0.166	0.167	0.187*
	(0.056)	(0.052)	(0.051)	(0.030)	(0.036)	(0.140)	(0.109)	(0.107)	(0.107)	(0.109)
Credit access (0–4)	0.016***	0.014***	0.014***	0.006**	0.013***	0.015***	0.008**	0.008**	0.008**	0.011***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Pred_(Cash Flow/ Assets)				−0.003					−0.001	
				(0.002)					(0.002)	
Pred_(Equity/Assets)					−0.008**					−0.0012**
					(0.004)					(0.0006)

Observations	3,002	2,924	2,897	2,319	2,801	3,002	2,346	2,319	2,319	2,801
Number of firms	1,314	1,279	1,264	1,142	1,214	1,314	1,157	1,142	1,142	1,214
Estimation			Pooled probit					GLS-RE		
Pseudo-R^2/R^2	0.25	0.27	0.28	0.31	0.30	0.34	0.31	0.32	0.32	0.43

Notes: Columns (a)–(e): The dependent variable is a binary indicator coded 1 if the firm owes accounts payable, 0 otherwise; all coefficients estimates are maximum likelihood estimates of a pooled probit model. Marginal effects computed at means for continuous regressors. Columns (f)–(j): the dependent variable is the ratio of accounts payable over total assets; all coefficients estimates are GLS estimates with firm-level random effects. All estimations include year and sector dummies. Right-hand side variables include, in all estimations: the size of the firm (the ratio of total sales over total assets) set to its value available at the first year for each firm-country; the stock to total assets ratio set to its value available at the first year for each firm-country; the accounts receivable to total assets ratio set to its value available at the first year for each firm-country; a bank credit access indicator taking a value between 0 and 4 according to whether the answer to the question "Is access to bank loans an obstacle to business?" was "not at all, minor, moderate, major, or severe". In columns (b)–(e) and (g)–(j) is also included the age; columns (c)–(e) and columns (h)–(j) add the presence in the capital city. The ratio of cash flow over total assets set to its value available at the first year for each firm-country is added in columns (d) and (i); the ratio of shareholders' equity over total assets set to its value available at the first year for each firm-country appears in columns (e) and (j). Cluster-robust standard errors in parentheses. Intercept not reported. Froot (1989) correction for firm-level cluster correlation. Significance levels: *10, **5, and ***1%.

bank credit along the lines of Love, Preve, and Sarria-Allende (2007) or Duchin, Oguzhan, and Berk (2010). Both eqs [1] and [2] were estimated again, setting all balance-sheet variables to their value at the first year available for each firm-country.

Table 11 reports these estimates. Columns (a)–(e) report marginal effects computed at means for continuous regressors from a pooled probit estimation of eq. [1]; columns (f)–(j) display the GLS estimates with firm-level random effects of eq. [2]. Main results are qualitatively unchanged, except for the cash flow over assets ratio, with a compromised significance. If anything, the impact of age and of the ratio of receivables over assets appears less robust for the linear specification.

7 Conclusions

Using a cross-country firm-level database based on the World Bank's Investment Climate Survey, we studied the impact of financial development on the traditional determinants of trade credit usage at the firm level in six countries from the MENA region. Our results initially support the substitutability of bank credit and trade credit; similarly, the indicators of the quality of the firm's financial structure negatively influence the use of trade credit, emphasizing the utility of this form of credit for companies in precarious financial health. However, additional investigations tend to suggest that increased financial development significantly reduces (and can even make disappear) the substitution relationship between trade credit and bank credit and more generally decreases the influence of most firm-level determinants for trade credit usage. This provides micro-evidence on the impact of financial development on the bank/trade credit relationship and hence empirical support to the theoretical result of Burkart and Ellingsen (2004), who show that trade credit is more prevalent in less-developed credit markets. Moreover, the findings show that the phenomenon of trade credit is demand-driven: when bank credit access gets increasingly difficult, or when financial health deteriorates, the use of trade credit also increases. This is more in favor of a demand-driven story (firms trying to compensate bank credit, or a bad financial health, with trade credit) than a supply-driven one (it is unlikely that suppliers would grant by their own will more trade credit to credit-constrained firms). This also fits well with our key result regarding financial development: when the latter increases, firms have better access to bank credit, and the impact of this variable on the demand for

trade credit becomes less or not significant. Similar results arise for our financial health indicators, with a much less clear impact on trade credit use when financial development is high.

References

Aghion, P. 2008. "Interaction Effects in the Relationship between Growth and Finance." In *Handbook of European Financial Markets and Institutions, part 1.2*, edited by X. Freixas et al. Oxford: Oxford University Press.

Arcand, J. L., E. Berkes, and U. Panizza. 2012. "Too much Finance?" Working Paper no. 12/161, International Monetary Fund.

Beck, T. 2002. "Financial Development and International Trade: Is There a Link?" *Journal of International Economics* 57:107–31.

Beck, T., A. Demirgüç-Kunt, and R. Levine. 2000. "A New Database on Financial Development and Structure." *World Bank Economic Review* 14: 597–605.

Berger, A. N., and G. F. Udell. 1995. "Relationship Lending and Lines of Credit in Small Firm Finance." *Journal of Business* 68(3):351–81.

Berger, A. N., and G. F. Udell. 1998. "The Economics of Small Business Finance: The Roles of Private Equity and Debit Markets in the Financial Growth Cycle." *Journal of Banking and Finance* 22(8):613–73.

Berger, A. N., and G. F. Udell. 2002. "Small Business Credit Availability and Relationship Lending: The Importance of Bank Organisational Structure." *Economic Journal* 112 (477):32–53.

Bergöf, E., and P. Bolton. 2002. "The Great Divide and Beyond: Financial Architecture in Transition." *Journal of Economic Perspectives* 16:77–110.

Biais, B., and C. Gollier. 1997. "Trade Credit and Credit Rationing." *Review of Financial Studies* 10:903–37.

Biggs, T., M. Raturi, and P. Srivastavac. 2002. "Ethnic Networks and Access to Credit: Evidence from the Manufacturing Sector in Kenya." *Journal of Economic Behavior and Organization* 49(4):473–86.

Breig, H. 1994. "*Bank Lending and Corporate Financing in Major Industrial Countries: Are France and Germany Really Similar?*" Working Paper, Breisgau: Albert Ludwing Universitat.

Brennan, M., V. Macksimovic, and J. Zechner. 1988. "Vendor Financing." *Journal of Finance* 43:1127–41.

Burkart, M., and T. Ellingsen. 2004. "In-Kind Finance: A Theory of Trade Credit." *The American Economic Review* 94(3):569–90.

Carbo-Valverde, S., F. Rodriguez-Fernandez, and G. Udell. 2008. "Bank Lending, Financing Constraints and SME Investment." Federal Reserve Bank of Chicago Working Paper no. 2008–04.

Carbo-Valverde, S., F. Rodriguez-Fernandez, and G. Udell. 2012. "*Trade Credit, the Financial Crisis, and Firm Access to Finance*," mimeo, University of Granada.

Cook, L. D. 1999. "Trade Credit and Bank Finance: Financing Small Firms in Russia." *Journal of Business Venturing* 14:493–518.

Coricelli, F. 1996. "Finance and Growth in Economies in Transition." *European Economic Review* 40(3–5):645–53.
Crawford, P. 1992a. "Trade Credit and Credit Rationing: Part I." Discussion paper no. 92/323, University of Bristol.
Crawford, P. 1992b. "A Survey of the Trade Credit Literature." Discussion paper no. 92/324, University of Bristol.
Cuñat, V. 2007. "Trade Credit: Suppliers as Debt Collectors and Insurance Providers." *Review of Financial Studies* 20(2):491–527.
Delannay, A. F., and L. Weill. 2004. "The Determinants of Trade Credit in Transition Countries." *Economics of Planning* 37:173–93.
Deloof, M., and M. Jegers. 1996. "Trade Credit, Product Quality, and Intragroup Trade: Some European Evidence." *Financial Management* 25(3):33–43.
Deloof, M., and M. Jegers. 1999. "Trade Credit, Corporate Groups and the Financing of Belgian Firms." *Journal of Business, Finance and Accounting* 26(7–8):945–66.
Demirgüc-Kunt, A., and V. Maksimovic. 2001. "Firms as Financial Intermediaries: Evidence From Trade Credit Data." World Bank, Working Paper no. 2696.
Duchin, R., O. Oguzhan, and A. Berk. 2010. "Costly External Finance, Corporate Investment, and the Subprime Mortgage Crisis." *Journal of Financial Economics* 97:418–35.
Elliehausen, G. E., and J. D. Wolken. 1993. "*The Demand for Trade Credit: An Investigation of Motives for Trade Credit Use by Small Business*." Staff Study, 165, Board of Governors of the Federal Reserve System, Washington, DC.
Fafchamps, M., J. Pender, and E. Robinson. 1995. "Enterprise Finance in Zimbabwe." Report, *Regional Program for Enterprise Development, Africa Technical Department*. Washington, DC: The World Bank.
Fisman, R., and I. Love. 2003. "Trade Credit, Financial Intermediary Development and Industry Growth." *Journal of Finance* 58(1):353–74.
Froot, K. 1989. "Consistent Covariance Matrix Estimation with Cross-Sectional Dependence and Heteroskedasticity in Financial Data." *Journal of Financial and Quantitative Analysis* 24: 333–55.
Gama, A. P., C. Mateus, and A. Teixeira. 2008. "Does Trade Credit Facilitate Access to Bank Finance? Empirical Evidence Form Portuguese and Spanish Small Medium Size Enterprise." SSRN Working Paper Series, http://ssrn.com/abstract = 1310818.
Garcia-Appendini, M. 2011. "*Supplier Certification and Trade Credit*," mimeo, Department of Finance, Università Bocconi.
Garcia-Appendini, M., and J. Montoriol-Garriga. 2013. "Suppliers as Liquidity Providers: Evidence from the 2007–2008 Financial Crisis." *Journal of Financial Economics* 109(1):272–291.
Ge, Y., and J. Qiu. 2007. "Financial Development, Bank Discrimination and Trade Credit." *Journal of Banking and Finance* 31:513–30.
Gujarati, D. 2004. *Basic Econometrics*, 4th edition. New York: The McGraw-Hill companies.
Hadlock, C., and J. Pierce. 2010. "New Evidence on Measuring Financial Constraints: Moving Beyond the KZ Index." *Review of Financial Studies* 23(5):1909–40.
Hammes, K. 2003. "Trade Credits in Transition Economies." CERGU Working Paper no. 00-11, Göteborg University.
Hubbard, G. 1998. "Capital Market Imperfections and Investment." *Journal of Economic Literature* 36(3):193–225.
Isaksson, A. 2002. "*Trade Credit in Kenyan Manufacturing: Evidence from Plant-Level Data*." Statistical and Information Networks (UNIDO) Working Paper no. 4.

Kashyap, A., J. Stein, and D. Wilcox. 1993. "Monetary Policy and Credit Conditions: Evidence from the Composition of External Finance." *American Economic Review* 83(1):78–98.

Klapper, L., and D. Randall. 2010. "The Impact of the Financial Crisis on Supply-Chain Financing." Enterprise Surveys, Enterprise Note Series no. 13.

Levine, R. 2005. "Finance and Growth: Theory and Evidence." In *Handbook of Economic Growth*, edited by P. Aghion and S. Durlauf, 866–934. Amsterdam: North-Holland.

Love, I., L. Preve, and V. Sarria-Allende. 2007. "Trade Credit and Bank Credit: Evidence from Recent Financial Crises." *Journal of Financial Economics* 83(2):453–69.

Marotta, G. 1997. "Does Trade Credit Redistribution Thwart Monetary Policy? Evidence from Italy." *Applied Economics* 29(12):1619–29.

Marotta, G. 2001. "*Is Trade Credit More Expensive Than Bank Loan? Evidence from Italian Firm-Level Data*." University of Modena Working Paper no. 0103.

Meltzer, A. H. 1960. "Mercantile Credit, Monetary Policy and Size of Firms." *Review of Economics and Statistics* 42(4):429–43.

Mian, S. L., and C. W. Smith. 1992. "Account Receivable Management Policy: Theory and Evidence." *Journal of Finance* 47(1):169–200.

Nilsen, J. H. 2002. "Trade Credit and the Bank Lending Channel." *Journal of Money, Credit and Banking* 34(1):226–53.

Ono, M. 2001. Determinants of Trade Credit in the Japanese Manufacturing Sector. *Journal of the Japanese and International Economies* 15:160–77.

Pagan, A. 1984. "Model Evaluation by Variable Addition." In: *Econometrics and Quantitative Economics*, edited by D. F. Hendry and K. F. Wallis,103–34. Oxford: Blackwell.

Petersen, M. A., and R. G. Rajan. 1994. "The Benefits of Lending Relationships: Evidence From Small Business Data." *The Journal of Finance* 48(1):3–37.

Petersen, M. A., and R. G. Rajan. 1997. "Trade Credit: Theories and Evidence." *Review of Financial Studies* 10(3):661–91.

Rajan, R. G., and L. Zingales. 1998. "Financial Dependence and Growth." *American Economic Review* 88:559–86.

Rousseau, P., and P. Wachtel. 2011. "What Is Happening to the Impact of Financial Deepening on Economic Growth." *Economic Inquiry* 49(1):276–88.

Stock, J. H., and M. Yogo. 2005. "Testing for Weak Instruments in Linear IV Regression." In *Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg*, edited by D. W. Andrews and J. H. Stock. Cambridge: Cambridge University Press.

Summers, B., and N. Wilson. 2002. "An Empirical Investigation of Trade Credit Demand." *International Journal of the Economics of Business* 9(2):257–70.

Wilner, B. S. 2000. "The Exploitation of Relationship in Financial Distress: The Case of Trade Credit." *Journal of Finance* 55(1):153–79.

Wilson, N., C. Singleton, and B. Summers. 1999. "Small Business Demand for Trade Credit, Credit Rationing and the Late Payment of Commercial Debt: An Empirical Study." In *Management Buy-Outs and Venture Capital: Into Next Millennium*, edited by M. Wright and K. Robbie, 181–201. Cheltenham, UK: Edward Elgar.

Wilson, N., and B. Summers. 2002. "Trade Credit Terms Offered by Small Firms: Survey Evidence and Empirical Analysis." *Journal of Business Finance and Accounting* 29(3 et 4):0306–686X.

Wooldridge, J. 2002. *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: MIT Press.