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Document type
NAC Analytica Working Paper No.15

This version is available at
http:
//nacanalytica.com/images/macro/Papers/Trade_credit_and_financial_crises_in_Kazakhstan.pdf

Citation details
Adilkhanova, Z., A. Nurlankul, A. Token and B. Yavuzoglu. 2020. Trade credit and financial crises in Kazakhstan. *NAC Analytica Working Paper*. No. 15

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TRADE CREDIT AND FINANCIAL CRISES IN KAZAKHSTAN

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Abstract

This paper studies the trade credit and delinquency behavior in Kazakhstan paying attention to the effects of two recent crises using a unique dataset of large firms and SMEs from the year 2009 to 2016. Our estimates suggest that the relationship between trade credit and bank loans is mainly substitutional except that it was complementary for large firms following the year 2014-5 crisis. This new piece of evidence might provide more insight into the mixed findings in the literature. We also discern that trade credit demand is more prevalent among capital-intensive firms. Kazakhstani firms pass a sizeable portion of their delinquent receivable to their trade credit suppliers. The transmission of trade credit delinquency, additionally, is amplified during the year 2014-5 economic crisis but the year 2009 global financial crisis.

Keywords: Trade Credit; Delinquency; Financial Crisis; Large Enterprises; SMEs.

JEL Codes: D22, G01, G20, G32.

[⋆] We are grateful to Giulio Seccia, Xavier Mateos-Planas, Charles Becker, Morten Ravn, Makoto Nakajima, and two anonymous referees for their helpful comments. Funding was provided by grant no. SHSS2018002 by Nazarbayev University through the "Small Grant Program."

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1. INTRODUCTION

Trade credit is a type of inter-firm credit relationship in which the supplier delivers goods and services to the customer on the promise of delayed payment, typically to be received within one or two months. It is issued by non-financial firms, and unlike bank loans, trade credit transactions do not necessarily involve a formal contract. For debtors, trade credit can serve as a source of financing, whereas suppliers might use it as an opportunity to increase their sales. Trade credit is observed to be more prevalent among countries with an underdeveloped financial system (Beck et al., 2008; Fisman and Love, 2003; Ge and Qiu, 2007). This source of financing plays a major role in firms' operations in Kazakhstan as well and is used more extensively than bank loans: about 90% of large enterprises and 70% of small and medium enterprises (SMEs) recur to trade credit, whereas bank loans are accessed by only around one-third of large firms and one-tenth of SMEs. Compared with the rest of the world, as depicted by the "difference" row in Table 1, the role of trade credit in relation to bank loans is enormous for Kazakhstani firms. Since around 80% of the Kazakhstani enterprises with access to bank loans utilize the secured amount to finance their operational expenses according to the National Bank of Kazakhstan, the observed anomaly for the relative role of trade credit might be partly attributed to the limited loan availability, especially for SMEs, and as a result more firms resort to using trade credit.

Table 1: Percentages of Firms with Access to Trade Credit and Bank Loans in Kazakhstan and the Rest of the World

	Kazakhstan		Europe and Central Asia	East Asia and Pacific	Latin America
	Large Ent.	SMEs			
Trade Credit	92%	70%	23%	21%	50%
Bank Loans	35%	9%	38%	30%	53%
Difference	57%	61%	-15%	9%	-3%

Sources: Enterprise Surveys of World Bank and authors' calculations for Kazakhstan for year 2016.

At the intensive margin, the average ratio of trade credit demand to total assets in the year 2016 was about 38% for firms in Kazakhstan, regardless of their size. This statistic varies from 11.5% to 17% for listed firms in G-7 countries (Rajan and Zingales, 1995), 11% to 42% for unlisted companies in 8 developed European countries with Portugal having the largest statistic and France the second largest with 30.5% (Giannetti, 2003), 25% to 27% in Belgium, Greece, and Spain (García-Teruel and Martínez-Solano, 2010b), is 10.5% in Sweden (Jacobson and Von Schedvin, 2015), and 9% in China (Oh and Kim, 2016). Kazakhstani firms are indeed considerably indebted: The relative size of trade credit to other short-term debt is 1.61 for large firms and 0.55 for SMEs. This ratio is about 0.5 in Ireland, Netherlands, Spain, and the U.K., 1 in Belgium, France, and Italy, and reaches 3 in Portugal (Giannetti, 2003). Yet, bank loans account for a smaller portion of external financing for Kazakhstani firms. The average ratio of bank loans to total assets is 12.0% for large firms and 3.4% for SMEs in Kazakhstan, whereas it is given by 61% in 13 European countries included in Amadeus (McGuinness et al., 2018), 27.6% in Spain (Canto-Cuevas et al., 2016), and 65.9% in Japan (Tsuruta, 2015). These statistics show that the patterns observed at the extensive margins of trade credit and bank loans extend to their intensive margins: while Kazakhstani firms find it easy to recur to trade credit, they find it difficult to access to bank loans.

The limited loan availability for Kazakhstani firms is partly caused by the shortcomings in the banking sector. Despite the attempts of the government to solve the problems of the banking sector by providing aids in the years 2008, 2015, and 2017, some banks got closed or recapitalized. The non-performing loans stood at one-quarter of all loans in the year 2016 according to the National

Bank of Kazakhstan, causing banks to be selective in their decisions to extend loans, especially to small and more risky businesses. Another obstacle in accessing bank loans in Kazakhstan is high interest rates: the real rate on loans for business was above 6% in the year 2017 according to World Bank. There are government programs providing low-interest rate loans to SMEs, operated by the Damu Fund, but these are limited in volume.

The statistics on external financing sources at the extensive and intensive margins in Kazakhstan underline the ample role of trade credit in firms' operations, an anomaly of the financial system. To evaluate the consequences of this anomaly, it is essential to understand the role of trade credit in determining the financial position and resilience of different types of firms. That can be useful to tailor policy recommendations to support businesses. Since Kazakhstan experienced two crises recently, the year 2009 global financial crisis and the year 2014-5 economic crisis that mainly arose from the sharp decline in energy prices, the recent data also allow us to investigate the trade credit behavior in periods of financial downturn. This investigation might be particularly important in an attempt to infer the consequences of the ongoing COVID-19 pandemic and evaluate the variety of policy measures taken by the government to support firms' finances.

We conduct our analysis using the confidential data, part of the annual national statistical monitoring, obtained from the Statistics Committee of the Ministry of National Economy of the Republic of Kazakhstan. The data have two parts: The first part is an administrative panel data consisting of large enterprises (more than 50 workers in between years 2009 and 2014, and more than 100 workers afterward), whereas the second part is a repeated cross-sectional data of around 30% of SMEs in between years 2009 and 2016. In analyzing the trade credit demand and supply behavior in Kazakhstan, we utilize the determinants measuring firms' ability to obtain external and internal financing, inventory management, creditworthiness as well as geographical and sectoral variation.

The literature provides several motives behind the decisions of non-financial firms to extend trade credit to their customers, including market frictions due to the existence of taxes (Brick and Fung, 1984), transaction costs arising from cash management (Emery, 1984; Ferris, 1981), imperfect market competition allowing price discrimination that makes the credit profitable (Brennan et al., 1988), suppliers having information advantages over banks (Biais and Gollier, 1997; Petersen and Rajan, 1997), inter-firm relationships reducing moral hazard problems (Burkart and Ellingsen, 2004), and suppliers having better ability to enforce debt payments than banks due to the shared rents from a long-standing relationship (Cuñat, 2007). Trade credit is not only quantitatively large but also constitutes an economically important adjustment mechanism for companies. It is known to interact with bank credit whether as a substitute or as a complement. The substitution hypothesis states that trade credit demand should be negatively associated with the amount of secured bank loans; on the other hand, according to the complementarity hypothesis, creditworthy firms are likely to attract both more trade credit and bank loans. Given the immense role of trade credit relative to bank loans in Kazakhstan, analyzing the relationship between these two types of external financing is useful to better understand the constraints faced by firms in their financing decisions. We find that trade credit demand and bank loans are mainly substitutes in Kazakhstan, as in Cuñat (2007), García-Teruel and Martínez-Solano (2010a), and Hill et al. (2017) rather than Agostino and Trivieri (2014), Andrieu et al. (2018), and Giannetti et al. (2011), with the degree of substitutability decreasing with the size of bank loans for large firms. This finding can be perceived as a by-product of the anomaly observed in the financial system, with firms, having limited access to bank loans, extensively relying on trade

credit. We also find evidence that firms having access to external credit use some portion of it to extend trade credit.

Many papers in the trade credit literature use the size of assets as a measure of firm size to control for the creditworthiness of firms (e.g., Andrieu et al., 2018; Bougheas et al., 2009; Canto-Cuevas et al., 2016; García-Teruel and Martínez-Solano, 2010a; Petersen and Rajan, 1997). Another contribution of our paper is that we additionally control for the heterogeneity in the size labor cost to understand the implications of labor/capital intensity for trade credit behavior. Seperating fixed assets from the rest of the assets as well, we utilize three firm size measures: long-term assets except for fixed assets, labor cost in a year, and fixed assets to measure collaterals. We discern that trade credit demand is more prevalent among capital-intensive rather than labor-intensive firms. Besides, we find a positive association between liquidity and trade credit demand implying the dearth of trade credit to illiquid firms, possibly arising from the default risk.

Kiyotaki and Moore (1997) pioneered the works on trade credit chains arguing liquidity shocks are passed along through delinquencies. Although delinquency on trade credit payments may provide relief in face of liquidity constraints and prevent bankruptcies, it imposes losses on other firms and may in turn feed further delinquency. Boissay and Gropp (2013) and Jacobson and Von Schedvin (2015) are among the papers that estimate to what degree trade credit delinquencies are passed along to suppliers in the context of French and Swedish firms. Having data on trade credit delinquency for large Kazakhstani firms, we explore the characteristics affecting delinquency behavior and measure its degree of transmission. We find that on average large firms pass along around 6% of their delinquent receivable to their trade credit suppliers through delayed payments in Kazakhstan. This statistic is estimated to be around 17% on average for large firms that are already delinquent on their payables. These findings show that the ability of a large Kazakhstani firm to pay its trade credit on time is dependent on the ability of its borrowers to pay their credit on time. The only other significant and substantial determinant of delinquency behavior is estimated to be profitability.

At the extensive margin, the annual exit rate of firms increased from around 9% to 13% while the annual bankruptcy rate increased from 0.4% to 0.6% after the year 2014-5 economic crisis (Nurlankul and Yavuzoglu, 2020). The study of the extensive margin on firm exit behavior is beyond the scope of this paper as it requires a structural model incorporating the effect of delinquency on firm exit behavior, which is taken up by Mateos-Planas et al. (2020). The robustness check we conduct, employing propensity score matching after splitting the sample into crisis and no-crisis periods, also provides evidence in favor of our findings being robust to the changes observed at the extensive margin.

We next focus on the implications of financial downturns on the trade credit behavior of Kazakhstani firms based on the two recent crises experienced. The evidence regarding the relationship between trade credit and external financing during crisis is mixed in the literature. Hyun (2017a) finds that financially constrained Korean SMEs secured more trade credit during the 1997-8 Asian financial crisis. The findings of Carbó-Valverde et al. (2016) for Spanish SMEs, Lawrenz and Oberndorfer (2018) for unlisted German SMEs, and Yang (2011) for the U.S. manufacturing firms regardless of their size during the Great Recession are also in favor of the substitution hypothesis. Differently, Love and Zaidi (2010) discover that financially constrained SMEs from four East Asian countries during the Asian financial crisis, and Psillaki and Eleftheriou (2015) that French SMEs in the manufacturing industry and Tsuruta (2015) that Japanese SMEs during the global financial crisis received less trade credit provided that they had difficulty accessing bank loans, in favor of the complementarity

hypothesis. While our estimates suggest that trade credit and bank loans were mainly substitutes in Kazakhstan for both large firms and SMEs during the year 2009 global financial crisis, and for SMEs during the year 2014-5 economic crisis, they exhibited a complementary relationship for large firms following the year 2014-5 economic crisis. This new piece of evidence from Kazakhstan might provide further insight into the discussion in the literature about the non-uniform effects of crises. The relation between trade credit and bank loans switching from being substitutional to complementary for large firms following the year 2014-5 economic crisis highlights the difficulty the relatively less creditworthy firms experienced to secure external financing. Our estimates also suggest that less liquid firms found it even more difficult to secure trade credit following the year 2014-5 economic crisis, consistent with Tsuruta (2013) in the context of Japan during the Asian financial crisis.

There is compelling evidence that trade credit delinquency chains propagate financial shocks, intensifying their aggregate effects (e.g., Altinoglu, 2020; Costello, 2020; Reischer, 2019). Analyzing the delinquency behavior during the two recent crises, we discover that the financial ability of large Kazakhstani firms to repay their trade credit on time was negatively influenced by the year 2014-5 economic crisis with the transmission of trade credit delinquency, compared to periods of no crisis, amplified by 60% for all large firms and 95% for large firms that are already delinquent on their payables. This finding highlights the strain on firms' finances the year 2014-5 economic crisis brought about. Additionally, large firms with access to bank loans were found to be more delinquent following the year 2014-5 economic crisis. Such effects were not observed for the year 2009 global financial crisis.

The findings of our analysis have important policy implications. First, increasing the availability of bank loans, especially to SMEs, seems essential to alleviate the financing problems Kazakhstani firms experience. A partial remedy in the medium-run might be increasing the size of the existing government programs providing low-interest rate loans. Second, rather than taking a one-size-fits-all approach, the policies aimed towards increasing access to finance should target illiquid firms, a group that includes mainly smaller and younger firms, as well as capital-intensive firms. Third, it is essential to introduce policies in support of firms' finances in periods of crisis to ease the strain they experience. Lastly, since the year 2014-5 economic crisis was more detrimental for financially constrained and/or illiquid large firms, policymakers should oversee the financing difficulties these firms experience during crises and introduce interventions in support of them if necessary.

Even though the ongoing COVID-19 crisis is not a typical financial downturn with its peculiar implications, in light of our findings, we can try to evaluate the measures the government has taken to mitigate its effects on the financial positions of firms. Bank loan extensions, subsidized loans, and tax exemptions/deferrals in support of SMEs seem to address their financing needs. Given the unavailability of the recent data, it is hard to conclude though if the sizes of these measures are large enough. The only adopted policy measure for large enterprises is tax exemptions in given sectors. It is important for policymakers to monitor the activities of financially constrained and/or illiquid large firms and in case extend some of the introduced policy measures to them.

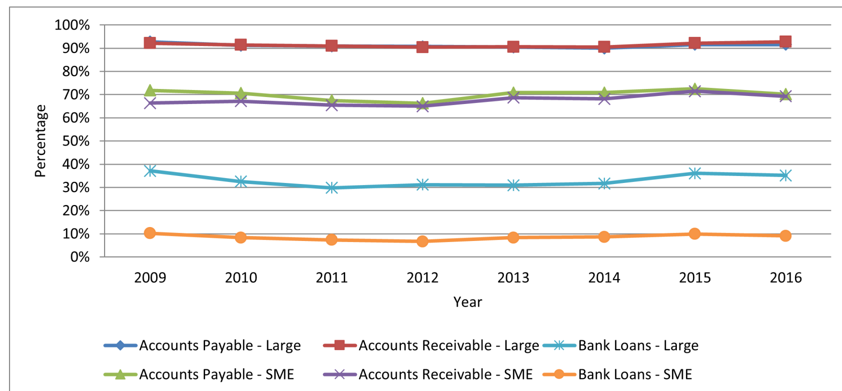
2. RECENT CRISES AND DYNAMICS OF TRADE CREDIT AND ITS DELINQUENCY

The data used in this study span the two recent financial crises Kazakhstan experienced. The former one is the Great Recession that began in the United States officially in December 2007, with the burst of the housing bubble, and ended in June 2009. It met the IMF criteria of being a global

recession only in the year 2009. Since the available Kazakhstani data cover the period starting from the year 2009, we choose to refer to the part of the crisis under study as the year 2009 global financial crisis. The next financial downturn for the Kazakhstani economy was the year 2014-5 economic crisis in Kazakhstan which started with the devaluation of the currency, Kazakh Tenge (KZT), by 19% against the U.S. dollar on February 11, 2014, from 155.6 KZT/USD to 185 KZT/USD according to the National Bank of Kazakhstan, as a consequence of the negative balance of payments and increased speculation due to devaluation expectations. This was followed by the decline in energy prices from more than $100 per barrel to less than $36 at the end of the year 2014 causing a significant decrease in government revenue since the economy of Kazakhstan is heavily dependendt on the export of fuel and energy products, constituting about 70% of all exports according to the Statistics Committee of Kazakhstan. Additionally, the imposition of sanctions against Russia, the country's main trading partner, amplified the uncertainty in the economy. The government, in response, switched to a managed-floating exchange regime in the year 2015. KZT lost another 46% vis-à-vis the USD by the end of the year, having an exchange rate of 342.5 KZT/USD on Dec 31, 2015. This crisis indeed lasted in the first quarter of the year 2016.

We next focus on the trends in the usage of external financing sources in Kazakhstan, paying attention to the effects of the two recent crises. All the statistics in this section are obtained using the entire sample of firms broken down by their size: large firms and SMEs. We measure trade credit demand and supply via short-term accounts payable and receivable, utilizing the end of the year values here and elsewhere. Figure 1 displays the percentages of large firms and SMEs with access to trade credit and bank loans. There are no significant patterns except that the percentages of SMEs recurring to credit and firms of either size having access to bank loans decreased slightly following the year 2009 global financial crisis then recouped its original level by the year 2015.

Figure 1: Percentage of Firms with Access to Trade Credit and Bank Loans

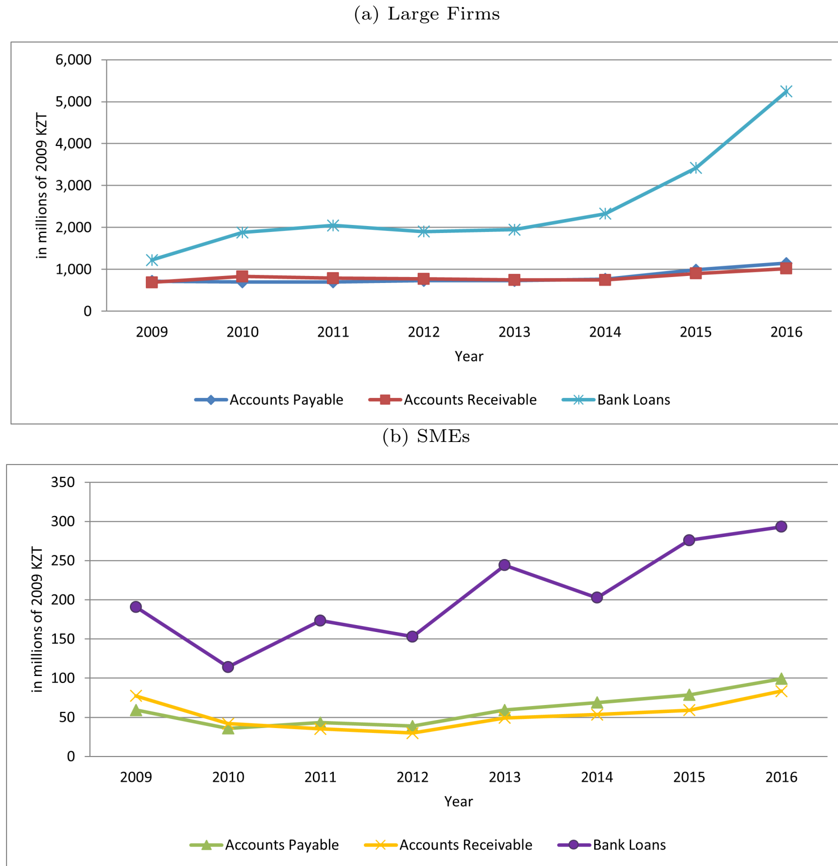


Figures 2a and 2b provide the dynamics for the average sizes of trade credit and bank loans for large firms and SMEs with access, respectively. The data show that the year 2009 global crisis had diverging effects on the financing behavior of firms by size. While the average size of trade credit for large firms with access remained virtually the same between years 2009-14, the slight decrease at the extensive margin of trade credit for SMEs observed in Figure 1 was accompanied by a decrease at the intensive margin. Regarding bank loans, large firms with access were able to secure larger amounts on average after the year 2009 global crisis whereas SMEs with access experienced a decrease in the

amount of loans they secured. The year 2014-5 economic crisis on the other hand was followed by an increase at the intensive margin for both financing sources.

Figure 2: Average Sizes of Trade Credit and Bank Loans for Firms with Access

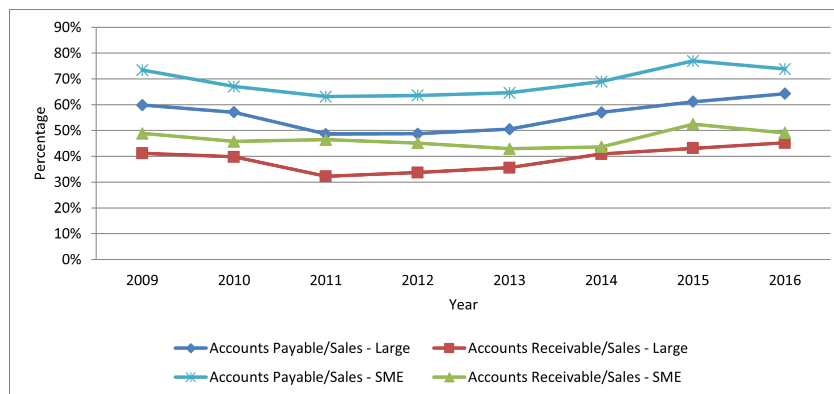
(a) Large Firms



(b) SMEs

Figure 3 depicts trade credit dynamics of firms normalized by their sales to understand the relative role of trade credit in their operations. The most notable feature of this figure is that both of the recent crises were associated with higher amounts of trade credit proportional to sales. While SMEs

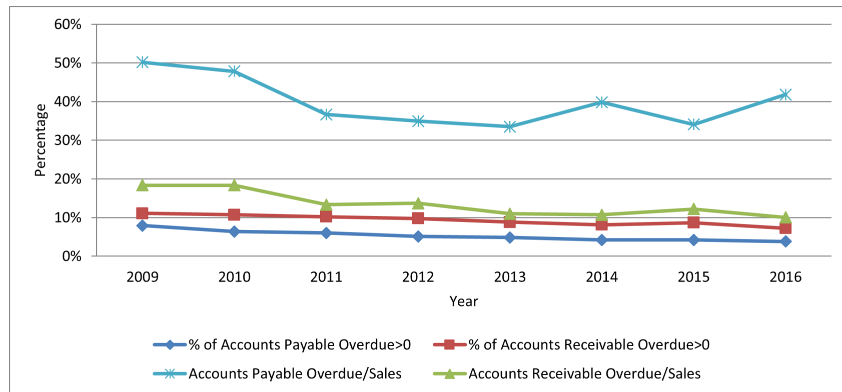
Figure 3: Average Ratios of Trade Credit to Sales for Firms with Access



recurred to and extended more trade credit proportionally, trade credit dynamics by firm size are very similar except for a repercussion in the relative size of trade credit for SMEs in the year 2016. Interpreting Figure 3 together with Figures 2a and 2b, it is possible to conclude that sales of large firms (SMEs) were affected more by the year 2014-5 (2009) crisis. One can also establish, considering the percentages and average sizes from Figures 1 and 2, that relatively smaller firms secured trade credit from relatively larger firms on average explaining the gap between accounts receivable and payable figures.

As depicted in Figure 4 the percentages of large firms with delinquent payable and receivable in Kazakhstan decreased over time while the average ratio of delinquent amount proportional to sales, after a significant decrease following the year 2009 global financial crisis, remained almost intact. Remark that the proportion of large firms with positive overdue receivable is almost double the proportion with positive overdue payable. This is caused by the structure of trade credit: Once a firm is delinquent, many creditors are intertwined with this debtor.

Figure 4: Percentage of Firms with Delinquent Trade Credit and Average Ratios of Deliquency to Sales for Delinquent Firms



3. DATA

The data utilized in this paper are obtained from the Statistics Committee of the Ministry of National Economy of the Republic of Kazakhstan, which is part of the national statistical monitoring. It is confidential and composed of the information reported, in written forms, annually by (i) the population of big firms with more than 50 employees (1-PF data) and (ii) a random sample of around 30% of SMEs (2-MP data) except for educational and medical organizations, banks, and public associations for the period of 2009-14. Since then, the agency started collecting the data online and revised its cutoff for the definition of SMEs to more than 100 employees. A firm that is observed in the year 2014 but not in 2015 in the 1-PF data then either had less than 100 workers or went out of business. In the former case, there is a chance for this firm to be present in the 2-MP data in the years 2015 and/or 2016. The data contain information on balance sheet components and some firm-level characteristics including firm size, industry, and location. The large firm data additionally include information on delinquent receivable from suppliers and delinquent payable to customers, the latter being the unique feature of the Kazakhstani data.

The administrative panel data of large firms have a total of 43,417 firm-year observations out of 10,208 firms. We drop 1,889 firm-year observations including mainly inactive but still registered

firms having annual revenue of less than 10 million year 2009 KZT, corresponding to around 65,000 USD, as well as a limited number of observations with inconsistencies over the time in the variables of interest in this study. We also drop 1,236 firm-year observations with missing values for any variable of interest except for delinquency to obtain our working large firm sample, consisting of 9,151 firms with a total of 40,292 observations. For the repeated cross-sectional data of SMEs, we drop 7.8% of firm-year observations that are inactive but still registered with a revenue of less than 150,000 KZT, corresponding to around 80% of the minimum wage. Since the SME data are not a panel, we cannot check inconsistencies in variables of interest over time, as we did for large firms. We additionally censorize the top 1% of the ratios we constructed from balance sheet variables, corresponding to a total of 3% of observations. The working SME sample consists of 136,923 observations, from 63,857 firms.

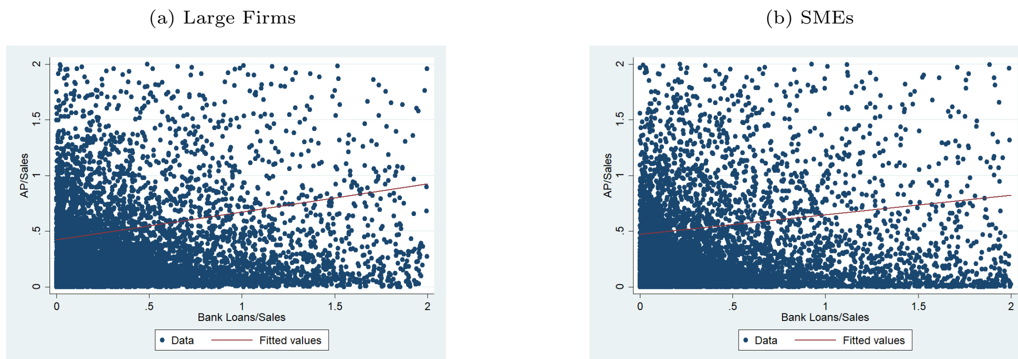
As determinants of trade credit and its delinquency, we control for the ability to obtain external and internal financing, inventory management, creditworthiness as well as geographical and sectoral variation. We measure trade credit demand using short-term (up to one-year) accounts payable (AP) and trade credit supply via short-term accounts receivable (AR). Delinquent payable are measured using overdue liabilities to suppliers and contractors (*AP overdue*), and delinquent receivable utilizing overdue collectibles from buyers and consumers (*AR overdue*).

We control for firms' ability to obtain external financing via bank loans, short-term liabilities except for trade and bank credit (*ST Liabilities*), and long-term liabilities except for bank credit (*LT Liabilities*). Short- and long-term liabilities help us capture other financing sources such as leasing finance, tax liabilities, and informal finance – the data provide only the sums. Access to bank loans is measured using two variables: a binary variable indicating whether a firm has an outstanding bank loan (*AF1*) along with its size (*AF2*).

Trade credit is known to interact with bank loans, whether as a substitute or as a complement. According to the substitution hypothesis, trade credit demand should exhibit a negative relationship with external financing: Firms unable to acquire bank loans should rely on trade credit. The findings of Cuñat (2007), García-Teruel and Martínez-Solano (2010a), and Hill et al. (2017) are in line with this view. Alternatively, the complementarity hypothesis suggests that creditworthy firms attract more bank loans and trade credit simultaneously. Agostino and Trivieri (2014), Andrieu et al. (2018), and Giannetti et al. (2011) corroborate this hypothesis. Figures 5a and 5b depict the relationship between the sizes of bank loans and trade credit normalized by sales for large firms and SMEs in Kazakhstan.

Figure 5: Accounts Payable vs. Bank Loans

(a) Large Firms (b) SMEs



The raw data suggests some complementarity, albeit with a sizeable variation. We indeed later show that controlling for observables, trade credit and bank loans are mainly substitutes in Kazakhstan, except for being complementary for large firms following the year 2014-5 economic crisis.

We measure firms' ability to generate internal funds using *Profitability* and *Liquidity*. More profitable firms, finding it easier to generate capital for reinvestment, might have less need to raise trade credit for their operations. A similar negative association with trade credit demand might be expected for *Liquidity* unless, arising from the default risk, illiquid firms find it difficult to attract credit from their suppliers. Being able to generate internal funds, we expect both profitable and liquid firms to extend more trade credit. We additionally analyze the importance of *Inventory* in trade credit behavior. Since inventory might be considered as collaterals, we expect it to be positively associated with trade credit supply provided that large sizes of the inventory do not stem from the difficulty in selling products. We normalize all the introduced variables by sales revenue.[1]

To evaluate the effect of the creditworthiness of firms on trade credit behavior, we utilize the size of assets and the cost of labor in a year. This dual measure of creditworthiness helps us to discern the trade credit behavior of capital-intensive from labor-intensive firms. Since the implications of different types of assets on trade credit behavior might diverge, we separate fixed assets from the rest of the assets. The three firm size measures we utilize, long-term assets of the firm except for fixed assets (*SizeLA*), labor cost in a year (*SizeLC*), and collaterals measured by fixed assets (*SizeCOL*) are provided in logarithms after being normalized to the value of KZT in the year 2009 using consumer price index (CPI). The SME data also have information on whether a firm is located in an urban area (*Urban*). A recap of the variables of interest in our study along with their definitions can be found in Table 2.

Table 2: Variable Definitions

Variable	Definition
AP	Short-term payable/Sales
AR	Short-term receivables/Sales
AP Overdue	Overdue payable to suppliers/Sales – only for large firms
AR Overdue	Overdue receivable from customers/Sales – only for large firms
AF1	Access to bank loans (dummy)
AF2	(Short-term bank loans + Long-term bank loans)/Sales
ST Liabilities	(Short-term liabilities - Short-term bank loans and payable)/Sales
LT Liabilities	(Long-term liabilities - Long-term bank loans)/Sales
Profitability	Gross profit/Sales
Liquidity	(Cash + Bank deposits + Other current assets)/Sales
Inventory	Inventory/Sales
SizeLA	log (Long-Term assets - Fixed assets)
SizeLC	log (Labor cost)
SizeCOL	log (Fixed assets)
Urban	Located in an urban area (dummy) – only for SMEs

We additionally investigate if the relationship between trade and bank credit depends on the three firm size measures we utilize within each coarse firm size classification, large enterprises and SMEs, introduced by the data collection agency. This helps us to have a better understanding of the differential effect of firm size on trade credit behavior. To that end, we utilize three interaction terms between the size of bank loans and firm size measures. Since the relationship between trade and bank credit might also depend on the other sources of external financing, we consider two interaction

[1] We choose to scale our control variables by sales rather than assets since one contribution of our paper is to uncover the implications of labor/capital intensity on trade credit behavior. It would not be possible to discern these implications if we used assets to scale control variables.

terms between bank loans and liabilities. We further use three interaction terms between the level of inventory and firm size measures, and another two interaction terms between inventory and other sources of external financing to inspect whether the effect of inventory on trade credit behavior depends on firm size or liabilities. Eventually, we only include the highly significant interaction terms in our regressions.

The industry-location-year composition of firms is provided in Table 3. The industrial variation in our data is provided via 5-digit classification, similar to O*NET. We use the first 2 digits and identify 17 sectors. Among them, manufacturing, construction, and retail and wholesale trade are the major sectors regardless of firm size. The other major sectors are agriculture for large firms, professional, scientific and technical services, and real estate for SMEs. The geographical data are composed of all 14 regions (called *oblasts*) and 2 cities of republican significance having a population of above 1 million, Almaty and

Table 3: Data Structure

	Large Firms		**SMEs**	
Table 3a: Industry Composition	Freq.	Percent	Freq.	Percent
Agriculture	4,419	10.97	8,325	6.08
Mining	1,423	3.53	2,657	1.94
Oil and Gas	329	0.82	90	0.07
Manufacturing	7,235	17.96	13,169	9.62
Utilities	2,445	6.07	4,609	3.37
Construction	5,898	14.64	14,235	10.40
Automobile	342	0.85	1,832	1.34
Retail and Wholesale Trade	5,263	13.06	21,942	16.03
Transportation and Warehouse	2,888	7.17	9,036	6.60
Accommodation and Food Services	1,097	2.72	4,773	3.49
Information and Communication	1,042	2.59	6,328	4.62
Finance and Insurance	198	0.49	6,896	5.04
Real Estate	1,072	2.66	12,315	8.99
Professional, Sci. & Tech. Services	2,811	6.98	13,006	9.50
Administration and Support Services	2,574	6.39	10,148	7.41
Art, Entertainment and Recreation	1,063	2.64	3,527	2.58
Other Services	193	0.48	4,035	2.95
# of Obs.	40,292	100.00	136,923	100.00
Table 3b: Location Composition	Freq.	Percent	Freq.	Percent
Akmola oblast	2,150	5.34	7,059	5.16
Aktobe oblast	1,872	4.65	6,766	4.94
Almaty oblast	2,300	5.71	8,449	6.17
Atyrau oblast	1,694	4.20	5,041	3.68
WKO	1,273	3.16	5,017	3.66
Zhambyl oblast	970	2.41	4,831	3.53
Karagandy oblast	3,024	7.51	12,430	9.08
Kostanay oblast	2,679	6.65	7,963	5.82
Kyzylorda oblast	1,300	3.23	3,703	2.70
Manggystau oblast	1,657	4.11	5,314	3.88
Turkestan oblast†	2,349	5.83	9,287	6.78
Pavlodar oblast	1,694	4.20	7,025	5.13
North Kazakhstan oblast	1,972	4.89	6,048	4.42
East Kazakhstan oblast	2,984	7.41	11,832	8.64
Nur-Sultan city††	3,570	8.86	11,720	8.56
Almaty city	8,804	21.85	24,438	17.85
# of Obs.	40,292	100.00	136,923	100.00

† South Kazakhstan oblast was renamed to Turkestan oblast in 2018 when the city of Shymkent was given the status of a city of republican significance and removed from the oblast.
†† Astana city was renamed to Nur-Sultan city in 2019.

Table 3c: Year Composition	Freq.	Percent	Freq.	Percent
2009	4,917	12.20	15,742	11.50
2010	5,112	12.69	21,291	15.55
2011	5,405	13.41	12,690	9.27
2012	5,625	13.96	12,057	8.81
2013	5,778	14.34	17,839	13.03
2014	5,930	14.72	18,779	13.72
2015	3,776	9.37	16,145	11.79
2016	3,749	9.30	22,380	16.34
# of Obs.	40,292	100.00	136,923	100.00

Nur-Sultan (capital). Almaty city has the largest concentration of firms followed by Nur-Sultan city, Karagandy region, and East Kazakhstan region. The numbers of observations for the years 2015 and

2016 in the large firm dataset are lower due to the change in the data collection regulations discussed earlier.

Summary statistics for large firms and SMEs are provided in Table 4. While accounts payable constitute around 50% of sales for an average firm regardless of its size, accounts receivable account for 35% of sales for large firms and 32% for SMEs. This discrepancy in the average rates of accounts payable and receivable arises from the fact that relatively smaller firms secure trade credit from relatively larger firms on average. It also extends to the delinquency behavior of large firms: delinquent payable and receivable are around 3% and 2% of sales. Proportional to their sales, SMEs are more profitable and liquid on average, but have a limited access to bank loans. The average size of labor costs is significantly larger than the average size of long-term assets which is more pronounced for SMEs. Large firms and SMEs do not seem to differ in terms of their average levels of trade credit, other external financing sources, and inventory management.

Table 4: Summary Statistics

Table 4a: Summary Statistics for Large Firms

Variable	# of Obs.	Mean	Std. Dev.	Min	Max
AP	40,292	0.503	1.742	0	48.859
AR	40,292	0.351	1.395	0	47.133
AP Overdue	39,573	0.032	0.506	0	43.793
AR Overdue	38,424	0.019	0.321	0	22.966
AF1	40,292	0.327	0.469	0	1
AF2	40,292	0.321	1.748	0	62.288
ST Liabilities	40,292	0.255	1.347	0	68.845
LT Liabilities	40,292	0.301	2.149	0	100.669
Profitability	40,292	0.246	0.499	-20.746	1
Liquidity	40,292	0.236	1.062	0	44.221
Inventory	40,292	0.280	0.780	0	31.866
SizeLA	40,292	6.753	4.862	0	21.118
SizeLC	40,292	11.565	1.376	0	18.408
SizeCOL	40,292	11.189	3.140	0	20.495

Table 4b: Summary Statistics for SMEs

Variable	# of Obs.	Mean	Std. Dev.	Min	Max
AP	136,923	0.488	1.910	0	40.72
AR	136,923	0.318	1.246	0	27.22
AF1	136,923	0.080	0.517	0	7.903
AF2	136,923	0.087	0.281	0	1
ST Liabilities	136,923	0.279	1.231	0	27.74
LT Liabilities	136,923	0.238	1.303	0	21.55
Profitability	136,923	0.488	0.425	-1.779	1
Liquidity	136,923	0.408	1.700	0	48.03
Inventory	136,923	0.218	0.678	0	11.67
SizeLA	136,923	2.269	3.493	0	19.40
SizeLC	136,923	8.252	1.703	0	14.70
SizeCOL	136,923	5.880	4.145	0	19.75
Urban	136,923	0.841	0.366	0	1

Table 5 presents the pairwise correlations among the determinants of trade credit analyzed in this paper for large firms and SMEs. The pairwise correlations among the three firm size measures we utilize are sizeable. We keep them to account for the different trade credit behavior of firms based on capital/labor structure. The two other sizeable correlations are between short-term liabilities with liquidity and inventory for large firms. The former might be caused by a necessity to hold on to cash to repay short-term liabilities, whereas the latter might be due to the presence of firms having difficulty with selling their products.

Table 5: Pairwise Correlation Tables

Table 5a: Pairwise Correlation Table for Large Firms

	AP	AR	AP Overdue	AR Overdue	AF1	AF2	ST Liabilities	LT Liabilities	Profitability	Liquidity	Inventory	Size LA	SizeLC	SizeCOL
AP	1.000													
AR	0.608	1.000												
AP Overdue	0.245	0.173	1.000											
AR Overdue	0.203	0.248	0.622	1.000										
AF1	0.041	0.066	0.022	0.033	1.000									
AF2	0.257	0.398	0.128	0.167	0.261	1.000								
ST Liabilities	0.174	0.254	0.203	0.245	0.014	0.163	1.000							
LT Liabilities	0.191	0.203	0.031	0.022	-0.003	0.122	0.096	1.000						
Profitability	-0.143	-0.095	-0.059	-0.043	-0.050	-0.062	-0.119	-0.042	1.000					
Liquidity	0.243	0.219	0.041	0.052	0.015	0.229	0.357	0.263	-0.064	1.000				
Inventory	0.386	0.249	0.198	0.159	0.073	0.230	0.346	0.158	-0.128	0.172	1.000			
SizeLA	0.049	0.052	0.006	0.014	0.197	0.119	0.077	0.124	-0.002	0.112	0.055	1.000		
SizeLC	-0.122	-0.076	-0.050	-0.041	0.065	-0.051	-0.036	-0.009	0.033	0.001	-0.135	0.442	1.000	
SizeCOL	0.060	0.048	0.008	0.009	0.262	0.109	0.054	0.096	-0.091	0.063	0.070	0.523	0.463	1.000

Table 5b: Pairwise Correlation Table for SMEs

	AP	AR	AF1	AF2	ST Liabilities	LT Liabilities	Profitability	Liquidity	Inventory	Size LA	SizeLC	SizeCOL	Urban
AP	1.000												
AR	0.417	1.000											
AF1	0.048	0.094	1.000										
AF2	0.011	0.022	0.505	1.000									
ST Liabilities	0.150	0.270	0.037	-0.000	1.000								
LT Liabilities	0.058	0.126	0.039	0.005	0.060	1.000							
Profitability	-0.042	0.016	-0.003	-0.087	-0.005	-0.003	1.000						
Liquidity	0.215	0.175	0.067	-0.003	0.271	0.116	0.069	1.000					
Inventory	0.279	0.131	0.084	0.058	0.197	0.125	-0.123	0.092	1.000				
SizeLA	0.076	0.063	0.172	0.198	0.096	0.187	-0.047	0.072	0.055	1.000			
SizeLC	-0.071	-0.065	0.032	0.160	-0.051	-0.025	-0.072	-0.077	-0.057	0.315	1.000		
SizeCOL	0.099	0.035	0.139	0.263	0.078	0.112	-0.116	0.001	0.097	0.385	0.489	1.000	
Urban	-0.017	-0.002	-0.043	-0.03	-0.009	-0.075	0.203	0.016	-0.069	-0.046	0.023	-0.105	1.000

4. TRADE CREDIT AND DELINQUENCY DETERMINANTS IN KAZAKHSTAN

Accounting for the panel structure of the data, we analyze the determinants of trade credit for large firms employing fixed effects models, which allow to control for the unobservable heterogeneity across firms that is fixed over the years. Since the fixed effects Tobit model fails to produce a sufficient statistic for estimation, we resort to a linear model. Considering that more than 91% of large Kazakhstani firms rely on trade credit, the benefit of this choice outweighs the cost of renouncing the Tobit model, not accounting for the present left censoring.

Our regression model for large firms is presented below in Model I. The dependent variable is either Accounts Payable or Accounts Receivable. We set $\beta_{12} = \beta_{17-18} = \beta_{20} = 0$ in both trade credit demand and supply regressions, and additionally set $\beta_{11} = \beta_{13-15} = 0$ when the dependent variable is Accounts Payable and $\beta_{19} = 0$ when the dependent variable is Accounts Receivable since the relevant interaction terms are not estimated to be highly significant (p-value more than 0.05). α_i denotes the firm fixed effect, $\underline{\beta_n}$ is the vector of parameters for the year dummies, $\underline{\beta_m}$ is the vector of parameters for the location dummies, and $\underline{\beta_k}$ is the vector of parameters for the sector dummies. We control for location and sector dummies to account for the behavior of firms that were relocated or switched sectors.

Model I: The Determinants of Accounts Payable and Receivable for Large Firms

$$\begin{aligned}
Trade\ credit_{it} = {} & \alpha_i + \beta_1 AF1_{it} + \beta_2 AF2_{it} + \beta_3 STLiabilities_{it} + \beta_4 LTLiabilities_{it} \\
& + \beta_5 Profitability_{it} + \beta_6 Liquidity_{it} + \beta_7 Inventory_{it} + \beta_8 SizeLA_{it} \\
& + \beta_9 SizeLC_{it} + \beta_{10} SizeCOL_{it} + \beta_{11} AF2 * STLiabilities_{it} \\
& + \beta_{12} AF2 * LTLiabilities_{it} + \beta_{13} AF2 * SizeLA_{it} + \beta_{14} AF2 * SizeLC_{it} \\
& + \beta_{15} AF2 * SizeCOL_{it} + \beta_{16} Inventory * STLiabilities_{it} \\
& + \beta_{17} Inventory * LTLiabilities_{it} + \beta_{18} Inventory * SizeLA_{it} \\
& + \beta_{19} Inventory * SizeLC_{it} + \beta_{20} Inventory * SizeCOL_{it} + \underline{\beta_n} Year_n \\
& + \underline{\beta_m} Location_m + \underline{\beta_k} Sector_k + \epsilon_{it}.
\end{aligned}$$

We estimate the determinants of trade credit for small firms within a Tobit framework since we have only a repeated cross-sectional data, see Model 2 below. We set $\beta_{11-14} = \beta_{18} = \beta_{20} = 0$ for both trade credit demand and supply regressions, and additionally set $\beta_{15} = 0$ when the dependent variable is Accounts Payable since these estimates turn out not to be highly significant.

Model II: The Determinants of Accounts Payable and Receivable for SMEs

$$\begin{aligned}
Trade\ credit_{it} = {} & \beta_0 + \beta_1 AF1 + \beta_2 AF2 + \beta_3 STLiabilities + \beta_4 LTLiabilities \\
& + \beta_5 Profitability + \beta_6 Liquidity + \beta_7 Inventory + \beta_8 SizeLA + \beta_9 SizeLC \\
& + \beta_{10} SizeCOL + \beta_{11} AF2 * STLiabilities + \beta_{12} AF2 * LTLiabilities \\
& + \beta_{13} AF2 * SizeLA + \beta_{14} AF2 * SizeLC + \beta_{15} AF2 * SizeCOL \\
& + \beta_{16} Inventory * STLiabilities + \beta_{17} Inventory * LTLiabilities \\
& + \beta_{18} Inventory * SizeLA + \beta_{19} Inventory * SizeLC \\
& + \beta_{20} Inventory * SizeCOL + \beta_{21} urban + \underline{\beta_n} Year_n + \underline{\beta_m} Location_m \\
& + \underline{\beta_k} Sector_k + \epsilon.
\end{aligned}$$

Table 6 provides the regression results of Models I and II. We only provide the non-trivial average marginal effects (AMEs) for the fixed effects regression of large firms, since the estimates of linearly modeled regressors are identical to their AMEs, and the unconditional AMEs for the Tobit regression of SMEs. For the trade credit supply regression for large firms, while the estimate of AF1 is negative but imprecise, AF2 is positively and precisely estimated. These estimates suggest that trade credit demand

Table 6: Regression Results of Models I and II

	LARGE FIRMS				SMEs			
	AP		AR		AP		AR	
VARIABLE	**FE Est.**	**AME†**	**FE Est.**	**AME†**	**Tobit Est.**	**Uncond'l AME**	**Tobit Est.**	**Uncond'l AME**
AF1	-0.036		-0.068**		-0.164***	-0.079***	-0.016	-0.007
	(0.031)		(0.028)		(0.022)	(0.011)	(0.016)	(0.007)
AF2	0.090***		0.553**	0.488***	0.044**	0.021**	0.511***	0.132***
	(0.024)		(0.229)	(0.058)	(0.021)	(0.010)	(0.072)	(0.016)
ST Liabilities	-0.048	-0.052	0.183***	0.178***	0.084***	0.034***	0.265***	0.122***
	(0.034)	(0.033)	(0.039)	(0.039)	(0.018)	(0.008)	(0.017)	(0.007)
LT Liabilities	0.069***		0.091***		-0.002	-0.008	0.099***	0.044***
	(0.028)		(0.027)		(0.012)	(0.005)	(0.012)	(0.005)
Profitability	-0.173***		-0.088***		-0.220***	-0.105***	0.005	0.002
	(0.065)		(0.059)		(0.029)	(0.014)	(0.017)	(0.008)
Liquidity	0.298***		0.030		0.230***	0.110***	0.059***	0.028***
	(0.070)		(0.046)		(0.018)	(0.008)	(0.009)	(0.004)
Inventory	2.279***	0.683***	0.193***	0.191***	1.327***	0.395***	0.214***	0.093***
	(0.621)	(0.091)	(0.054)	(0.054)	(0.129)	(0.018)	(0.019)	(0.008)
SizeLA	0.002		-0.005	-0.010***	0.038***	0.018***	0.009***	0.004***
	(0.004)		(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.001)
SizeLC	-0.191***	-0.230***	-0.125***	-0.110***	-0.077***	-0.046***	0.012**	0.005***
	(0.040)	(0.035)	(0.026)	(0.026)	(0.008)	(0.004)	(0.005)	(0.002)
SizeCOL	0.013**		0.005	-0.009	0.115***	0.055***	0.043***	0.018***
	(0.007)		(0.006)	(0.007)	(0.003)	(0.002)	(0.002)	(0.001)
Urban					0.225***	0.108***	0.189***	0.088***
					(0.033)	(0.016)	(0.023)	(0.011)
AF2*ST Liabilities			-0.010***					
			(0.001)					
AF2*SizeLA			-0.014**					
			(0.006)					
AF2*SizeLC			0.045**					
			(0.023)					
AF2*SizeCOL			-0.044***				-0.036***	
			(0.013)				(0.007)	
Inventory* ST Liabilities	-0.012***		-0.007***		-0.041***		-0.019***	
	(0.003)		(0.003)		(0.007)		(0.005)	
Inventory* LT Liabilities					-0.046***		-0.019***	
					(0.009)		(0.006)	
Inventory*SizeLC	-0.138**				-0.057***		-0.017**	
	(0.055)				(0.016)		(0.008)	
year2010	0.029		0.001		0.012	0.006	0.046***	0.022***
	(0.021)		(0.017)		(0.022)	(0.010)	(0.017)	(0.007)
year2011	0.045*		-0.012		-0.053**	-0.025**	0.040**	0.019**
	(0.023)		(0.020)		(0.026)	(0.012)	(0.018)	(0.009)
year2012	0.071***		0.028		-0.044	-0.021	0.030	0.014
	(0.025)		(0.022)		(0.028)	(0.013)	(0.019)	(0.009)
year2013	0.086***		0.050**		-0.015	-0.007	0.046***	0.021***
	(0.027)		(0.023)		(0.025)	(0.012)	(0.017)	(0.008)
year2014	0.168***		0.116***		-0.015	-0.006	0.033*	0.015*
	(0.031)		(0.027)		(0.025)	(0.012)	(0.017)	(0.008)
year2015	0.198***		0.101***		0.026	0.012	0.121***	0.057***
	(0.031)		(0.027)		(0.027)	(0.013)	(0.018)	(0.009)
year2016	0.219***		0.095***		-0.020	-0.010	0.085***	0.040***
	(0.036)		(0.028)		(0.025)	(0.012)	(0.017)	(0.008)
Constant	1.182*		1.351***		-0.383***		-0.822***	
	(0.703)		(0.319)		(0.078)		(0.051)	
Location	controlled		controlled		controlled		controlled	
Sector	controlled		controlled		controlled		controlled	
# of Obs.	40,292		40,292		136,923		136,923	

Robust clustered standard errors are in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.
Year 2009 is the reference category.
† Only non-trivial AMEs are provided.

and bank loans are mainly substitutes for large firms and the degree of substitutability decreases with the size of bank loans. This substitutional relationship switches to being complementary for 11.3% of the observations having access to bank loans amounting to more than 40.0% of their sales. Since bank loan estimates in the supply regression for large firms differ significantly when we account for their changing role in crisis periods in the next section, we choose not to emphasize them any further here. For SMEs, trade credit demand and bank loans are estimated to be substitutes, unless the size of bank loans amounts to more than 4 times the sales, and the degree of substitutability decreases with the size of bank loans like large firms. Large firms and SMEs have a diverging trade credit behavior though in response to the other sources of external financing: Only long-term (short-term) liabilities are estimated to be complements with trade credit for large firms (SMEs).

At the average values of firm size variables and short-term liabilities, large firms having access to bank loans more than 13.9% of their sales are estimated to use some portion of their loans to extend trade credit, with its size increasing with labor intensity but decreasing with the amount of short-term liabilities. The limited number of SMEs having access to bank loans are also estimated to extend more trade credit, relatively less in size for those having more collaterals. Similarly, we discover positive associations between other external financing sources and trade credit supply.

Our estimates suggest that more profitable firms on average recur to trade credit less, as expected since they can use their profits for investment and in line with Bougheas et al. (2009) and García-Teruel and Martínez-Solano (2010a). We yet find a positive association between liquidity and trade credit demand implying that the default risk might drive suppliers away from extending trade credit to illiquid firms. This finding has an important policy implication as it underlines the difficulty the illiquid firms, a group that includes mainly smaller and newly created firms, experience in raising external financing for their operations. Regarding trade credit supply, liquid SMEs are estimated to extend more along with the expectations, yet the finding that profitable large firms extend less on average is puzzling.

The positive AME estimate of Inventory for the demand regression suggests that inventory might be considered as collaterals, in line with Cuñat (2007). Inventory is also estimated as a positive determinant of trade credit supply contrary to Bougheas et al. (2009) who utilized firm-level data from the U.K. and Ireland. Since the financial system of Kazakhstan is not well developed and trade credit is the primary external financing source unlike the U.K. and Ireland, this estimate might signal the difficulty of firms selling their products, rather than having a choice to extend more trade credit to decrease their inventory as in Bougheas et al. (2009). This line of thinking might be backed-up by the relatively high positive correlation between short-term liabilities (except trade credit) and inventory, see Table 5.

Firm size is used to control for the creditworthiness of firms in trade credit literature and measured typically using assets (Andrieu et al., 2018; Bougheas et al., 2009; Canto-Cuevas et al., 2016; García-Teruel and Martínez-Solano, 2010a; Petersen and Rajan, 1997). Going beyond, we utilize the cost of labor in a year as an additional measure to discern the trade credit behavior of labor-intensive firms. Since different types of assets might have diverging implications on trade credit behavior, we additionally separate collaterals from the rest of the assets in our analysis. For both large firms and SMEs, AME estimates of the variables measuring firm size by assets and labor cost in a year are opposite and significant, except for other long-term assets for large firms, in supply regressions. This reflects the differences in trade credit behavior of capital-intensive from labor-intensive firms, which is not surprising considering the nature of trade credit. The results tying firm size to trade credit supply are rather mixed: While large firms having higher labor cost and long-term assets but collaterals are estimated to extend less trade credit on average, we observe positive associations between trade credit and all of the size measures for SMEs.

SMEs located in urban areas are estimated to recur to and extend more trade credit on average, as in Niskanen and Niskanen (2006). Lastly, the majority of the industry, like in Giannetti et al. (2011) and Ng et al. (1999), and location dummy variables in Model II are estimated to be economically and statistically significant. Running another Tobit regression for large firms, omitting the panel structure, reveals the same pattern. These findings underline the sectoral and geographical variation in trade credit behavior in Kazakhstan.

A different strand of literature consists of works on trade credit networks pioneered by Kiyotaki and Moore (1997). In their work, they theoretically show how liquidity shocks are transmitted through delinquencies on trade credit. Boissay and Gropp (2013) and Jacobson and Von Schedvin (2015) are among the papers that estimate the degree of this transmission in the context of French and Swedish firms. Having data on trade credit delinquency for large Kazakhstani firms, we next analyze the determinants of delinquent payable along with the degree of transmission of corporate payment failure via Accounts Receivable Overdue, see Model III presented below. Since only 5.4% of large firm-year observations have delinquent payable the cost of renouncing the Tobit framework in favor of a linear fixed effects model is drastic. We, therefore, resort to the Tobit model omitting the panel structure of the data. Our model includes only two interaction terms, the ones between AF2 and ST Liabilities, and Inventory and SizeLC, since none of the other interaction terms considered are estimated to be highly significant.

Model III: The Determinants of Delinquent Payable for Large Firms

$$\begin{aligned} AP\ Overdue = {} & \beta_0 + \gamma AROverdue + \beta_1 AF1 + \beta_2 AF2 + \beta_3 STLiabilities \\ & + \beta_4 LTLiabilities + \beta_5 Profitability + \beta_6 Liquidity + \beta_7 Inventory \\ & + \beta_8 SizeLA + \beta_9 SizeLC + \beta_{10} SizeCOL + \beta_{11} AF2 * STLiabilities \\ & + \beta_{12} Inventory * SizeLC + \underline{\beta_n} Year_n + \underline{\beta_m} Location_m + \underline{\beta_k} Sector_k + \epsilon. \end{aligned}$$

Table 7 illustrates the regression results of Model III where unconditional along with conditional AMEs are provided. Since only a small portion of large firms are delinquent on their payables, conditional and unconditional AMEs differ considerably from each other allowing to discern, additionally, the average behavior of large firms that are already delinquent on their trade credit. The estimates of AR Overdue suggest that a large firm's ability to repay its trade credit on time depends on the ability of its borrowers to repay their credit on time. Considering all the large firms, on average 6.2% of delinquent receivable are passed along to trade credit suppliers through delayed payments. The same statistic is estimated to be 17.1% for large firms that are already delinquent on their payable. Remark that *Profitability* is the only economically and statistically significant determinant of delinquency in addition to many year, region, and sector dummies. More profitable large firms are estimated to be less delinquent on average as expected since they are more likely to pay off their debts on time.

The size of trade credit delinquency of large firms, in comparison to sales, is observed to decline steadily. Controlling for the other determinants, the estimated decrease is 3 percentage points with respect to sales in the year 2016 compared to the year 2009. Note that our regression models do not account for the extensive margin properly as they assume firm exit is random. Indeed, there is an increase in the firm exit behavior following the year 2014-5 economic crisis (Nurlankul and Yavuzoglu, 2020). Our robustness check, discussed in the next section, also provides evidence in favor of our findings not being affected qualitatively from the changes observed at the extensive margin. A structural analysis taking of the interplay among trade credit, its delinquency, and firm exit into account is taken up by Mateos-Planas et al. (2020).

5. TRADE CREDIT AND ITS DELINQUENCY DURING CRISES

We next analyze the changes in the effects of financial indicators (bank loans, short-term and long-term liabilities, and liquidity) and three firm size measures (*SizeLA, SizeLC, and SizeCOL)* in the periods

Table 7: Regression Results of Model III

AP Overdue							
VARIABLE	**Tobit Est.**	**Uncond'l AME**	**Cond'l AME**	**VARIABLE**	**Tobit Est.**	**Uncond'l AME**	**Cond'l AME**
AR Overdue	1.295***	0.062***	0.171***	Inventories*	-0.119***		
	(0.235)	(0.011)	(0.031)	SizeLC	(0.047)		
AF1	-0.029	-0.001	-0.004	year2010	-0.179***	-0.009***	-0.024***
	(0.068)	(0.003)	(0.009)		(0.058)	(0.003)	(0.008)
AF2	0.020	0.001	0.003	year2011	-0.247***	-0.012***	-0.033***
	(0.020)	(0.001)	(0.003)		(0.063)	(0.003)	(0.008)
ST Liabilities	0.042	0.002	0.005	year2012	-0.339***	-0.016***	-0.045***
	(0.037)	(0.002)	(0.005)		(0.070)	(0.003)	(0.009)
LT Liabilities	0.005	0.000	0.001	year2013	-0.412***	-0.020***	-0.055***
	(0.016)	(0.001)	(0.002)		(0.083)	(0.004)	(0.011)
Profitability	-0.199***	-0.010***	-0.026***	year2014	-0.513***	-0.025***	-0.068***
	(0.059)	(0.003)	(0.008)		(0.087)	(0.004)	(0.011)
Liquidity	-0.062	-0.003	-0.008	year2015	-0.550***	-0.026***	-0.073***
	(0.052)	(0.002)	(0.007)		(0.096)	(0.004)	(0.012)
Inventory	1.427***	0.003	0.006	year2016	-0.624***	-0.030***	-0.083***
	(0.543)	(0.002)	(0.006)		(0.110)	(0.005)	(0.014)
SizeLA	0.019**	0.001**	0.003**	Constant	-3.343***		
	(0.008)	(0.000)	(0.001)		(0.653)		
SizeLC	-0.035	-0.005***	-0.010**				
	(0.036)	(0.002)	(0.004)				
SizeCOL	0.042***	0.002***	0.006***				
	(0.013)	(0.001)	(0.002)	Location		controlled	
AF2*	-0.002***			Sector		controlled	
ST Liabilities	(0.001)			# of Obs.		38,196	

Robust clustered standard errors in parentheses.
*** p<0.01,** p<0.05, * p<0.1.
Year 2009 is the reference category.

of crisis. To that end, we extend the fixed effects formulation for large firms and Tobit formulation for SMEs given in Models I and II including interaction terms of these variables with the year dummies for 2009, 2015, and 2016 (we choose to utilize a dummy for the year 2016 since the year 2014-5 economic crisis lasted only in the first quarter of the year 2016). These analyses, in other words, amounts to examining the trade credit behavior of financially constrained, illiquid, and capital/labor intensive firms in periods of financial downturns.

In Models IV and V presented below, FI denotes the vector of financial indicators including bank loans, short- and long-term liabilities, and liquidity, Size denotes the vector of variables representing firm size including *SizeLA, SizeLC, and SizeCOL*, $\underline{\beta_{FI,year}}$ is the vector of parameters for the interaction terms between years of crisis and financial indicators, $\underline{\beta_{Size,year}}$ is the vector of parameters for the interaction terms between years of crisis and variables mea-

Model IV: Trade Credit Behavior of Large Firms During the Crisis

$$\begin{aligned} Trade\ credit_{it} = {} & \alpha_i + \underline{\beta_{FI,2009}} year2009 * FI_{it} + \underline{\beta_{Size,2009}} year2009 * Size_{it} \\ & + \underline{\beta_{FI,2015}} year2015 * FI_{it} + \underline{\beta_{Size,2015}} year2015 * Size_{it} \\ & + \underline{\beta_{FI,2016}} year2016 * FI_{it} + \underline{\beta_{Size,2016}} year2016 * Size_{it} + \underline{\beta_{X_1}} X_{1it} + \epsilon_{it}. \end{aligned}$$

Model V: Trade Credit Behavior of SMEs During the Crisis

$$\begin{aligned} Trade\ credit = {} & \underline{\beta_{FI,2009}} year2009 * FI + \underline{\beta_{Size,2009}} year2009 * Size \\ & + \underline{\beta_{FI,2015}} year2015 * FI + \underline{\beta_{Size,2015}} year2015 * Size \\ & + \underline{\beta_{FI,2016}} year2016 * FI + \underline{\beta_{Size,2016}} year2016 * Size + \underline{\beta_{X_2}} X_2 + \epsilon. \end{aligned}$$

suring firm size, X_1 is the matrix of independent variables in Model I except for the interaction terms that turn out to be not highly significant, $\underline{\beta_{X_1}}$ is the vector of parameters for these variables, X_2 is

the matrix of independent variables in Model II except for the interaction terms that turn out to be not highly significant, and $\underline{\beta_{X_2}}$ is the vector of parameters for the variables in X_2.

The regression results of Models IV and V are presented in Table 8. The estimated AMEs of the trade credit determinants in years of no crisis are very similar to those of previous regressions in Section 4 except for bank loans for large firms. We then confine our attention to interpreting how the effects of financial indicators and firm size measures altered with the year 2009 global financial and the year 2014-5 economic crises along with the effect of bank loans in no crisis periods.

Accounting for the changing role of bank loans during crises, we discover that, in periods of no crisis, the trade credit and bank loans are substitutes for large firms until the ratio of bank loans to sales exceeds 0.77, which is the case for only 7.3% of observations, along with SMEs regardless of the size of bank loans. These findings are in line with the findings of Cuñat (2007), García-Teruel and Martínez-Solano (2010a), and Hill et al. (2017) rather than Agostino and Trivieri (2014), Andrieu et al. (2018), and Giannetti et al. (2011).

The substitutional relationship between trade credit and bank loans observed in the periods of no crisis extends to the year 2009 global financial crisis for both large firms and SMEs, corroborating Hyun (2017a), Carbó-Valverde et al. (2016), Lawrenz and Oberndorfer (2018), and Yang (2011), with an increased degree of substitutability for SMEs. This relationship seems to had weakened for large firms in the year 2015 such that the relationship switches to being complementary when bank loans exceed 29.4% of sales, the case for 44.4% observations with access to bank loans, as well as for SMEs in the year 2016 when bank loans amount to more than 64.1% of sales. Trade credit and bank loans are indeed estimated to be fully complements for large firms in the year 2016: As the secured amount of bank credit increases, trade credit is observed to increase by 9.2% of that amount on average, in line with the findings of Love and Zaidi (2010), Psillaki and Eleftheriou (2015), and Tsuruta (2015). One might wonder if the complementary relationship found for large firms following the year 2014-5 crisis might be caused by the firm size classification criterion imposed by the data collection agency, which is low. This line of thinking is not warranted, unlike in Canto-Cuevas et al. (2016), since we indirectly control for this possibility via the interaction terms between firm sizes and bank loans. As these estimates turn out to be statistically insignificant, we ran our regressions after excluding these terms from our model. Indeed, the relevant interaction term estimates are also economically insignificant and inclusion of them in the demand regression does not change any of our findings qualitatively.

This new piece of evidence from Kazakhstan on the non-uniform relationship between trade credit and bank loans during crisis might provide further insight into the mixed findings in the literature. Hyun (2017b) similarly finds evidence for a non-uniform relationship during the year 1997 Korean financial crisis, but based on business group affiliations. In his case, the substitutional relationship between trade credit and bank loans held only for *chaebol*-affiliated firms. Because of data limitations, we cannot explore the role of group affiliations behind our findings.

Regarding other sources of external financing, short-term liabilities are estimated not to affect trade credit demand for SMEs during the year 2009 global financial crisis, contrary to the rest of the time period under study. The positive correlations observed between trade credit supply and external financing sources conform with Hyun (2017a) and Love and Zaidi (2010).

The observed positive association between trade credit demand and liquidity, even stronger for large firms following the year 2014-5 economic crisis, is consistent with Tsuruta (2013) in the context of Japan during the Asian financial crisis. This finding reveals that suppliers might limit their credit

Table 8: Regression Results of Models IV and V

	LARGE FIRMS		SMEs	
	AP	**AR**	**AP**	**AR**
VARIABLE	**FE Est.**	**FE Est.**	**Tobit Est.**	**Tobit Est.**
AF1	-0.057*	-0.052*	-0.148***	-0.016
	(0.031)	(0.028)	(0.028)	(0.016)
year2009*AF1	0.023		-0.165***	
	(0.046)		(0.054)	
year2015*AF1	0.036		0.012	
	(0.053)		(0.060)	
year2016*AF1	0.105*		0.011	
	(0.060)		(0.052)	
AF2	0.074***	0.851***	0.010	0.513***
	(0.027)	(0.154)	(0.025)	(0.072)
year2009*AF2	0.005	0.148**	-0.013	
	(0.054)	(0.072)	(0.049)	
year2015*AF2	0.105*	0.071	0.050	
	(0.064)	(0.046)	(0.060)	
year2016*AF2	0.018	0.106*	0.203***	
	(0.060)	(0.055)	(0.068)	
ST Liabilities	-0.052*	0.177***	0.093***	0.267***
	(0.031)	(0.039)	(0.024)	(0.017)
year2009*ST Liabilities			-0.100***	
			(0.038)	
year2015*ST Liabilities			-0.017	
			(0.041)	
year2016*ST Liabilities			0.047	
			(0.041)	
LT Liabilities	0.069**	0.090***	-0.002	0.094***
	(0.027)	(0.028)	(0.012)	(0.014)
year2009*LT Liabilities				0.099***
				(0.028)
year2015*LT Liabilities				0.003
				(0.026)
year2016*LT Liabilities				-0.042*
				(0.022)
Liquidity	0.216***	0.048	0.230***	0.060***
	(0.054)	(0.056)	(0.018)	(0.013)
year2009*Liquidity	-0.072	-0.088		-0.086***
	(0.077)	(0.056)		(0.022)
year2015*Liquidity	0.097	-0.100**		-0.003
	(0.091)	(0.050)		(0.021)
year2016*Liquidity	0.324**	0.022		0.042*
	(0.150)	(0.096)		(0.023)
SizeLA	0.005	-0.003	0.040***	0.009***
	(0.004)	(0.003)	(0.004)	(0.002)
year2009*SizeLA	-0.008	-0.008*	0.009	
	(0.005)	(0.004)	(0.009)	
year2015*SizeLA	-0.011*	-0.007*	-0.015**	
	(0.007)	(0.004)	(0.008)	
year2016*SizeLA	-0.004	-0.010**	-0.009	
	(0.008)	(0.005)	(0.007)	
SizeLC	-0.191***	-0.109***	-0.061***	0.011**
	(0.040)	(0.027)	(0.010)	(0.005)
year2009*SizeLC	0.032*		-0.082***	
	(0.016)		(0.022)	
year2015*SizeLC	-0.006		-0.015	
	(0.027)		(0.023)	
year2016*SizeLC	-0.025		-0.017	
	(0.031)		(0.019)	
SizeCOL	0.015**	0.003	0.111***	0.043***
	(0.007)	(0.006)	(0.004)	(0.002)
year2009*SizeCOL			0.027***	
			(0.008)	
year2015*SizeCOL			0.011	
			(0.008)	
year2016*SizeCOL			-0.005	
			(0.006)	
year2010	0.343*	-0.016	-0.518***	0.039**
	(0.175)	(0.023)	(0.159)	(0.016)
year2011	0.359**	-0.034	-0.583***	0.033*
	(0.180)	(0.025)	(0.160)	(0.019)
year2012	0.387**	0.004	-0.574***	0.023
	(0.182)	(0.025)	(0.161)	(0.019)
year2013	0.403***	0.027	-0.552***	0.038**
	(0.181)	(0.026)	(0.162)	(0.017)
year2014	0.488***	0.095***	-0.549***	0.026
	(0.183)	(0.028)	(0.162)	(0.017)
year2015	0.606*	0.145***	-0.418*	0.115***
	(0.336)	(0.042)	(0.223)	(0.018)
year2016	0.734*	0.109**	-0.388*	0.070***
	(0.379)	(0.049)	(0.199)	(0.017)
Constant	0.900	1.194***	-0.038	-0.811***
	(0.721)	(0.325)	(0.153)	(0.051)
Other Determinants	controlled	controlled	controlled	controlled
Location	controlled	controlled	controlled	controlled
Sector	controlled	controlled	controlled	controlled
# of Obs.	40,292	40,292	136,923	136,923

Robust clustered standard errors in parentheses.
*** p<0.01,** p<0.05, * p<0.1.
Year 2009 is the reference category.

to illiquid firms during crises due to the risk of credit contagion. While liquid SMEs extended more trade credit in Kazakhstan following the year 2014-5 economic crisis, in line with Hyun (2017a) and McGuinness et al. (2018), interestingly they offered less trade credit during the year 2009 global

financial crisis as did the large firms during the year 2014-5 economic crisis.

The finding that labor-intensive firms recur to less trade credit remains intact with its magnitude estimated to be lower for large firms and higher for SMEs during the year 2009 global financial crisis. The estimates for the year dummies imply that, even after controlling for the levels of trade credit determinants, large firms increased their supply of trade credit to SMEs during the year 2014-5 economic crisis.

We next analyze the trade credit delinquency behavior of large Kazakhstani firms during crisis, paying special attention to the transmission of corporate payment failure along with the effects of the same set of financial indicators and firm size, see Model VI below. X_3 denotes the matrix of independent variables in Model III except for the interaction terms as they are estimated not to be highly significant and $\underline{\beta_{X_3}}$ denotes the vector of parameters for those variables.

Model VI: Trade Credit Delinquency Behavior of Large Firms During the Crisis

$$\begin{aligned} AP\ Overdue = {} & \underline{\beta_{AROverdue,2009}} year2009 * AROverdue + \underline{\beta_{FI,2009}} year2009 * FI \\ & + \underline{\beta_{Size,2009}} year2009 * Size + \underline{\beta_{AROverdue,2015}} year2015 * AROverdue \\ & + \underline{\beta_{FI,2015}} year2015 * FI + \underline{\beta_{Size,2015}} year2015 * Size \\ & + \underline{\beta_{AROverdue,2016}} year2016 * AROverdue + \underline{\beta_{FI,2016}} year2016 * FI \\ & + \underline{\beta_{Size,2016}} year2016 * Size + \underline{\beta_{X_3}} X_3 + \epsilon. \end{aligned}$$

Table 9 provides the results of this regression. The estimated marginal effects for the transmission of the trade credit delinquency in years of no crisis are virtually the same compared to the findings in Section 3, with an unconditional AME of 0.060 and a conditional AME of 0.166. Most importantly, we find that the financial ability of large Kazakhstani firms to repay their debts on time is negatively influenced by the year 2014-5 economic crisis with marginal effects amplified by 60% when all the large firms and by 95% when large firms that are already delinquent on their payables are considered, in line with the findings of Altinoglu (2020), Costello (2020), and Reischer (2019) that delinquency of trade credit acts as a transmission channel of aggregate fluctuations since it imposes losses for firms in an arms' length relationship. Such an amplification was not observed during the year 2009 global financial crisis. The only other determinant with substantial and significant marginal effects is access to bank loans following the year 2014-5 economic crisis: Large firms with access to bank loans are estimated to be more delinquent on average by 0.9% of their sales in the year 2016, and the same statistic is estimated to be 3.1% for firms that are already delinquent.

As a robustness check, we conduct propensity score matching after splitting the dataset into no-crisis (years 2010 - 14) and crisis (years 2009, 2015 - 16) periods. To that end, we employ one-to-one nearest-neighbor matching without replacement imposing the common support condition. Differently from our results, trade credit and bank loans are estimated to be complements regardless of the size of bank loans also in the year 2015, instead of only for firms with access to bank loans amounting to more than 29.4% of their sales, and there is no statistical evidence for the puzzling negative association between profitability and trade credit supply. Both these departures indeed strengthen our results. The rest of the matched sample estimates corroborate all our findings qualitatively, providing a roustness check.

Table 9: Regression Results of Model VI

AP Overdue			
VARIABLE	**Tobit Est.**	**VARIABLE**	**Tobit Est.**
AR Overdue	1.258*** (0.274)	SizeLA	0.020*** (0.008)
year2009*AR Overdue	0.139 (0.300)	SizeLC	-0.040 (0.036)
year2015*AR Overdue	1.393* (0.784)	year2009*SizeLC	-0.046 (0.040)
year2016*AR Overdue	-0.436 (0.554)	year2015*SizeLC	0.134*** (0.048)
AF1	-0.065 (0.074)	year2016*SizeLC	0.053 (0.053)
year2009*AF1	0.006 (0.100)	SizeCOL	0.042*** (0.013)
year2015*AF1	0.114 (0.131)	year2010	-0.663 (0.485)
year2016*AF1	0.317** (0.150)	year2011	-0.732 (0.487)
AF2	0.022 (0.021)	year2012	-0.822* (0.492)
ST Liabilities	0.083 (0.056)	year2013	-0.894* (0.494)
year2009*ST Liabilities	-0.015 (0.082)	year2014	-0.994** (0.497)
year2015*ST Liabilities	-0.199* (0.120)	year2015	-2.698*** (0.807)
year2016*ST Liabilities	-0.114* (0.066)	year2016	-1.834** (0.833)
LT Liabilities	0.014 (0.017)	Constant	-2.742*** (0.683)
year2009*LT Liabilities	-0.031 (0.034)	Other Determinants	controlled
year2015*LT Liabilities	-0.017 (0.033)	Location	controlled
year2016*LT Liabilities	-0.092* (0.050)	Sector	controlled
Liquidity	-0.159 (0.107)	# of Obs.	38,196
year2009*Liquidity	0.172 (0.111)		
year2015*Liquidity	-0.016 (0.215)		
year2016*Liquidity	0.217* (0.119)		

Robust clustered standard errors in parentheses.
*** p<0.01,** p<0.05, * p<0.1.
Year 2009 is the reference category.

6. POLICY RECOMMENDATIONS

In this section, we first discuss the policy implications of the results of the econometric analysis, then in light of our findings, try to evaluate the series of measures that have been adopted by the government of the Republic of Kazakhstan in mitigating the negative effects of the COVID-19 pandemic on the financial positions of firms. The most notable distortion observed in firms' finances in Kazakhstan, compared to the rest of the world, is the pronounced role of trade credit in relation to bank loans. This anomaly might be partly attributed to the limited availability of bank loans, especially for SMEs. While, according to the Enterprise Surveys of World Bank, 38% of firms in Europe and Central Asia have access to bank loans, the same statistic is only 9% for Kazakhstani SMEs. Even though this statistic for Kazakhstani large enterprises is on par, 35%, with that of Europe and Central Asia, the amount of loans they are able to secure is relatively modest: the average ratio of bank loans to total assets is only 12% for large Kazakhstani firms, whereas it is 61% in 13 European countries contained in Amadeus (McGuinness et al., 2018). The obstacles in accessing bank loans in Kazakhstan stem from the shortcomings in the banking sector. Despite the multiple attempts made by the government aimed

towards solving the problems of the banking sector, by providing aids in the years 2008, 2015, and 2017, the problem of non-performing loans was not fully resolved: the percentage of non-performing loans currently stands at around 10% of all corporate loans and above 20% when only SMEs are considered. High interest rates for businesses, presently above 5% in real terms, is another obstacle that hinders accessing bank loans. The first policy recommendation is, therefore, to increase the availability of bank loans to help improve the financial system. A more immediate recommendation might be increasing the size of the existing government programs providing low-interest rate loans, especially to SMEs, such as the Business Road Map 2025 program.

In the periods of no crisis, the relationship between trade credit and bank loans is estimated to be mainly substitutional in Kazakhstan, with its degree of substitutability decreasing with the size of bank loans for large enterprises. This finding highlights the anomaly observed in the financial system of Kazakhstan as, due to the limited loan availability, firms recur to trade credit extensively to finance their operational expenses; noting that large firms that are able to secure greater amount of loans have less need to resort to trade credit. Increasing the availability of bank financing, as recommended before, is essential to help to alleviate the external financing problems Kazakhstani firms experience. Since firms are found to extend more trade credit with the size of bank loans they secure, such a policy for supporting businesses will additionally have a multiplier effect by indirectly increasing the supply of external financing.

The next set of findings is useful to determine the types of firms in need of external financing and to that end, can help to identify the target groups for tailored policies. We discern that trade credit demand is more prevalent among capital-intensive rather than labor-intensive firms, and there are significant sectoral and geographical variations in the trade credit behavior of Kazakhstani firms. These findings suggest that it will be more efficient if the policies aimed towards increasing access to finance target capital-intensive firms and are tailored according to the needs of regions and sectors, an area for future study. We further find that illiquid firms, a group that includes mainly smaller and younger firms, have greater difficulties in raising trade credit from their suppliers due to the default risk. Given the role of entrepreneurial firms for economic development, this finding sends a message to policymakers on the importance of supporting the finances of firms with limited liquidity.

Our analyses of trade credit behavior during the two recent crises in Kazakhstan is important to draw inferences on the consequences of possible new crises and, in particular, the ongoing COVID-19 pandemic. For SMEs, we discover that the substitutional relationship between trade credit and bank loans observed in periods of no crisis extends to both crises. We further find that while the degree of the substitutability between trade credit and bank loans increased during the year 2009 global financial crisis, it decreased following the year 2014-5 economic crisis, likely because suppliers limited their trade credit provision to SMEs as evidenced by Figure 3. Differently, for large enterprises, we observe that the relationship between trade credit and bank loans switched to being complementary during the year 2014-5 economic crisis. As discussed earlier, this crisis affected the sales of large firms more, and as a result, it seems that the relatively less creditworthy large firms had difficulty raising both trade credit and bank loans. We additionally observe that it became more difficult for illiquid large firms to raise trade credit during following the year 2014-5 economic crisis. While most of the measures taken by the authorities were aimed towards SMEs in response to the 2014-5 economic crisis, these findings point out that the economy would have benefited if these policy measures had been extended to the financially-constrained and/or illiquid large firms.

We also find evidence for the existence of trade credit delinquency chains in Kazakhstan: on average, 6.2% of delinquent receivable are passed along to trade credit suppliers through delayed payments. This chain is important as it prorogates financial shocks. The transmission of the trade credit delinquency is indeed exacerbated to 9.8% following the year 2014-5 economic crisis. This finding highlights the importance of policy measures easing the strains on firms' financing during crisis.

The COVID-19 crisis is unprecedented in several dimensions, from the nature of its cause to the associated lockdown measures, with its peculiar implications. Because the COVID-19 pandemic is ongoing and given the unavailability of the recent data, a true assessment of its impact on firms' financial positions in Kazakhstan may be delayed. We can yet try to infer some of its consequences on the financial positions of Kazakhstani companies from our analyses of the external financing behavior of firms during the two recent crises. Even though the consequences of the two recent crises under study differ in some aspects, the main effect seems to be the strain these crises put on firms' finances. We further discover that the year 2014-5 crisis was especially detrimental for financially constrained and/or illiquid large firms. Note that during both crises the government of the Republic of Kazakhstan introduced policy measures to stabilize the financial sector by providing aids to banks and financial support to firms, mainly SMEs. Starting in March 2020, to mitigate the economic effects of the COVID-19 pandemic and the plunge in oil prices that followed, the government has adopted a series of measures.[2] Many of these interventions are addressed to the support the finances of SMEs, ranging from the provision of low-interest rate credit to the bank loan repayment extensions for firms in given sectors along with the ones with a proof of weakened financial indicators in other sectors, as well as tax exemptions for given sectors and tax deferrals for other sectors. These introduced policy measures for SMEs seem to address their financing needs. Given the unavailability of the data, it is hard to conclude though if the size of these measures is sufficient to offset the negative effects of the pandemic on the finances of SMEs.[3] Regarding large enterprises, the only adopted policy measure is the tax exemptions for firms in given sectors. In light of our findings, it is imperative for policymakers to oversee the difficulties financially constrained and/or illiquid large firms are facing and in case extend some of the policy measures introduced for SMEs to them.

7. CONCLUSION

Trade credit plays an extensive role in firms' operations in Kazakhstan: Around 90% of large enterprises and 70% of SMEs recur to trade credit, whereas bank loans, the other major source of external financing, are accessed by only around 30% of large firms and 10% of SMEs. These relationships extend to the intensive margins. Compared to the rest of the world, the role of trade credit in relation to bank loans is indeed enormous for Kazakhstani firms. This anomaly might be partly attributed to the limited loan availability, especially for SMEs, caused by the shortcomings in the banking sector such as the large proportion of non-performing loans making banks reluctant to extend loans, high real interest rates, and the limited government funding for provision of low-interest rate loans to SMEs.

[2] As of July 8, the total cost of the anti-crisis measures taken by the government amounted to around 6 trillion KZT, equivalently 14 billion USD.

[3] On June 23, 2020, the Agency for Regulation and Development of the Financial Market of the Republic of Kazakhstan reported that 5,000 SMEs out of 14,500 in the sectors that suffered from the pandemic received support from the introduced state programs.

We use the confidential data obtained from the Statistics Committee of the Ministry of National Economy of the Republic of Kazakhstan. The data have two parts: The first is an administrative panel data consisting of large enterprises, and the second is a repeated cross-sectional data of around 30% of SMEs in between the years 2009 and 2016. For our analyses of trade credit, we utilize determinants measuring the ability to obtain external and internal financing, inventory management, creditworthiness as well as industry and location dummies. Given that the large firm data also have information on trade credit delinquency, we extend our research exploring the characteristics affecting the delinquency behavior along with its degree of transmission.

Trade credit is an economically important adjustment mechanism as it interacts with bank credit. The relationship between trade credit and bank loans is mainly substitutional in Kazakhstan, with its degree of substitutability decreasing with the size of bank loans for large firms. This finding underlines the anomaly in Kazakhstan's financial system: Firms that find it difficult to access bank loans rely on trade credit more. We also find that firms having access to bank loans use some portion of it to extend further trade credit. Having three separate firm size measures, long-term assets, labor cost, and collaterals, we discern that trade credit demand is more prevalent among capital-intensive rather than labor-intensive firms. We further find evidence for the trade credit chains for large firms with liquidity shocks being passed along via delinquencies: On average, around 6% of delinquent receivable are passed along to trade credit suppliers through delayed payments. These estimates impart how trade credit delinquency may form a chain of financial problems in the economy.

The range of our dataset covers two crises in Kazakhstan, the year 2009 global financial crisis and the year 2014-5 economic crisis that mainly arose from the sharp decline in energy prices. The analyses of trade credit behavior during these crises might be particularly important to draw inferences on the consequences of the ongoing COVID-19 crisis and evaluate the policy measures that have been adopted in seeking to mitigate its negative impacts on firms' financial positions. We discover that trade credit and bank loans were substitutes for both large firms and SMEs during the year 2009 global financial crisis, and for SMEs during the year 2014-5 economic crisis in line with the findings of Hyun (2017a), Carbó-Valverde et al. (2016), Lawrenz and Oberndorfer (2018), and Yang (2011). Interestingly, they were complements for large firms during the year 2014-5 economic crisis, corroborating Love and Zaidi (2010), Psillaki and Eleftheriou (2015), and Tsuruta (2015), which indicates the obstacles the relatively less trustworthy firms encountered in raising external financing. This new piece of evidence from Kazakhstan on the non-uniform relationship between trade credit and bank loans might provide further insight into the mixed findings in the literature. Our estimates also attest to the increased unavailability of trade credit to illiquid firms during the year 2014-5 economic crisis, probably due to default risk with credit contagion. We additionally discover that during the year 2014-5 economic crisis, compared to periods of no crisis, the transmission of trade credit delinquency was amplified by 60% when all large firms and by 95% when large firms that are already delinquent on their payables are considered. This finding manifests the pressure year 2014-5 economic crisis put on firms' finances.

These findings have important policy implications. Most eminently, there is a need to reform the financial system to increase the availability of bank loans to support the financing of operations of local firms. In the medium-run, expanding the size of existing government programs providing low-interest loans to firms, especially SMEs, might partially relieve firms' financing problems. For the policies aimed towards increasing access to finance, rather than taking a one-size-fits-all approach, the policymakers should prioritize illiquid firms, a group that includes mainly smaller and younger firms,

along with capital-intensive firms. Additionally, these policies should be tailored according to the needs of regions and sectors, an area for further study. Our analyses of the financing behavior of firms during the two recent crises stress their need for financing support in periods of financial downturn. Finally, our discovery that the year 2014-5 economic crisis put a strain on the finances of illiquid and/or financially constrained large firms sends a message to policymakers to oversee the operations of such firms during crisis periods and in case introduce policies in support of their finances.

The COVID-19 crisis, due to its nature, has its distinct implications. Yet, using the lessons learnt from our analyses of the two recent crises in Kazakhstan, we can try to assess the introduced policy measures in support of firms' finances to reduce the effects of the pandemic. The types of policy measures that have been introduced for SMEs, bank loan extensions, subsidized loans, and tax exemptions/deferrals, seem to address their needs of finance. Due to current data limitations, it is not possible yet to conclude whether the sizes of these measures are large enough to offset the effects of the pandemic. The support large firms received, on the other hand, has been very limited: only tax exemptions in given sectors. It is imperative for the policymakers to scrutinize the activities of financially constrained and/or illiquid large firms and intervene if needed.

References

M. Agostino and F. Trivieri. Does trade credit play a signalling role? some evidence from SMEs microdata. *Small Business Economics*, 42(1):131–151, 2014.

L. Altinoglu. The origins of aggregate fluctuations in a credit network economy. *Journal of Monetary Economics*, forthcoming, 2020.

G. Andrieu, R. Staglianò, and P. Zwan. Bank debt and trade credit for SMEs in Europe: Firm-, industry-, and country-level determinants. *Small Business Economics*, 51(1):245–264, 2018.

T. Beck, A.Demirguc-Kunt, and V. Maksimovic. Financing patterns around the world: Are small firms different? *Journal of Financial Economics*, 89(3):467–487, 2008.

B. Biais and C. Gollier. Trade credit and credit rationing. *The Review of Financial Studies*, 10(4): 903–937, 1997.

F. Boissay and R. Gropp. Payment defaults and interarm liquidity provision. *Review of Finance*, 17 (6):1853–1894, 2013.

S. Bougheas, S. Mateut, and P. Mizen. Corporate trade credit and inventories: New evidence of a trade-off from accounts payable and receivable. *Journal of Banking and Finance*, 33(2):300–307, 2009.

M. J. Brennan, V. Miksimovic, and J. Zechner. A pure financial explanation for trade credit. *The Journal of Finance*, 43(5):1127–1141, 1988.

I. E. Brick and W. K. H. Fung. Taxes and the theory of trade debt. *The Journal of Finance*, 39(4): 1169–1176, 1984.

M. Burkart and T. Ellingsen. In-kind finance: A theory of trade credit. *American Economic Review*, 93(3):569–590, 2004.

F. Canto-Cuevas, M. Palacín-Sánchez, and F. Pietro. Trade credit in SMEs: A quantile regression approach. *Applied Economics Letters*, 23(13):945–948, 2016.

S. Carbó-Valverde, F. Rodríguez-Fernández, and G. F. Udell. Trade credit, the financial crisis, and SME access to finance. *Journal of Money, Credit and Banking*, 48(1):113–143, 2016.

A. M. Costello. Credit market disruptions and liquidity spillover effects in the supply chain. *Journal of Political Economy*, 128(9):3434–3468, 2020.

V. Cuñat. Trade credit: Suppliers as debt collectors and insurance providers. *The Review of Financial Studies*, 20(2):491–527, 2007.

G. W. Emery. A pure financial explanation for trade credit. *The Journal of Financial and Quantitative Analysis*, 19(3):271–285, 1984.

J. S. Ferris. A transactions theory of trade credit use. *The Quarterly Journal of Economics*, 96(2): 243–270, 1981.

R. Fisman and I. Love. Trade credit, financial intermediary development, and industry growth. *The Journal of Finance*, 58(1):353–374, 2003.

P. García-Teruel and P. Martínez-Solano. A dynamic perspective on the determinants of accounts payable. *Review of Quantitative Finance and Accounting*, 34(4):439–457, 2010a.

P. García-Teruel and P. Martínez-Solano. Determinants of trade credit: A comparative study of European SMEs. *International Small Business Journal*, 28(3):215–233, 2010b.

Y. Ge and J. Qiu. Financial development, bank discrimination and trade credit. *Journal of Banking and Finance*, 31(2):513–530, 2007.

M. Giannetti. Do better institutions mitigate agency problems?: Evidence from corporate finance choices. *Journal of Financial and Quantitative Analysis*, 38(1):185–212, 2003.

M. Giannetti, M. Burkart, and T. Ellingsen. What you sell is what you lend? Explaining trade credit contracts. *The Review of Financial Studies*, 24(4):1261–1298, 2011.

M. Hill, G. Kelly, L. Preve, and V. Sarria-Allende. Trade credit or financial credit? An international study of the choice and its influences. *Emerging Markets Finance and Trade*, 53(10):2318–2332, 2017.

J. Hyun. Trade credit behavior of Korean small and medium sized enterprises during the 1997 financial crisis. *Journal of Asian Economics*, 50(C):1–13, 2017a.

J. Hyun. Trade credit, group affiliation, and credit contraction: Evidence from the 1997 korean financial crisis. *Working paper*, 2017b.

T. Jacobson and E. Von Schedvin. Trade credit and the propagation of corporate failure: An empirical analysis. *Econometrica*, 83(4):1315–1371, 2015.

N. Kiyotaki and J. Moore. Credit cycles. *Journal of Political Economy*, 105(2):211–248, 1997.

J. Lawrenz and J. Oberndorfer. Firm size effects in trade credit supply and demand. *Journal of Banking and Finance*, 93:1–20, 2018.

I. Love and R. Zaidi. Trade credit, bank credit and financial crises. *International Review of Finance*, 10(1):125–147, 2010.

X. Mateos-Planas, G. Seccia, and B. Yavuzoglu. Endogenous trade credit and delinquency. *Working Paper*, 2020.

G. McGuinness, T. Hogan, and R. Powell. European trade credit use and SME survival. *Journal of Corporate Finance*, 49:81–103, 2018.

C. K. Ng, J. K. Smith, and R. L. Smith. Evidence on the determinants of credit terms used in interfirm trade. *The Journal of Finance*, 54(3):1109–1129, 1999.

J. Niskanen and M. Niskanen. The determinants of corporate trade credit policies in a bank-dominated financial environment: The case of Finnish small firms. *European Financial Management*, 12(1): 1–102, 2006.

A. Nurlankul and B. Yavuzoglu. Firm exit and bankruptcy behavior in Kazakhstan. *Mimeo*, 2020.

S. Oh and W. Kim. Growth opportunities and trade credit: Evidence from chinese listed firms. *Applied Economics*, 49(56):5437–5447, 2016.

M. Petersen and R. Rajan. Trade credit: Theories and evidence. *The Review of Financial Studies*, 10 (3):661–691, 1997.

M. Psillaki and K. Eleftheriou. Trade credit, bank credit, and flight to quality: Evidence from french SMEs. *Journal of Small Business Management*, 53(4):1219–1240, 2015.

R. Rajan and L. Zingales. What do we know about capital structure? some evidence from international data. *Journal of Finance*, 50(5):1421–1460, 1995.

M. Reischer. Finance-thy-neighbor trade credit origins of aggregate fluctuations. *University of Cambridge Job Market Paper*, 2019.

D. Tsuruta. Credit contagion and trade credit: Evidence from small business data in Japan. *Asian Economic Journal*, 27(4):341–367, 2013.

D. Tsuruta. Bank loan availability and trade credit for small businesses during the financial crisis. *The Quarterly Review of Economics and Finance*, 55:40–52, 2015.

X. Yang. The role of trade credit in the recent subprime financial crisis. *Journal of Economics and Business*, 63(5):517–529, 2011.