The Trade Credit Channel of Monetary Transmission in India

Saibal GHOSH[1]

[1]Department of Economic and Policy Research, Reserve Bank of India, Fort, Mumbai 400 001 [saibalghosh@ rbi.org.in]. The views expressed and the approach pursued in the paper are strictly personal.

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The issue of trade credit as a transmission channel for monetary policy has been an under-researched topic, and more so in the Indian scenario. This assumes relevance, since with the gradual deregulation and liberalization of financial institutions and markets, monetary transmission channels has come to occupy a key role.

In this context, I would like to thank Indian Institute of Banking and Finance (IIBF) for providing me an opportunity to undertake this study. I would especially like to thank, Dr. Ajit Ranade, Mr. Madan Sabnavis and Ms. Brinda Jagirdar for raising important questions that can be addressed *via* this study. Half way through the work, I was fortunate to receive the comments of two anonymous referees on certain additional areas that can be focused on as part of the study. To the best of my ability, an attempt has been made to address all possible comments and suggestions received.

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Executive Summary

Trade credit is a type of credit extended by one business to another, allowing the latter to buy goods from the former without making an immediate full payment by check or cash. In effect, it normally involves short-term delayed payment of purchases of goods and services. As observed by Cunat and Garcia-Appendini (2012), three features of trade credit are of relevance. First, suppliers lend 'in kind'; seldom there is a cash transaction. Second, in contrast to bonds or loans, trade credit is frequently not subject to specific, formal contracts between the lender and the borrower. Finally, trade credit is issued by non-financial firms.

Trade credit is economically significant from both the micro- as well as a macroeconomic perspective. Trade credit is one of the most important sources of working capital for firms, not only in advanced economies, but in India as well. According to research by Allen et al (2012), trade credit accounts for roughly 11% of the external finance for large firms in India. In the case of SMEs, this proportion is nearly double at around 20%. Globally, the extant evidence appears to suggest that, on average 19.7% of all investment financed through external sources is *via* trade credit.

Obviously, these are not insignificant numbers, highlighting clearly the role and importance of trade credit in modern market economies. Notwithstanding its importance, there is limited information on this topic for emerging economies and most certainly, for India. With the gradual liberalization of the economy and its greater sophistication, there have also been key changes in the operating framework of monetary policy. Gone are the days when a quantity variable was employed as the operating target. The widely employed multiple indicator approach - wherein a gamut of variables on both the financial and real sectors were employed to deduce robust inferences regarding the economic conditions - is gradually been phased out. Following from the consensus that

central banks need to be more focused in their ultimate objective, the recent focus has shifted towards targeting inflation as a key consideration in the conduct of monetary policy. Concerns have however been raised whether such an approach would make the Indian central bank an inflation "nutter" focussed solely on bringing down inflation to the exclusion of all else, including financial stability? As Rajan (2014) observes in this context:

> Medium term flexible inflation targeting means that the monetary policy committee focuses on inflation over the medium term, being concerned about too high, as well as too low, inflation. That means it may be willing to overlook temporary inflation spikes ... but also raise rates when sustained low interest rates and low inflation increase threats to financial stability – because a financial crisis could lead to deflation. In other words, the monetary policy committee will not put on blinkers and see just the inflation number. A number of emerging markets have adopted some form of targetting, while "non-targetters" like the Fed target inflation in all but name, including putting a numerical target to its goal of price stability.

The key point is that since the implementation and sophistication in the conduct of monetary policy is undergoing a sea change, it becomes imperative to ascertain the relevance of a separate channel - the *trade credit channel* - over and above the existing channels of monetary transmission in the Indian context.

Towards this end, the study explores whether a trade credit channel exists in India that works in the direction that is opposite to what the bank lending channel would predict.

We present our analysis over several Chapters. In Chapter I, we introduce the analysis. Contextually, we also review the various theories that have been proposed to explain trade credit. Besides, we also present the admittedly limited evidence regarding trade credit in the Indian case.

In Chapter II, we introduce an analytical framework to explore the existence of a trade credit channel in India. To ensure comprehensiveness, the analysis is executed from the standpoint of both the suppliers of as well as the users of trade credit, since an important aspect of trade credit is the two-way nature of the transaction. For our purpose, we utilize annual panel data of an extended sample of manufacturing firms from the *Prowess* database covering the period of 1993-2012. We take on board the level of firms' financial constraints by using financial constraint index that has been advocated in the literature. Thus, by splitting the firms into unconstrained and constrained ones, where the status of the firm varies over time depending on their capital structure and macroeconomic conditions, we are able to understand the behaviour of trade credit for firms with varying capital structure.

Chapter III discusses the findings, including conducting several robustness tests of the analysis.

The final Chapter collates the findings and highlights possible policy conclusions emanating from the analysis.

In addition to examining the central question regarding the existence or otherwise of a trade credit channel for India, our study also adds to the literature in a few important ways. First and foremost, we examine whether firm ownership impacts trade credit behaviour. Second, we examine whether and how the recent global financial crisis impacted the behaviour of trade credit and additionally, whether such behaviour differed across firm ownership. While there is some documentary evidence in the Indian context as to the use of trade credit by firms across ownership, a systematic analysis of these aspects is missing. Third, we examine how the behaviour of trade credit and bank credit evolved during the crisis.

Therefore, by having a comprehensive understanding of the monetary transmission process operating through trade credit, we

might uncover important policy implications in areas of finance, banking regulations, monetary policy, and economic growth. Policymakers should consider the implications of the trade credit process when introducing economic policies.

Chapter 1: Trade Credit – Theories and Evidence

After providing a motivation as to the relevance of trade credit, we review the extant literature as regards the various theories that have been propounded to explain the importance of trade credit. Subsequently, we highlight the empirical evidence. We conclude by supplementing the extant evidence by reviewing the use of trade credit in the Indian context.

I. Introduction and motivation

The issue of channels of transmission of monetary policy has engaged the attention of researchers and policymakers alike. Broadly speaking, two major channels of monetary transmission have been highlighted: the **money (or interest rate) channel** and the **credit channel**.

Money channel: According to the money channel, monetary policy affects output through the interest channel. It is argued that a fall in money supply would raise the real interest rate, thereby increasing the cost of capital. As a consequence, companies are forced to cut down on their investment. In addition, a rise in interest rates also

leads to a decline in aggregate demand as savings take precedence over investment.

Credit channel: The alternative to the money channel – the credit channel – contends that the transmission of monetary policy works through quantity. There are two views regarding how the credit channel brings about a monetary policy transmission. The former observes that it is through *broad credit channel* that money affects output, whereas the latter emphasizes the importance of *bank lending* as a channel of monetary transmission.

> **Broad credit channel:** Proponents of the broad credit channel argue that a rise in the lending rate owing to shrinkage in loan supply increases not only the interest rates of banks but also the cost of external finance for companies. As a result, the retained profits of companies are curtailed. This affects the value of collateral offered by companies and, in turn, raises the cost of external finance. As a result, borrowing becomes expensive, lowering the demand for not only bank loans but also other kinds of external finance.

Bank lending channel: While the broad credit channel operates through the demand side of credit, the bank lending channel affects bank credit on the supply side. This is especially pervasive in bank-based economies where households and small firms lack access to other forms of credit apart from bank loans. It is argued that a monetary contraction drains resources from the banking system, as a result of which banks have to readjust their portfolio by reducing their supply of loans, given the imperfect substitutability between loans and other assets. Loan supply being reduced, banks increase lending rate or reduce their loans. Therefore, a reduction in the supply of loans leads to a rise in the external finance premium. As a result, credit allocated to bank-dependent borrowers is curtailed, in turn, leading them to cut back spending. Applied work has searched for the existence of a bank lending channel either by examining the differential impact of monetary policy impulses on different categories of banks (e.g., size, liquidity, capitalization, etc) or alternately, highlighting the differentiated access to bank loans on various types of firms.

II. Empirical Evidence

The quest for the existence of a broad credit channel has focused on the behaviour of different categories of firms during periods following a tight monetary policy. In fact, studies have focused on firms using criteria such as size, age, leverage, growth prospects and asset tangibility, among others. Several of these studies reported a strong association between financial variables and the activity of financially constrained firms (Fazzari *et al.*, 1988; Gertler and Gilchrist, 1993; Kashyap *et al.*, 1994; Carpenter *et al.*, 1998; Guariglia, 1999). On the other hand, there have also been studies that observed that the sensitivity of investment to cash flow is not so significant (Bond and Cummins, 2001) or for that matter, quite limited for firms with financing constraints (Kaplan and Zingales, 1997; Cleary, 1999).

Even in the case of India, there has been a substantial amount of research to test the various channels of monetary transmission, with admittedly mixed evidence. Yet authors, who have focused primarily on firms' investment behaviour, have observed that the sensitivity of investment to financial variables is in fact weaker for firms likely to

face particularly strong financing constraints [Kaplan and Zingales, 1997; Cleary, 1999]. The latter findings cast a cloud over the existence and the actual strength of a credit channel.

The contrasting results for the existence of a distinct bank-lending channel called for a closer examination of the borrowing behaviour of firms. In addition to borrowing from financial institutions, firms may be financed by their suppliers.

III. Trade credit

One argument which has been advanced to explain why some firms exhibit a low sensitivity of investment to financial variables is that, particularly during periods when bank lending is constrained, or more generally, when there is a high premium on external finance, firms make use of another source of finance to overcome liquidity shortages, namely trade credit. Simply defined, trade credit (i.e. accounts payable) is the amount of short-term loans provided by suppliers to their customers upon purchase of their products (Cunat and Garcia-Appendini, 2012). It is automatically created when the customers delay payment of their bills to the suppliers. An important assumption behind the idea that the trade-credit channel may offset

the impact of a monetary tightening is that the shock that raises the external finance premium for firms dependent on bank finance does not also raise the cost of finance for firms providing the trade credit, or at least does not raise it by as much.

Trade credit is typically more expensive than bank credit especially when customers do not use the early payment discount. Yet, according to Berger and Udell (1998), in 1993, roughly 16% of the total assets of small US businesses were funded by trade credit. Similarly, Rajan and Zingales (1995) document that in 1991, funds loaned to customers represented 17.8% of total assets for US firms, 22% for UK firms, and more than 25% for European economies such as Italy, France, and Germany. Thereafter Kohler *et al.* (2000) document that 55% of the total short-term credit received by UK firms during the period 1983-95 was in the form of trade credit. A pictorial representation is outlined in Chart I.1.

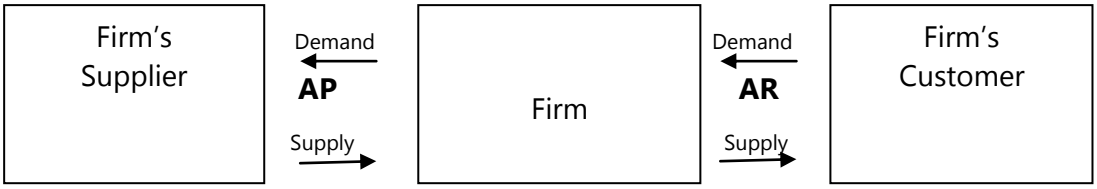


Chart I.1: Trade credit relationships. Trade credit extended by firm to its suppliers will appear as accounts payable (AP), whereas trade credit extended by firm to its customers will appear as accounts receivable (AR) [Source: Rajan and Zingales, 1997]

It is therefore possible, that even during periods of tight monetary policy when bank loans are not forthcoming, financially constrained firms are not compelled to reduce their investment to a significant extent, as they can finance it with trade credit.

As a result, trade credit issuance can increase during periods of contractionary monetary policy because the risks of issuing trade credit are lower than issuing bank loans. This is because suppliers can closely monitor their clients during the normal course of business and can threaten to cut-off future supplies to enforce repayment; additionally, they can easily repossess goods in case of failed payment (Petersen and Rajan, 1997; Kohler *et al.*, 2000). This observation was first made by Meltzer in the 1960s, when he remarked:

> When money was tightened, firms with relatively large cash balances increased the average length of time for which credit was extended. And this extension of trade credit appears to have favoured those firms against whom credit rationing is said to discriminate. (1960: pp. 429)

The presence of a trade credit channel could therefore dampen the relationship between firms' real activities and traditionally used financial variables, such as the coverage ratio and cash flow, and in general, could weaken the credit channel of transmission of monetary policy.

Against the backdrop of the above discussion, the present essay investigates the role and relevance of trade credit, focusing on India as a case study. India provides a compelling case among emerging markets to study this aspect for several reasons. First, India is one of the largest and fastest growing developing countries and our findings may be representative of the role of trade credit in other developing economies. Second, the importance of trade credit could generally be more important in developing nations because public capital markets are typically underdeveloped, legal and regulatory infrastructures to protect creditors are often inadequate, in turn making trade credit an ideal source of funds for firms (Wilner, 2000).

Evidence presented by Love and Martinez Peria (2005) for the period 1995-2003 suggested no significant differences in trade credit (proxied by the ratio of payables to total asset) across firm size and age. However, across ownership, foreign firms were observed to use more trade credit as compared to private Indian or government-owned firms. This, the authors attributed, could be owing to trade credit being made available to foreign firms by their parents. A clear finding emanating from the analysis was the significant use of trade credit by firms across ownership and industry categories. Recent evidence for India adduced by Allen *et al.* (2012) for the period 2001-05 provides strong evidence in support of this contention: trade credit, on average, accounted for 11% of total external finance for large firms and this proportion was significantly higher for SMEs (Table I.1).

Table I.1: Financing sources for Indian manufacturing firms 2001-05
(as percent of total funding)

	Internal	**External**				**Median asset** (Rs. mn)
		Market	Bank/ FIs	Non market, non bank	Trade credit/ Non market, non bank	
All firms	46.6	19.3	16.9	17.2	11.2	700
Listed firms	58.3	14.6	12.3	14.8	12.0	2230
Unlisted firms	34.5	24.1	21.7	19.7	10.4	510
SMEs	15.1	38.6	21.6	24.7	15.8	91
Listed SMEs	39.5	38.2	10.4	11.9	6.9	690
Unlisted SMEs	11.2	38.7	23.4	26.7	17.3	86

Internal=Net income after dividend+depreciation+provisions
External(market) = Equity and debt from capital markets
External (Banks/ FIs) = debt/ loans from banks and financial institutions
Non market, non bank = Equity/ debt raised from private sources, including group companies, promoters, trade credit and other liabilities
Source: Allen *et al.* (2012)

Against the backdrop of the above discussion, the reminder of the analysis is structured as follows. Chapter II provides an overview of the relevant literature, focusing on both the theoretical developments as well as the empirical advances in the analysis of trade credit. Contextually, we also highlight the research undertaken in India on the relevance of trade credit. Chapter III details the estimation strategy, focusing on both the supply (i.e., accounts receivables) as well as the demand for (i.e., accounts payable) trade credit. In this context, the Chapter also discusses the data and descriptive statistics,

including some broad trends in the behaviour of credit, which could provide useful leads for the ensuing empirical analysis.

Chapter IV describes the empirical results. These results are categorised under several heads. First, we examine the possible existence of a trade credit channel of monetary transmission, separately for both the supply of as well as the demand for trade credit as well as *net* trade credit. Second, we explore whether and how the behaviour of trade credit differs across firm categories. Third, we analyse the role of the recent financial crisis in impacting the behaviour of trade credit. In this context and following recent advances in the literature (Huang *et al.*, 2011; Yang, 2011), we also address whether there has been any possible substitution between trade credit and bank credit. The final Chapter identifies the policy conclusions that emanate from the analysis and gathers the concluding remarks.

IV.Literature Overview

We begin our literature overview by a discussion on the extant literature by analysing the trade credit terms and the theoretical

literature on why trade credit has assumed prominence. Subsequently, we examine the empirical literature on trade credit and monetary transmission. We conclude our discussion of this section by examining the Indian evidence.

IV.1 Trade Credit Terms

There are two main types of trade credit agreement. In the first type - the *net term* - the supplier requires full payment within a certain period after the goods are delivered. The length of the period is usually specified in the contract. For instance, a 'net 15' agreement means that the payment is due within 15 days of the product delivery, failing which the seller has the right to charge a penalty for late payment.

The second type of trade credit agreement is called *two-part term*. In this contract, the supplier may offer a discount if payment is made within a specified period, which is typically shorter than the net payment period. For example, a "2/15 net 30" agreement would provide the buyer a discount of 2% if payment is realized by the 15th day following delivery. If the buyer fails to take advantage of the

discount, s/he still has 15 additional days to pay the full price of the goods without being in default – the net period has a total duration of 30 days. Finally, as with net terms, suppliers could charge penalties if the buyer still fails to meet the payment after the net terms expired. A graphical exposition of these two contract terms is provided in Chart I.2.

Chart I.2 [A]: *Net terms*

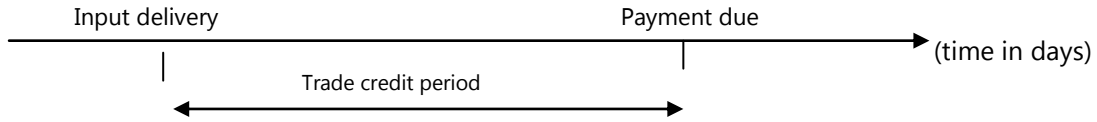
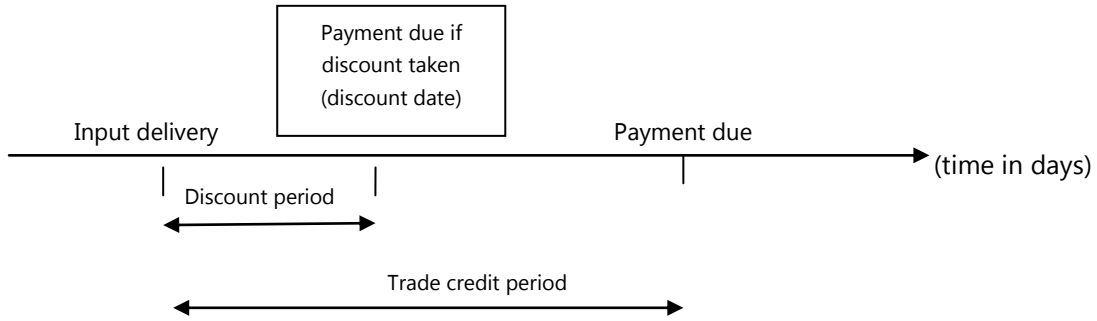


Chart I.2 [B]: *Two part terms*



IV.2 Theories of Trade Credit

The literature on the factors affecting trade credit can be classified into research that focuses on real operations and those that focus on financial aspects. The first line of research includes trade credit as a motivation for transactions cost minimization, price discrimination and quality guarantees. The second line of thinking, the financial approach, suggests that trade credit reflects arbitrage.

Transactions Cost Theories: A first explanation for the use of trade credit by both suppliers and buyers centers around cost reduction motives (Ferris, 1981; Schwartz, 1974). The argument is that both suppliers and customers will engage in trade credit because doing so will lead to cost reduction for both trading parties. One of the factors that may encourage trade credit use is when transactions between the seller and the buyer are frequent (see Petersen and Rajan, 1997; Summers and Wilson, 2003; Wilson and Summers, 2002).

From the supplier's perspective, trade credit provision may lead to cost reduction in two ways. First, by allowing a frequent buyer to accumulate invoices a supplier may be relieved from the trouble and cost of writing an invoice for each transaction. Second, suppliers will

be able to transfer goods to the customer regularly and hence reduce the problem of inadequate storage and storage costs (Petersen and Rajan, 1997).

The related argument to unpredictable delivery and the consequences for trade credit demand focuses on the number of suppliers from whom the customer buys the product. It is argued that if a customer buys from many suppliers, the uncertainty of the delivery date tends to be higher and as a result, the demand for trade credit increases (Summers and Wilson, 2003). The idea is that by the time suppliers deliver the goods or by the time the need for new stock arises, the customer may have no cash due to a mismatch between the moment they will receive cash and the moment they have to pay their suppliers. The mismatch of cash flow may occur in two ways. First, it may occur when a customer has used the cash generated from sales to buy other goods, expecting that by the time the need arise to replenish their stock, they will have received the money. Second, a mismatch may occur between the moment the buyer receives payments on trade credit they have extended to their own customers and the moment they have to pay for purchases from

suppliers. In case of such a mismatch, buyers may have more demand for trade credit (Fafchamps, 2000; Paul and Wilson, 2007; Paul, 2008).

Another aspect that reflects the cost reduction motive in using trade credit is related to the volume of the transactions. Both suppliers and buyers are motivated to engage in trade credit in order to increase the volume of the transactions, which in turn leads to cost reduction. From the suppliers' point of view, if trade credit is offered, the customer may be stimulated to increase the quantity they purchase per transaction (Chung and Liao, 2006). This reduces the need for large storage space and storage costs for the supplier (Petersen and Rajan, 1997). Thus, suppliers will offer trade credit to encourage customers to buy large quantities and require payment on delivery for customers who buy small quantities

Price Discrimination: It is possible that trade credit is offered even if the supplier does not have a financing advantage, because credit may be used to price discriminate (Mian and Smith, 1992).

Firms with a high margin between sales and variable costs have a strong incentive to make additional sales without cutting the price to existing customers. Since their profit on the next unit is higher, they would be willing to incur a positive cost to sell the additional unit, provided it does not affect previous sales. As a result, creditworthy customers, who find such trade credit costly, will repay it quickly whereas risky customers will find it worthwhile to borrow since trade credit may still be cheaper than other competing financing sources.

Wilner (2000) argues in another version of this theory that suppliers may have a long-term interest in the survival of the buyer. This might be true when the supplier has no other available substitutes for the customer. Therefore, suppliers might want to keep their customers in business by providing short-term finance (Huang, 2004).

Marketing Theory: Suppliers may offer trade credit to achieve marketing targets. More specifically, trade credit can enable suppliers to create long-term relationships with customers (Wilner, 2000), which could ensure long-term benefits through future sales (Nadiri, 1969). A related marketing argument concerns the observation that firms may

need to establish their reputation *vis-à-vis* their potential customer base. In the literature, reputation building has been linked to the age of the firm. In this case, younger firms are expected to provide more trade credit in order to assure quality, build up a reputation among potential customers, and consequently increase their market share (Summers and Wilson, 2003). On the other hand, larger and older firms will offer less trade credit because they have already established their reputation. In this case, their reputation signals to customers that they offer better quality (Long *et al.*, 1993; Deloof and Jegers, 1996; Van Horen, 2005, 2007).

Another argument related to the marketing theory emphasizes the importance of competitive pressure in the market as a reason for offering trade credit (Pike et al, 2005). In particular, suppliers may offer more trade credit if the market is competitive (Fisman and Raturi, 2004). In an environment of market competitiveness, customers may switch easily if there are no incentives to stick with a certain supplier. Providing trade credit may be one instrument to retain customers (Fisman and Raturi, 2004; Van Horen, 2005).

Financing Theory: From the suppliers' perspective, the financing theory suggests that firms that obtain bank loans may offer more trade credit to their own customers (Schwartz, 1974). A similar argument was also advanced by Deloof and Van Overfelt (2011). The authors argue that firms having bank loans will give trade credit to financially constrained firms. Suppliers may offer trade credit to customers who find it difficult to get bank loans if they expect benefits through increased sales to these financially constrained customers (Nadiri, 1969).

From the customers' point of view, the financing theory suggests that firms that do not have access to bank loans will have a higher demand for trade credit, since it may be an important source of short-term finance (Petersen and Rajan, 1997; Nielsen, 2002; Giannetti *et al.*, 2008). If, on the other hand, a customer has access to bank loans, this will curtail the demand for trade credit (Reber and Carole, 2003).

Some studies employ the age and size of the buying firms (customers) to measure access to bank loans. In this case, it is argued that younger firms lack the reputation to get a bank loan as

compared to older firms. Since younger firms are unable to get bank loans they are expected to be more capital-constrained (Petersen and Rajan, 1997). These firms are expected to buy more on trade credit, whereas when they get older they will have built up a relationship with banks, which facilitates their access to bank loans (Mateut and Mizen, 2003) and hence reduce their use of trade credit. In a similar vein, small firms (customers) are expected to be more credit-constrained, which means they may need more trade credit as a source of short-term finance (Chant and Walker, 1988). In contrast, large firms have less need for trade credit since they can easily obtain credit from banks (Danielson and Scott, 2004).

Financing Advantage Theory: The financing advantage theory suggests that suppliers of goods/services have more advantages when offering trade credit to customers than when banks provide loans to their borrowers (see Schwartz, 1974; Nielsen, 2002). These, according to Petersen and Rajan (1997) include advantages in evaluating the creditworthiness of the customer (information advantage), in monitoring and enforcing credit repayment

(monitoring advantage) and finally, in liquidating the goods in case of buyer default (liquidation advantage).

First, suppliers can acquire more and cheaper information about the buyer than financial institutions. This information advantage may stem from a number of reasons. Suppliers can visit the premises of the buyer more often than financial institutions, and buyers who take advantage of early payment discounts may give suppliers some signal of the creditworthiness of the buyer. In addition, the timing and size of the orders give some information about the condition and performance of the buyer. Since suppliers obtain all this information during the normal course of business operations, they do not have to devote additional effort while financial institutions must do so. This superior information of the supplier to financial institutions is supported by Smith (1987), Brennan *et al.* (1988), Biais and Gollier (1997) and Jain (2001).

Second, suppliers can threaten to cut future orders to the buyer in order to insure repayment of the credit. This will be more credible if the supplier is the main source to the buyer or if the buyer's credit

account is a small portion of the supplier's sales (Cunat, 2007). Johnson *et al.* (2002) find evidence that firms are more likely to switch suppliers when buying standardized off-the shelf goods. When terminating the relationship is costly, customers are less likely to default. Furthermore, Burkart and Ellingsen (2004) argue that the supplier's enforcing advantage applies exclusively to input transactions since cash is much more easily diverted than inputs. Giannetti *et al.* (2011) argue that due to the higher switching cost of differentiated good producers, buyers of differentiated goods are less likely to default.

Third, in the case of the default of the buyer, the supplier can seize the goods and resell the goods more easily than financial institutions can, as the supplier has a network in the industry (Frank and Maksimovic, 2004). Mian and Smith (1992) argue that the more durable the goods supplied, the better collateral the buyer can provide and, as a result, the more trade credit is offered by the supplier. Giannetti *et al.* (2011) also propose that this comparative advantage of the suppliers is related to differentiated goods in particular, but the differentiated goods should not be tailored to the

needs of a unique customer. Ng *et al.* (1999) also point out that the value of goods differs between firms and financial institutions: Products may have more collateral value for suppliers than banks and, thus, the supplier would be willing to offer cheaper credit than banks due to the reduction of credit risk.

Table I.2 provides a snapshot of some of the major studies on the determinants of trade credit, both on the demand and supply sides.

Table I.2: Determinants of Trade Credit

Panel A: Trade credit supply	**Related theory**	**Positive relation**	**Negative relation**
Access to bank loans	Financing theory	**Petersen and Rajan (1997)**; **Van Horen (2005); Giannetti et al (2008)**	Summers and Wilson (2003)
Frequency of transactions	Transactions cost theory	**Johnson et al (2002)**; Wilson and Summers (2002); Summers and Wilson (2003); **Fisman and Raturi (2004)**	
Length of relationship	Financing advantage theory/ market power theory	**McMillan and Woodruff (1999)**; **Johnson et al (2002)**; **Fisman (2003); Fisman and Raturi (2004); Klapper et al (2011)**	
Competition	Marketing theory	Wilson and Summers (2002); **Cheng and Pike (2003**); **Fisman (2003); Fisman and Raturi (2004)**	**McMillan and Woodruff (1999); Johnson et al (2002)**
Firm age	Financing/ marketing theory	**Petersen and Rajan (1997); Ng *et al.* (1999)**; Wilson and Summers (2003); Summers and Wilson (2003)	McMillan and Woodruff (1999); **Giannetti et al (2008)**
Firm size	Financing theory	**Petersen and Rajan (1997)**; Wilson and Summers (2002); Summers and Wilson (2003); **Van Horen (2005)**; **Delannay and Weill (2004); Giannetti *et al.* (2008)**	McMillan and Woodruff (1999);
Panel B: Trade credit demand	**Related theory**	**Positive relation**	**Negative relation**
Access to bank loans	Financing theory	**Chant and Walker (1998)**; McMillan and Woodruff (1999); **Fisman and Raturi (2004)**	Petersen and Rajan (1997); Danielson and Scott (2004); **Matuet et al (2006)**; **Rodriguez (2006); Giannetti *et al.* (2008)**
Frequency of transactions	Transactions cost theory	Aaronson et al (2004)	Fisman (2003)
Volume of transactions	Transactions cost theory	**Elliehausen and Wolken (1993); Summers and Wilson (2002)**; Paul (2008)	
Length of relationship	Financing advantage theory	**McMillan and Woodruff (1999); Aaronson et al (2004); Biggs and Shah (2006); Fisman (2003)**	
Firm size	Financing theory	**Elliehausen and Wolken (1993)**; Petersen and Rajan (1997); **Isakson (2004)**; **Summers and Wilson (2002)**; **Danielson and Scott (2004)**; **Giannetti *et al.* (2008)**	McMillan and Woodruff (1999); **Atanasova and Wilson (2003)**; **Matuet and Mizen (2003)**; **Delannay and Weill (2004); Rodriguez (2006)**
Firm age	Financing theory	Petersen and Rajan (1997); **Isaksson (2002)**; Danielson and Scott (2004); **Biggs and Shah (2006)**; **Rodriguez (2006); Giannetti *et al.* (2008)**	Elliehausen and Wolken (1993); McMillan and Woodruff (1999); **Summers and Wilson (2002)**; **Matuet and Mizen (2003)**; **Aaronson et al (2004)**; Huyghebaert (2006);
Number of suppliers	Transactions cost theory	**Giannetti *et al.* (2008)**	Summers and Wilson (2002)

Studies in bold are those reporting significant relation between trade credit and the concerned variable (or its proxy)
Source: Author's findings

Having discussed the various theories of trade credit, we turn to a discussion of the empirical evidence. For purposes of convenience, we classify these studies into two broad categories: those pertaining to developed/ advanced economies and second, those pertaining to emerging market and developing economies (EMDEs).

While there has been a significant volume of research on the determinants of trade credit, there is admittedly limited research on the trade credit channel of monetary transmission. More specifically, the complicated nature of trade credit driven by the twin motives of *transaction motive* versus a *financing motive* makes empirical analysis a challenging task. The transaction motive serves to facilitate the exchange of goods and represents the time-invariant aspect of trade credit. The financing motive, on the other hand, represents an alternative source of financing to bank credit, which may vary over time according to credit market conditions.

Meltzer (1960) first introduced the idea of the trade credit channel. Using data on U.S. manufacturing firms, the evidence indicated that in

response to a contractionary monetary policy, firms with relatively large cash balances increased the length of time they extend credit, and especially to those firms that are exposed to credit rationing.

Following from this line of research, several authors have proceeded to investigate the relevance of the trade credit channel. For example, Brechling and Lipsey (1963) found similar results in their study of 75 British firms. The firms reacted to tight money by lengthening their credit periods, leading to substantial changes in net credit.

Thereafter, Schwartz (1974) observed that firms with relatively low costs of financing borrow more from the banks during contractionary periods to extend trade credit to the downstream firms that have high financing costs and difficulties in accessing bank loans. Biais and Gollier (1997), Wilner (2000), Burkart and Ellingsen (2004) and Mateut *et al.* (2006) introduced theoretical frameworks supporting the trade credit channel.

According to De Blasio (2003), monetary policy has effects on the real economy by reducing firms' financial resources. In particular, during a

tight monetary policy, firms with financially constraints will cut back on their inventory holdings. Moreover, since it is difficult for these firms to obtain bank loans, they will increase the use of the more expensive trade credit (Singleton *et al.*, 1999; Mateut *et al.*, 2006).

In contrast to theoretical papers on the trade credit channel, there are several empirical papers, many of which find support for its existence. Petersen and Rajan (1997), using cross sectional data for small firms, found that bank credit rationed firms substitute trade credit for bank borrowing. Concluding the paper, the authors remarked:

> The role of financially healthy suppliers in intermediating finance to growing firms as well as the implications for the transmission of monetary policy deserves further investigation (pp.689-90).

Subsequently, research has emanated that examines the trade credit channel. Calomiris et al (1995) found that US firms issuing commercial paper offer more trade credit. Kohler *et al.* (2000) indicates the existence of a trade credit channel that mitigates the effect of the bank credit channel of monetary policy transmission. Nilsen (2002) argues that the dependence of firms on trade credit increases during economic downturns and monetary contractions if they do not have

access to markets for traded long-term securities or commercial paper. Using balance sheet data for UK manufacturing firms, Mateut and Mizen (2002) indicate that while bank lending typically declines in periods of tight monetary policy, trade credit issuance increases which smoothes out the impact of the policy.

Atanasova and Wilson (2003), using information on UK firms, find evidence that the proportion of bank-credit constrained firms increases during the periods of tighter monetary policy and these firms substitute away from bank credit to trade credit. Choi and Kim (2005) show that both accounts payable and receivable increase with tighter monetary policy. Mateut *et al.* (2006), using panel data for UK manufacturing firms, find supporting evidence for the compensating effect of trade credit in the transmission of monetary policy.

Guariglia and Matuet (2006), looking at how trade credit actually relates to firms' inventory investment, find evidence for the trade credit channel for a panel of UK firms over the period of 1981-2000. Demiroglu *et al.* (2012) explore how bank lending standards are related to the availability of bank lines of credit for private and

comparable public firms and argue that private firms without lines of credit use more trade credit when bank lending standards are tight.

In contrast to studies for advanced economies, research on the trade credit channel for emerging market and developing economies (EMDEs) is limited, although on-the-ground evidence appears to suggest its widespread use, even in the area of microfinance (Box I.1). Love et. al (2007) explored the role of trade credit during the financial crisis for emerging countries (comprising Indonesia, Malaysia, Mexico, Philippines and South Korea). They found that firms with access to bank loans provided more trade credit after the financial crisis, but when the crisis deepened, those firms could not continue the role of reallocating bank loans due to the severe credit crunch.

More recently, Ozlu and Yalcin (2012) report the existence of a trade credit channel for Turkish manufacturing firms. In terms of the Chinese market, the evidence suggests that the bank lending channel still play a major role in promoting the industry's higher growth and reinvestment, with no strong evidence for the existence of trade credit channel (Cull *et al.*, 2009). This complementary hypothesis has

also been observed in advanced economies, most notably the US (Alphonse *et al.*, 2006) and Japan (Ono, 2011), respectively.

Box I.1: Use of trade credit in microfinance – Evidence from EMDEs

While it seems there is very little widespread notice of and no comprehensive studies on the strength of trade credit in microfinance, it is possible to summarize available evidence across countries and regions to demonstrate its pervasive role.

Latin America*:* In 2001, 17% of Nicaraguan homes had store credit, the number one type of credit named by survey respondents, representing a growth of 6% from 1998 in a climate where other forms of credit did not grow.

In 2002, microfinance experts in Brazil blamed the underdevelopment of their microfinance industry in large part on store credit, "a major indirect substitute to microfinance," and supplier credit, "used extensively across businesses of all sizes. . . [and] one of the most commonly used forms of financial services among microentrepreneurs."

Stores often state payment terms for installment credit in advertisements, and most accept post-dated checks as a form of store credit (post-dated checks were used in 36% of all transactions in April 1998).

The success of two specific trade credit programs in Latin America also demonstrated its acceptance: Casas Bahia in Brazil and Cemex in Mexico. Casas Bahia is the largest retail chain in Brazil, offering electronics, appliances, and furniture. Its business strategy was premised around the strategy that the only thing keeping the poor from buying goods was financing and today 90% of sales volume is financed. In fact, other consumer goods companies in Brazil have been forced to offer financing options to compete.

Cemex is the largest cement company in Mexico and the third largest in the world. In response to the unmet demand of poor Mexican women for opportunities to save for housing, Cemex created the Patrimonio Hoy program which combines credit (in the

form of concrete) and savings. More than 70,000 Mexican families have taken part in Patrimonio Hoy.

Africa*:* In 1994 in Kenya, 38% of small firms and 6% of micro firms reported using credit from suppliers, in comparison with 58% and 12%, respectively, offering credit to customers, and considerably fewer, 13% and 2%, for bank loans.

A 1996 study investigating discrimination in lending in South Africa reviewed the importance of "hire/purchase" lending. It found credit agreements between consumers and retailers of consumer durables were the second most common formal financial product used by black South Africans.

In Tanzania, there is robust evidence of widespread use of trade credit by rice retailers. Most such retailers are small and do not have access to external funds and as a result, nearly 70% of transactions are trade credit based. Additionally, since large quantities take time to be sold off completely, the period of trade credit also varies markedly, ranging from less than seven days to 20 days.

In 2003, 16% of the residents of Swaziland had store credit accounts, the financial product second only to membership in a savings club, which 19.5% claimed as a current financial product. Store credit was the most common financial product for other members of the respondents' households (5.3%) and the most common past financial product (16.9%).

India*:* In a 2000 study of economic growth and poverty in the Indian town of Visakhapatnam, it was found that the poor had begun to gain access to consumer durables in large numbers due to the development of an informal hire purchase industry. The movement was so powerful that the authors noted "the importance of this hire purchase credit system may represent a 'reinvention' of the traditional debt system." In India as a whole, declining costs of commercial credit led to a 13.6% increase from 2000-2003. This activity has been heavily skewed towards the South and West regions of the country, which together account for 70-80% of the financed consumer durables purchases.

On the other hand, there is also evidence that runs contrary to the existence of a trade credit channel. Oliner and Rudebush (1996) and

Gertler and Gilchrist (1993) do not find any support for Meltzer's idea over 1974-1991 for the US. Marotta (1997) also does not find evidence of a Meltzer effect when conducting research on an averaged panel of Italian firms. Cook (1999) points out a complementary relationship between bank credit and trade credit, using a data set of Russian companies during a period of extreme financial chaos. De Blasio (2005) uses Italian firm-level data and finds some weak evidence of a trade credit channel. Alphonso *et al.* (2006) find evidence supporting the complementary hypothesis of trade credit.

Trade Credit and Crisis: There have been studies that argue that firms may still demand more trade credit even if they have access to bank loans (Chant and Walker, 1988). These studies consider trade credit and bank loan as complementary source of finance. The argument that a firm may take more trade credit even if it has access to bank credit may be that the firm use bank credit for financing business expansion such as buying assets and trade credit to finance the purchase of goods. In the case of Russia, Cook (1999) presents

evidence which suggests a complementary relationship between trade credit and bank credit.

Of late, several studies have specifically explored the impact of financial crisis on trade credit. Employing U.S. data, Appendini and Garriga (2011) found evidence that firms with large levels of pre-crisis liquidity extended more trade credit during the crisis. They also found that financially constrained firms utilized (received) more trade credit. Around the same time, employing quarterly *Compustat* data from 2005-09, Huang (2011) found that bank credit and accounts payable to be simultaneously determined and negatively related, whereas accounts receivable and bank loans are positively related. This meant a substitute/ complementary effect between bank credit and accounts payable/ receivable. More recently, Carbo-Valverde *et al.* (2014), using panel data of Spanish small and medium sized enterprises (SME), find that substitution between bank loans and trade credit is conditional on the level of financing constraints, and is more intense during a financial crisis.

V. Cross-country evidence

By now, there is some amount of cross-country evidence as regards the use of trade credit across regions and countries.

Empirical evidence for the EU economies appears to indicate that the terms and common payment practices vary considerably across countries (Table I.3).

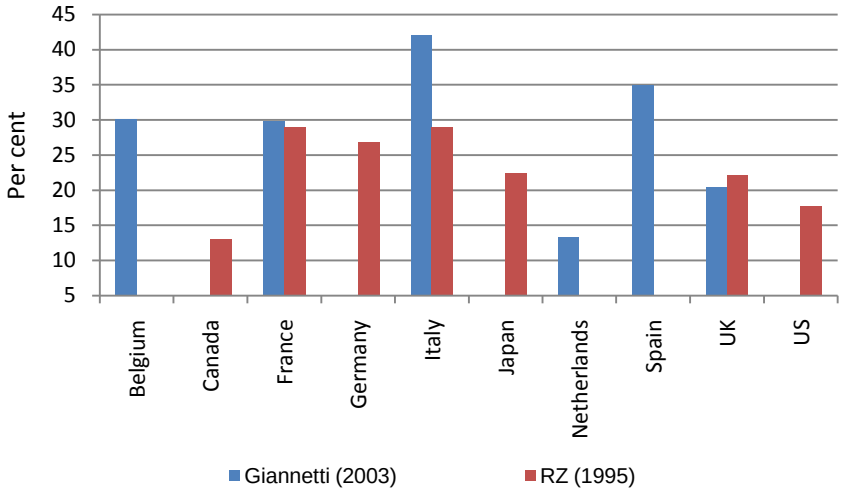
Table I.3: Trade Credit in EU Countries

Country	Credit period	Days of delay	% payment within 15 days after agreed date (days)
Belgium	45-90	17	53
France	60-90	16	57.9
Germany	30-60	11	79
Italy	60-120	17	62.1
Netherlands	25-40	17	49.8
Portugal	60-90	..	..
Spain	60-90	..	..
United Kingdom	30-60	15	60.3

Source: Matuet (2005)

Cross-country information (Chart I.3) indicates that, on average, trade credit represents between 12-40% of total assets for firms in the developed world (Rajan and Zingales RZ, 1995; Giannetti, 2003).

Chart I.3: Trade credit to total asset (%)



Evidence proffered by Beck *et al.* (2008) shows that, on average 19.7% of all investment financed through external sources is *via* trade credit. Third, although there has been considerable work in the Indian context on the channels of monetary transmission [Al Mashat, 2003; RBI, 2005; Pandit *et al.*, 2006; Bhaumik *et al.*, 2011; RBI, 2011], there is admittedly limited evidence on the trade credit channel of monetary transmission.

Given the importance of trade credit in the Indian context as observed earlier, it remains a moot question as to how far the trade credit channel is relevant and operative in the Indian context and calls for careful empirical research. Finally, India is one of the few emerging

economies for whom a comprehensive and reliable database on trade credit is publicly available. The time series, cross-sectional variation in the database makes it amenable to rigorous statistical analysis.

The aforesaid discussion suggests that most studies on trade credit pertain to advanced or emerging economies. Limited research in this count is available for low income countries (LIC). The Box items provide an overview of the limited literature on the relevance of trade credit for low income countries (Box I.2).

Box I.2: Trade credit in low income countries

In an early study, Biggs *et al* (1994) focused on enterprise finance in Kenya. Their findings appear to suggest that the use of trade credit increases with firm size. As compared to this, advance payments by clients are quite pervasive among small firms.

In a later research, Biggs *et al* (1996) sought to identify the determinants of access to trade credit using the Kenyan Regional Programme of Enterprise Development (RPED) data. Within a Probit framework, they find that access to trade credit for firms increases with size.

Cuevas *et al* (1993) study enterprise finance in Ghana. The basic findings of their study is that trade credit is the most important source of external financing for small firms.

In the case of Zimbabwean firms, Fafchamps *et al* (1995) found that larger firms were more likely to obtain trade credit on the first purchase, suggesting that reputation is used as a screening device.

Fafchamps (1997) deals with trade credit in Zimbabwean manufacturing using both RPED and case study data. Their research lends credence to previous findings: large firms are more likely to

obtain trade credit. According to the authors, the reason for use of trade credit lies in its ability to enable firms to better manage their cash flows.

Fafchamps (2000) focuses on the importance of ethnicity for trade credit in Zimbabwe and Kenya. Their multivariate analysis suggests that ethnicity is an important obstacle for access to trade credit by firms. They also report that trade credit is more prevalent in Zimbabwe than in Kenya, which is explained by the existence of a formal credit reference bureau in Zimbabwe.

Focusing on the relevance of trade credit for the rice market in Tanzania, Kihanga (2010) finds that it is the small firms that are more likely to use trade credit, since it is difficult for them to gain access to bank credit.

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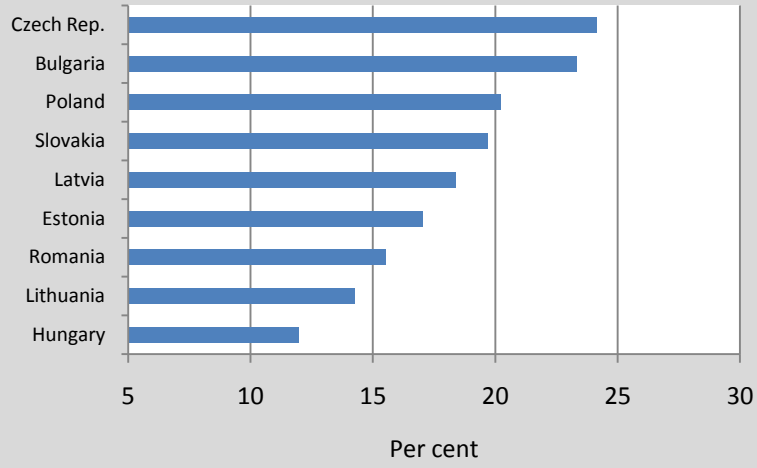
The use of trade credit is not limited to low income countries alone. There is also evidence of the extensive use of trade credit in transition economies as well (Box I.3).

Box I.3: Trade credit in transition economies

Unlike EMDEs, transition economies are typically characterized by the limited access to bank credit (external finance) for firms. A second feature concerns the risk-averse behavior of banks, as evidenced from the fact that banks mobilize more funds than they lend (Riess *et al.*, 2004). This needs to be weighed against the fact that the share of equity in the financial structure of companies is quite high, ranging from 36% in the case of Poland to 48% in case of Croatia (Delannay and Weill, 2004).



Notwithstanding the high equity and low external (bank) finance, trade credit (accounts payables) account for a significant share of total balance sheets. During 1999-2000, the share of trade credit in total balance sheet was the highest in the Czech Republic.

Several reasons have been advanced for this phenomenon. The first is the inadequately developed financial systems, which makes trade credit an important alternative source of finance. The second can be traced to history, wherein the vast enterprise of inter-enterprise relationships during the Communist era and personal relations between firm managers makes trade credit an attractive option

(Fisman and Love, 2003). The third reason, following Kornai (1980), is the presence of soft budget constraint (i.e., the company survives even though it makes persistent losses) because the government did not have the resources to bail out unprofitable companies and therefore, trade credit is used to prevent bankruptcy of otherwise unprofitable companies.

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The use of trade credit is not limited to advanced or transition economies alone. Even in case of Latin America, there is evidence to suggest extensive use of trade credit, although the proportion varies across industries (Table I.4). For example, use of trade credit dominates the construction sector in most countries; its use in manufacturing and mining are quite limited.

Table I.4: Use of Trade Credit in Latin America (percent)
(averages over 1994-2009, all firms)

Sector	Argentina		Brazil		Mexico	
	AP/Sales	AR/Sales	AP/Sales	AR/Sales	AP/Sales	AR/Sales
Management of companies and enterprises	20.3	20.3	7.4	16.5	..	..
Agriculture, forestry etc.	7.9	16.8	9.5	10.1	4.9	3.7
Retail trade	20.7	6.8	12.2	10.8	14.4	8.2
Wholesale trade	..	..	5.6	10.9	18.8	16.8
Construction	13.9	19.8	6.5	64.0	15.2	39.1
Manufacturing	13.2	16.2	7.1	12.1	7.5	9.5
Mining	13.7	12.3	6.0	5.7	7.3	9.4
Transportation	28.2	26.3	5.7	11.3	4.5	10.5

Source: Sheng *et al* (2014)

In the case of Canada, Cunningham (2004) utilised a sample of over 25000 firms and suggested that trade credit - bank credit substitution works quite well for medium-wealth firms, while low-wealth firms still use trade credit.

More recently, Guariglia and Mateut (2011) categorised Chinese firms into those that are politically affiliated and those that are not in order to study their trade credit behaviour. Utilising a database of more than 70000 Chinese firms for the period 2000-07, they uncovered evidence that politically affiliated firms are able to obtain more trade credit than non-affiliated ones; moreover, non-affiliated private firms are more likely to be constrained in external financing and in turn are more sensitive to trade credit extension. Thus, their findings show

that politically affiliated firms redistribute bank loans for trade credit. Meanwhile, Guariglia *et al.* (2011) studied a large panel of Chinese firms over the period 2000-2005 and concluded that the growth of state-owned enterprises (SOEs) is not affected by cash flow, whereas privately owned firms encounter the greatest effects of cash flow and constraint by bank loans.

Hale and Long (2011) agreed that it is easier for SOEs to get external financing than other firms. This is consistent with Bai *et al.* (2006) and Li *et al.* (2008), who stated that state-owned enterprises (SOEs) are politically connected firms and help private firms to obtain bank loans. As SOEs are politically affiliated, they have easier access to short-term external funding such as trade credit than non-SOEs.

VI. Evidence for India

Studies on trade credit in the Indian context dates back to the early 1980s. In an early attempt, Raj (1982) examined the use of trade credit by the corporate sector (including private and public limited companies) during the 1970s, using RBI statistics. Issues related to trade credit were further explored by Menon (1977). Focusing on the

liquidity position of corporates for the period 1965-1966 to 1974-1975, the author found that companies were increasing their inventories along with a simultaneous reduction in bank borrowing and increase in trade credit. Thereafter, Bhole (1984) examined the relevance of trade credit for monetary policy (Box I.4).

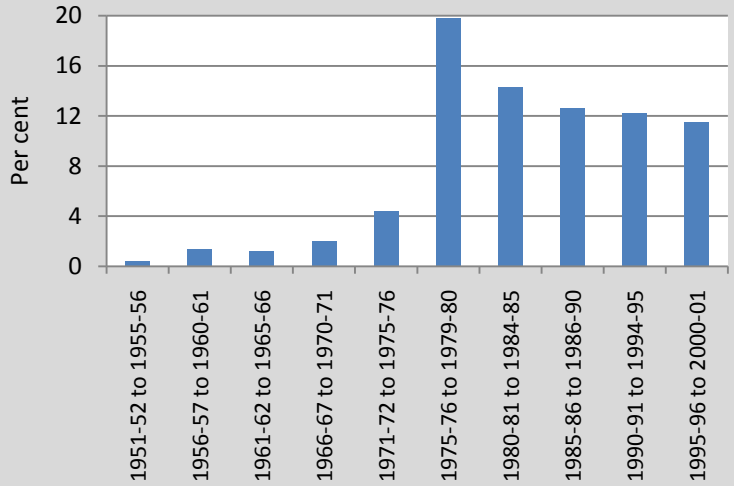
Box I.4: Early Studies on Trade Credit for India

The relevance of trade credit as a source of external funding for Indian corporates has attracted the attention of researchers since the 1970s. In an early study, Menon (1977) examined the status of corporate liquidity for over 1500 large public companies and over 700 large private companies during 1965-66 to 1974-75. Their findings indicated that trade credit comprised over 40% of current liabilities for both sets of companies during this period. The sharp increase in trade credit, especially during the latter half of the period, can be attributed to the stringent credit policy measures undertaken during this period.

Subsequently, Raj (1982) explored the relevance of trade credit for medium and large Indian firms (both public and private) during 1971-79. The study observed a sharp increase in the proportion of trade credit in total external funding of corporate, presumably a reflection of the attempt by the corporate sector to dilute the severity of monetary policy that was prevalent at that time.

Thereafter, Bhole (1984) examined the importance of trade credit in corporate financing structures and found that it had significant implications for the efficacy of monetary policy (proxied by the weighted average advance rate at which commercial banks makes advances). Empirically, the findings indicated that an increase in interest rate led to an increase in the volume of trade dues, although the effect of interest rate on trade receivables was muted.

The balance of evidence appears to suggest that the share of trade credit in total external funding of corporates has witnessed a sharp rise, especially since the 1970s.[2]



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Subsequent research on the behaviour of trade credit used data from 1984-99 encompassing public, private and foreign companies (Bhole and Mahakud, 2004). The results found firm size to be negatively associated with trade payables, supportive of the transaction demand

[2] Data after 1975 pertains only to public limited companies. The data across periods might not be strictly comparable owing to different number of companies across periods.

hypothesis. Additionally, the results also found that profitable firms exhibited lower trade credit demand. The descriptive statistics also suggested that the government sector was a substantial user of trade credit, throughout the entire period. In particular, the share of trade credit in total sources of funds ranged from 14% in the mid 1960s to 12% during 1996-2001, peaking to nearly 20% during the 1977-80 period. Subsequently, employing data on over 800 companies during 1990-2001, Bhat (2004) provides evidence to suggest that, during periods of restrictive monetary policy, firms with no access to trade credit cuts back their inventory levels.

Vaidya (2011) investigated the motives for offering trade credit in the Indian context. The evidence supports an inventory management motive for offering trade credit. To be more particular, firms attempt to increase sales and lower finished goods inventories by offering trade credit both on a gross and net basis. When inventories of finished goods and semi finished goods and raw materials increase, firms tend to postpone payments to their supplier and this shows up on their books of accounts as higher accounts payable. This is likely to help firms tide over negative shocks to sales. Therefore, trade credit in

general can be viewed to arise as a financial response to variable demand for finished goods.

In the Indian case, the only (survey-based) evidence by De and Singh (2010) for a sample of 680 SME firms suggested that the median length of the credit period was 1-3 months and the medium discount for timely payment was 2-5%.

Following from Bhole and Mahakud (2012) and employing a classification akin to Allen et al (2012), we categorize the financing sources for our sample firms during 1993-2012 (Table I.4), segregated according to ownership (Panel A) and year (Panel B).[3] Three major findings emerge. First, at around 30%, group and Indian private firms appear to display the maximum dependence on bank finance. Second, foreign banks have the highest dependence on trade credit, consistent with Love and Martinez Peria (2005). And finally, the

[3] A detailed description of the data and sample firms is provided in Section V (Data sources).

dependence on trade credit over the entire period has ranged around 17%, having declined somewhat during the crisis period.[4]

Table I.4: Financing sources for Indian manufacturing firms 1993-2012
(as percent of total funding)

Panel A: By ownership		**Government**	**Group**	**Indian private**	**Foreign**	**All**
Internal		7.3	11.2	7.7	16.8	9.1
External	Market	28.9	31.5	35.5	31.3	33.9
	Bank/FIs	16.9	26.9	27.7	17.9	26.8
	Non market, nonbank	46.9	30.4	29.0	33.8	30.1
	Of which: trade credit	15.4	17.0	16.2	20.9	16.6
Panel B: By year		**1993-2000**	**2001-2008**	**2009-2012**	**2008-2010***	**1993-2012**
Internal		6.4	9.4	12.2	10.7	9.1
External	Market	33.5	34.5	33.5	33.9	0.339
	Bank/FIs	32.1	25.6	22.4	26.8	0.268
	Non market, nonbank	28.0	30.6	31.9	30.1	0.301
	Of which: trade credit	16.9	16.7	16.1	16.6	0.166

*Denotes crisis period
The table describes the sources of finance for 8459 manufacturing firms, classified according to ownership and year groups. The classification of funding sources is the same as Allen *et al.*(2012).
Source: Author's calculations

It would be useful to put these numbers in perspective, by analyzing financing sources for firms across 40 largest countries and country characteristics (based on World Bank Enterprise Survey). The table reveals that internal sources dominate, the percentage of which is typically higher for low income as compared to high income countries

[4] The definition of crisis period (2008-10) follows Eichengreen and Gupta (2013).

(Table I.5). Among countries, retained earnings typically dominate in Latin America and MENA; its share in the Asian countries appears to be on the wane.

Looking across countries, the evidence suggests that the reliance on market financing is typically low in most countries; major exceptions are China (given the recourse to equity markets by some major firms over the past several years), Turkey, Hungary and Slovak Republic. What is important is to note the importance of alternative finance to all sources of finance which is typically high across most countries.

Within this category, the share of trade credit is high across most regions, ranging from 35% in Brazil and Chile to 14-17% in the MENA and transition economies.

Table I.5: Financing sources for firms during 2002-2010
(as percent of total funding)

		Internal	External			
Panel A: By country group		Retained earnings	Market finance	Bank finance	Alternative finance	*Of which: Trade credit*
High income		60	6	16	18	Not
Upper middle income		64	2	18	16	reported
Lower middle income		61	4	18	17	
Low income		72	3	14	11	
Panel B: By country/region		Retained earnings	Market finance	Bank finance	Alternative finance	*Of which: Trade credit*
Latin America	Argentina	69	1	5	25	19
	Brazil	56	4	14	25	35
	Chile	52	2	30	17	34
	Mexico	73	0	7	49	9
Transition	Czech Republic	55	7	9	29	14
	Hungary	55	16	16	12	11
	Poland	72	1	12	13	13
	Slovak Republic	64	10	8	18	8
Broader MENA	Egypt	86	4	7	3	24
	Morocco	63	1	19	16	14
	Syria	81	0	4	15	14
	Turkey	58	12	16	14	17
Asia	China	15	12	20	52	2
	India	58	1	28	13	29
	Indonesia	42	1	16	40	7
	Korea Republic	65	8	20	7	1
Western Europe	Germany	51	9	23	17	24
	Ireland	49	1	28	23	5
	Portugal	66	1	14	19	5
	Spain	60	2	22	16	24

The table provides evidence regarding the importance of sources of finance across countries, classified according to internal and external. Market financing includes funding by private and public equity), Bank financing includes funds from local commercial and foreign banks) and alternate finance is a catch-all for the other funding types (trade credit, credit cards, loans from family and friends, development banks, informal sources, etc.)
Source: Allen *et al.* (2012)

VII. Concluding Remarks

This Chapter had set out the various theories proposed to explain the relevance of a trade credit channel. After reviewing the existing

theories, an attempt was made to bring together the available Indian evidence that seeks to act as a backdrop for the subsequent analysis.

Chapter II: Trade Credit – Analytical Framework

This Chapter sets out the analytical framework to examine the trade credit channel of monetary policy transmission in India. Accordingly, after taking on board the international evidence and the available Indian dataset, we set out the empirical specifications to test the basic model. Subsequently, we augment the baseline model to explore several related hypotheses. In this context, we also detail the database employed in the analysis. A key feature of our analysis is the development of a narrative monetary policy indicator, akin to those employed in the international context.

I. Introduction

There has been an entire gamut of studies that have been undertaken to understand various facets of trade credit. In this Chapter, we focus exclusively on the trade credit channel of monetary policy and several related hypotheses. Prior to undertaking a country-specific analysis, it would be useful to understand how India fares in the cross-section as regards to its usage of trade credit. This, in a way, is expected to shed light on what country-specific factors determine the use of trade credit.

II. India in the Cross-Section

To analyze how India fares in the cross-section as regards its trade credit dependence, we obtain data on average levels of trade credit

used for 40 countries. This database has been collated by Allen et al (2012) from the *World Bank Enterprise Survey* database. We supplement this information with data on country-specific macroeconomic and banking variables as reported in the IMF (International Financial Statistics) and the World Bank (World Development Indicators) database.

The country-specific variables include log of per capita GDP at constant 2005 USD (as a control for the country's income), export *plus* imports to GDP (as a proxy for openness), CPI inflation, market capitalization to GDP (as a proxy for the depth of the capital market) and private credit to GDP (as a proxy for financial penetration). Akin to data for trade credit, we average these variables over the period 2002-10 to ensure comparability. These variables are introduced in a sequential manner along with an indicator for India. All equations control for country size by including the log of the country's population (averaged during 2002-10 period).

India does not seem to be an outlier, given its size and per capita GDP (Table II.1); the coefficient *India indicator* is not significant across

any of the specifications. Among the relevant variables, the evidence appears to suggest that low-inflation countries with low financial penetration are those that are more likely to take greater recourse to trade credit.

Table II.1: India in the Cross-section: Determinants of Trade Credit, 2002-10

	(1)	(2)	(3)	(4)	(5)
India indicator	0.035	0.027	0.019	0.020	0.031
	(0.034)	(0.039)	(0.034)	(0.037)	(0.037)
Log pc GDP	-0.017	-0.035	0.010	0.010	-0.005
	(0.029)	(0.029)	(0.031)	(0.033)	(0.035)
CPI annual		-0.555	-0.814	-0.884	-0.957
		(0.179)***	(0.230)***	(0.292)***	(0.303)***
Private credit/GDP			-0.047	-0.046	-0.034
			(0.018)***	(0.019)***	(0.018)*
Market capitalization/GDP				-0.023	-0.026
				(0.028)	(0.020)
(Exports+Imports)/GDP					-0.073
					(0.032)**
Control for country size	YES	YES	YES	YES	YES
Observations	40	40	40	37	37

Robust standard errors within brackets
***p<0.01; **p<0.05; *p<0.10

III. Estimation Strategy

The basic proposition we intend to test is the following: when monetary policy is tightened, then the quantity of trade credit demanded by constrained firms and the quantity of trade credit supplied by unconstrained firms should both increase.

To estimate this, we employ reduced form models of the supply of and the demand for trade credit. We estimate both sides separately since data is available for only one side of the transaction, in contrast to bilateral data in which both the parties in the transaction are known (See, for example Klapper *et al.*, 2011 for an application using bilateral transactions data).

It is commonplace in the literature to measure the demand for trade credit by accounts payable from the buyer's perspective and for trade credit supply to be represented by accounts receivable from the seller's perspective. It is however difficult to distinguish which firms are suppliers and which ones are demanders of trade credit. To circumvent this difficulty, we first treat the firms as suppliers and then treat the same firms as users of trade credit.

As Petersen and Rajan (1997) remark, the supply of trade credit is driven by supply factors; therefore, accounts receivable is regressed on the characteristics of the supplier firms. Likewise, accounts payable is regressed on the characteristics of the user firms.

We explore the relevance of a trade credit channel from both the suppliers as well from the demanders' standpoint. Economically, the capital structure and financial characteristics of the firms will affect the ability of firms to raise funds, and in turn influence their behaviour towards trade credit. In fact, depending on their capital structure and other relevant characteristics, a firm might be financially unconstrained or constrained. This, in turn, will also be affected by the business cycle and monetary policy considerations. In particular, monetary policy is likely to exert an asymmetric impact on firms in the sense that firms with limited access to institutional finance are likely to be more severely affected as compared to firms which do not encounter such problems.

Exploiting this argument, we categorize firms as unconstrained and constrained so as to obtain a more comprehensive assessment of their credit conditions and asymmetric informational problems, which are more likely to be manifest during periods of tighter monetary policy.

Additionally, as our previous discussion would suggest, the use of trade credit is also likely to differ across firm ownership. For instance, given possible support from their parent firms, it appears likely that foreign firms would exhibit higher dependence on trade credit. On the other hand, given the implicit guarantee enjoyed, dependence by government firms on trade credit could also be higher (Bhole and Mahakud, 2004).

Advancing this argument further, we split the sample into constrained and unconstrained firms. Towards this end, we employ the WW index which has been proposed by Whited and Wu (2006). The WW index is a combination of several variables, such as profitability, dividend, size and debt. Higher WW values indicate greater levels of financial constraint. We categorize the firms by quartile as earlier and employ this as our financial constraint measure. We sort the firms by their WW index and define the first quartile of the firms as unconstrained and the last quartile of the firms as constrained.

We estimate the trade credit models for both unconstrained and constrained firms and also for the whole sample without any

restriction of financial constraint. We interpret and compare the results for the whole sample and subsamples of unconstrained and constrained firms.

III.1 Supply of Trade Credit: We employ the following specification to test the hypothesis of a trade credit channel from the point of view of suppliers:

$$\left(\frac{AR}{A}\right)_{fit} = \alpha_o + \sum_{n=1}^{3} \beta_n [d\,(Z\,score)]_{n,\,fi(t-1)} + \sum_{n=1}^{3} \gamma_n [d\,(Z\,score)]_{n,\,fit-1} * [d\,(MYP)]_{t-1} + \varphi [d\,(MYP)]_{t-1} + \sum_{k} \eta_k X_{k,\,fi(t-1)} + \psi [d\,(OWN)]_{fit} + \eta_{it} + \varepsilon_{fit} \quad \textbf{(1)}$$

where *f* indexes firm, *i* indexes industry and *t* indexes year; (AR/A) is the ratio of accounts receivable to total asset for firm *f* at time *t* and is the proxy for the supply of trade credit. The variables on the RHS include the following.

[*d(Z score)*]: This represents a set of dummy variables categorising firms according to their extent of financial constraint and is basically a proxy for the firm's ability to access institutional finance. Thus, [*d(Z score)*]$_{1,\ f(t-1)}$ represents the least distressed whereas [*d(Z score)*]$_{4,\ f(t-1)}$ represents the most distressed firms (the control category). This variable is derived from the MacKie-Mason (1990) modified Altman Z

score which measures the likelihood of financial distress. The Z score aggregates information on profitability, solvency and liquidity and is widely employed as an indicator of financial health. As well, it also serves as an indicator for investors to judge the soundness of the investment policy of the firm (Aktas *et al.*, 2012). Therefore, Z score is a relevant variable to proxy the access of firms to institutional loans.

For the sample as a whole, we compute the Z score for each firm-year combination and split them into quartiles, each quartile being represented by a dummy variable, $d(Zscore)_{n,ft-1}$, n=1,2,3,4). The firms in the topmost quartile are the ones which are least distressed and therefore, have the lowest probability of being bankrupt. At the other end, the firms in the bottom-most quartile are the most distressed with the maximum probability of being bankrupt in a given year. Without loss of generality, it appears likely that the least distressed firms are the ones most likely to have better access to institutional loans.

[*d(MYP)*]: This is a dummy for the monetary policy variable. As Berger and Bouwman (2010) observe, employing a direct measure of

monetary policy (or, its change) might be misleading since it might contain anticipatory movements. In other words, movements in monetary policy might respond to information about future developments in the economy (which, in turn, could influence the supply and demand for trade credit), making it harder to isolate the impact of monetary policy. To circumvent this possible, we employ a coding variable, akin to Romer and Romer (2004). Provided there exists a trade credit channel, a tightening of monetary policy will mean that the quantity of trade credit demanded by constrained firms and the quantity of trade credit supplied by unconstrained firms should both increase.

We code the monetary policy variable as follows. In case there is an increase in either the policy rate (repo rate from 2001 and Bank Rate prior to that) by more than 50 basis points (bps) between two consecutive months in a given year, it is coded as +1. Monetary policy in this case is deemed as *strongly contractionary*.

An increase in excess of 25 bps upto 50 bps in either or both these variables between two successive months is coded as 0.5. The monetary policy is then deemed as *medium contractionary*.

Monetary policy is deemed as *mildly contractionary* provided there has been an increase of upto 25 bps in either or both these variables, in which case it is coded as 0.25. Reverse is the case in the event the monetary policy is expansionary. Provided there is no change in any measure during the year, it is coded as zero.

Therefore, the maximum value the index can assume in any month equals +2 (provided both the policy rate and CRR are increased by over 50 basis points over the previous month) and the minimum value equals -2 (provided both the policy rate and CRR are reduced by over 50 basis points over the previous month).

The raw scores for a month are cumulated for the year as a whole to arrive at an aggregate index in a given year. As a result, a value greater than one for a given year would signify a tightening; reverse would be the case in the event the value is less than one. Monetary

policy is deemed neutral in case the value of the index in a year equals zero. Provided the value of the aggregate index in a year is greater than (resp., less than) one, monetary policy is coded as contractionary (resp., expansionary). Monetary policy is deemed neutral if the index value in any year equals zero.

Chart II.1 [A] provides a graphical representation of the years when tight monetary policy was pursued. The graph provides evidence in support of tight monetary policy for nine (out of the 20) years of the sample. When we look at policy activism (defined in this case as instances when *changes* occurred in key monetary policy variables) across months, the evidence appears to suggest greater policy activism during the second half of the year (October-March) as compared to the first half (April-September); the average number of policy changes per month equals around seven Chart II.1 [B].

Chart II.1 [A]: Years of monetary policy tightening 1993-2012

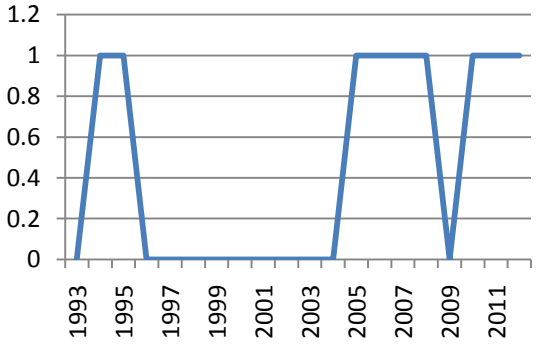
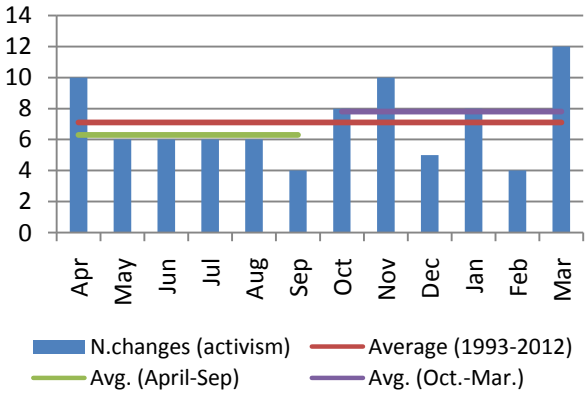


Chart II.1 [B]: Monetary policy activism by month, 1993-2012



[*d(Z score)*]* [*d(MYP)*]: This is the focus variable that captures the access of f^{th} firm to institutional finance during periods of tight monetary policy. Therefore, for the existence of a trade credit channel, $\gamma_n > 0$.

X_k: The **X**'s are a vector of control variables. These include the ones commonly considered in the literature, such as firm size, age, growth opportunities and liquidity.[5]

[5] Depending on the specification, several variables have been considered as explained subsequently.

[*d*[*OWN*)]: This is the ownership dummy indicating which category of firms exhibit greater supply response of trade credit. As discussed earlier, we consider four ownership categories: business group firms (BGF), Indian private firms (IPF), foreign firms (FF) and state-owned firms (SOF), the last being the control category. We also include relevant interaction terms of [*d(Z score)*]* [*d(MYP)*]* [*d(OWN)*] to ascertain the differential response of constrained *versus* unconstrained firms across ownership to a monetary tightening.

η_{jt} controls for all factors that are industry-specific (capital intensity, location, etc.) and industry-year specific (changes in policies, product demand, etc.) and finally, ε is random error.

The estimation strategy proceeds as follows. We first estimate (1) for all firms, and thereafter, for constrained and unconstrained firms and compare the coefficient estimates. Next, we classify firms according to firm-specific characteristics according to quartiles and examine the response to a contractionary monetary policy. Finally, we estimate how the response varied during the crisis. Box III.1 highlights the

empirical evidence regarding the impact of financial crisis on trade credit.

Box III.1: Trade Credit and SMEs

Besides large firms, trade credit is an important alternative to source of external funding for the SME sector. There are two reasons for this. First, by virtue of their informational asymmetries, SMEs have difficulties in accessing capital markets. And second, given the significant scale and scope of operations of Indian SME sector (accounting for nearly 10% of the GDP, over 40% of manufactured output and providing employment to nearly 60 million persons), the dependence on trade credit by Indian SMEs remains significant. According to the Rajan Committee Report (2008), during 2001-05, trade credit accounted for nearly a quarter of external funding of SMEs.

An analysis of whether trade credit provided an alternative source of external finance to SMEs during the financial crisis is provided by Carbó-Valverde *et al.* (2014). Employing longitudinal data on over 40,000 Spanish SMEs from 1994 to 2008, they find that: i) financially constrained firms are more dependent on trade credit to make their investment decisions. This runs contrary to evidence presented by Casey and O'Toole (2014). Utilizing data on SMEs in 11 Euro Area countries between 2009-2011 that encompasses the crisis period, they find that while constrained SMEs are more likely to use informal lending, they are less likely to apply for, or use, market finance.

References

Casey, E., and C. O'Toole (2014). Bank lending constraints, trade credit and alternative financing during the financial crisis: Evidence from European SMEs. Journal of Corporate Finance 27, 173-93.

Carbo-Valverde, S., F.Rodriguexz Fernandez and G. Udell (2014). Trade credit, the financial crisis and SME access to finance. Journal of Money, Credit and Banking (forthcoming).

Access to institutional loans might also fluctuate depending on the stance of monetary policy and the business cycle. It appears likely that firms with different financial constraints would be affected by monetary policy differently. During periods of tighter monetary policy, the behaviour of unconstrained and constrained trade credit suppliers should vary since they will have different levels of access to alternative financial resources.

The unconstrained firms are expected to continue to offer trade credit during periods of tighter monetary policy since they have better access to alternative financial resources. On the other hand, constrained firms will be more constrained during tighter times since those are the firms affected by credit rationing or credit crunches. Thus, one can expect that constrained firms should reduce the supply of trade credit during periods of tighter monetary policy.

We hypothesize that during periods of tight monetary policy, unconstrained firms that have better access to institutional loans will supply more trade credit. In contrast, constrained firms with better

access to institutional loans will supply relatively less trade credit compared to unconstrained firms during these tight times.

The control variables comprise of observable firm-specific variables to capture other potential factors that may influence the supply of trade credit. For example, the log of assets (LTA) and log of age (LAGE) capture firm reputation. One can expect that smaller and younger firms may need to offer more trade credit due to quality or reputational issues. (Long et al, 1993; Wei and Zee, 1993; Deloof and Jegers, 1996). As a result, the estimated coefficient for these variables is expected to be negative.

Following Deloof and Jegers (1999), we measure the firm's growth opportunities by its Tobin's Q ratio (TQ). In India as in several other emerging markets, the computation of Tobin's Q is rendered difficult primarily because a large proportion of corporate debt is institutional debt that is not actively traded in the debt market. As well, most companies report asset values to historical cost rather than at replacement costs. We, therefore, compute the proxy for Tobin's Q, defined as adjusted Q employed in similar studies on India (see for

example, Khanna and Palepu, 1997; Ghosh, 2007) by taking the aggregate of the market value of equity and book value of debt in the numerator, scaled by the book value of assets. Firms may tend to sell more on account to boost their sales taking into account their higher growth opportunities in the future. A positive estimated coefficient is expected for Tobin's Q-ratio.

Cash balance is captured by the ratio of cash plus short-term securities to assets (Cash/A). One might expect a negative relationship between (Cash/A) and the dependent variable since a firm may reduce its cash or equivalents to provide more receivables. In this case, the firm would be holding more receivables other than cash or equivalents.

III.2 Demand for Trade Credit: Akin to our previous specification, we employ the following reduced form equation from the point of view of buyers:

$$\left(\frac{AP}{A}\right)_{fit} = \lambda_o + \sum_{n=1}^{3} \beta_n [d\,(Z\,score)]_{n,\,fi(t-1)} + \sum_{n=1}^{3} \gamma_n [d\,(Z\,score)]_{n,\,fit-1} * [d\,(MYP)]_{t-1} + \varphi [d\,(MYP)]_{t-1} + \sum_{k} \eta_k X_{k,\,fi(t-1)} + \psi [d\,(OWN)]_{fit} + \mu_{it} + \varepsilon_{fit} \quad \textbf{(2)}$$

where on the LHS, (AP/A) is the ratio of accounts receivable to total asset for firm *f* at time *t* and is the proxy for trade credit demand. We employ explanatory variables similar to those in Equation (1), although in this case, some of the variables might control for different factors.

We explore the trade credit channel by examining the coefficient estimates of [*d(Z-score)*] and its interaction with the monetary policy dummy. Following from the pecking order hypothesis of Myers and Majluf (1984), institutional loans stand at the top of the pecking order, since they are cheaper than trade credit when the implicit cost is taken into account.[6] To the extent that the least distressed firms have better access to institutional loans, their demand for trade credit will be the lowest.

[6] The implicit cost refers to the opportunity cost of not taking advantage of the early payments discount. For the most common trade credit terms "2/10 net 30", the annualised implicit interest of trade credit is 43.9%. To calculate the cost. we employ the following expression:

$$\left[\frac{1}{(1-Discount\ Rate)}^{\left\{\frac{360}{(Net\ days-Discount\ days)}\right\}}-1\right]$$, where Discount rate = 0.02, Net days=30 and Discount days=10

Additionally, it seems likely that as earlier, the behaviour of constrained and unconstrained firms will vary according to the fluctuations in the business cycle and the evolution of monetary policy. Firms that are constrained and have limited access to institutional loans will be hard-pressed for external finance, necessitating greater recourse to trade credit. In contrast, unconstrained firms with possible access to institutional finance during periods of tight money policy will demand less trade credit. Therefore, if a tighter monetary policy entails constrained firms to demand more trade credit, this would suggest that $\gamma_n > 0$.

As earlier, we employ a set of control variables which includes LTA, LAGE and TQ as defined previously in equation (1). Besides, we include additional control variables in equation (2). For example, we control for internal finance capacity with the ratio of cash flow to assets (CF/A), where the cash flow is defined as net income plus depreciation. According to the pecking order theory, internally generated funds are higher in the pecking order as compared to trade credit, owing to the higher implicit cost of the latter. As a result,

the ability of firms to generate cash internally will decrease its demand for trade credit.

According to the maturity matching hypothesis (Deloof and Jegers, 1999), firms finance short-term investment or assets with short-term credit. One can expect that firms demand more trade credit if they hold more short-term assets. We control for this effect by adding accounts receivables (AR/A), and inventories (INV/A) to the model, with an expected positive sign on these variables.

We also control for firm's access to institutional/market finance by including two variables. First, we include a dummy which equals one if the firm is listed on the equity market. Alternately, since banks are a predominant source of finance for firms, we include the ratio of Bank debt/Asset as an alternate variable. Intuitively, firms with better access to alternate financing sources are expected to demand less trade credit.

The age represents the reputation of the firm and older firms are expected to have more accounts payable per asset since they might

be offered more trade credit. Larger firms may have less growth opportunities or may have more access to alternative financial resources. Therefore, one can expect that larger firms will have less accounts payable per assets. Higher Tobin's Q suggests higher unexploited growth opportunities (Mitchell and Walker, 2012); therefore firms with higher Tobin's Q tend to buy more physical capital or else on trade credit. We also control growth opportunities by using Sales/A as suggested by Atanasova (2007). We expect that firms with more sales per assets demand more trade credit.

Besides demand and supply, we also consider *net trade credit*, defined as the receivables and payables, scaled by total asset. Economically, firms that obtain more trade credit from their suppliers might be more inclined to extend credit to their customers.

Viewed from this standpoint, *net credit* reflects the relative willingness of firms to extend trade credit, net of the amount they receive themselves. Several papers have also considered this variable. In the case of UK for instance, Kohler *et al.* (2000) finds that net trade credit increases with GDP growth. Evidence for India appears to suggest that

finished goods inventories are more influential in determining net trade credit as compared to raw material inventories (Vaidya, 2011). Available evidence for US manufacturing firms during the period of the sub-prime crisis provides limited evidence in favour of substitutability between *net trade credit* and bank credit (Yang, 2011).

III.3 Trade Credit and Crisis: To understand how the trade credit channel of monetary policy played out during the crisis, we estimate the following specification for firm *f* at time *t* as give by (3):

$$TC_{fit} = \lambda_o + \sum_{n=1}^{3} \beta_n [d(Z\,score)]_{n,fi(t-1)} + \sum_{n=1}^{3} \gamma_n [d(Z\,score)]_{n,fit-1} * [d(MYP)]_{t-1} * Crisis_t + \varphi [d(MYP)]_{t-1} + \sum_k \eta_k X_{k,fi(t-1)} + \psi [d(OWN)]_{fit} + \mu_i + \varepsilon_{fit} \quad \textbf{(3)}$$

where TC equals either (AR/A) or (AP/A), reflecting the supply and demand sides respectively; the remaining variables are the same as earlier. The coefficient of interest is γ_n: if an accommodative monetary policy during the crisis leads to a decline in the demand for trade credit by unconstrained firms, one would expect $\gamma_n<0$.

In addition, we also include a four-way interaction term $[d(Z\,score)]_{n,t-1} * [d(MYP)]_{t-1} * Crisis_t * [d(OWN)]_f$ to ascertain the

differential response of the trade credit channel across firm ownership.

We also employ a similar response for the ratio of accounts payable to asset (AP/A), including separate interaction terms with crisis as well as crisis and firm ownership.

III.4 Trade Credit and Bank Credit: A natural question to ask in this context is: how did the role of trade credit and bank credit play out during the crisis. To examine this further, akin to Yang (2011), we estimate the following simultaneous equation system as given by (4):

$$(TC)_{fit} = \lambda_o + \delta_o\, BKDEBT_{fit} + \delta_1\, BKDEBT_{fit} * Crisis_t + \sum_{n=1}^{3} \beta_n [d(Z\,score)]_{n,fi(t-1)} + \sum_{n=1}^{3} \gamma_n [d(Z\,score)]_{n,fit-1} * [d(MYP)]_{t-1} * Crisis_t * BKDEBT_{fit} + \varphi [d(MYP)]_{t-1} + \sum_k \eta_k\, X_{k,fi(t-1)} + \psi [d(OWN)]_{fit} + \mu_i + \varepsilon_{fit} \quad \textbf{(4A)}$$

$$(BKDEBT)_{f,t} = \chi_o + \theta_o\, TC_{f,t} + \theta_1\, TC_{f,t} * Crisis_t + \sum_{n=1}^{3} \beta_n [d(Z\,score)]_{n,f(t-1)} + \sum_{n=1}^{3} \gamma_n [d(Z\,score)]_{n,t-1} * [d(MYP)]_{t-1} * Crisis_t * TC_{f,t} + \varphi [d(MYP)]_{t-1} + \sum_k \eta_k\, X_{k,f(t-1)} + \psi [d(OWN)]_{f,t} + \mu_f + \varepsilon_{f,t} \quad \textbf{(4B)}$$

where BKDEBT is the ratio of bank borrowings to total asset and TC denotes trade credit, alternately defined as AR and AP; the remaining variables are as earlier.

The coefficients of interest are **δ**. If trade credit is a substitute for bank credit, the $\delta_o<0$.

The model includes several interaction terms. The first interaction term - BKDEBT**Crisis* - examines how bank debt responds during the crisis. To the extent that bank debt declines during the crisis, $\delta_1<0$. The second interaction term - $[d(Z\,score)]*[d(MYP)]*Crisis_t*[OWN]$ examines the response of financially distressed firms across ownership to a contractionary monetary policy during the crisis.

IV. Database and Sample

For the purpose of the analysis, we employ the *Prowess* database, generated and maintained by the Centre for Monitoring the Indian Economy (CMIE), a leading private think-tank in India. The Prowess is a firm-level database, akin to the Compustat database for US firms

and the Financial Analysis Made Easy (FAME) database for UK and Irish public and private limited companies.

This database is being increasingly employed for micro-level analysis on Indian firms concerning issues like tunneling (Bertrand *et al.*, 2002), the impact of privatization on firm performance (Gupta, 2005), the effect of financial liberalization in alleviating financing constraints (Ghosh, 2006), the impact of trade liberalization on productivity (Goldberg *et al.*, 2010; Khandelwal and Topalova, 2011), sources of corporate profits (Mody *et al.*, 2011) and the financing pattern of Indian corporates in the post liberalization era (Love and Soledad Peria, 2005; Allen, 2012).

The present dataset contains financial information on over 10,000 companies (including services and construction companies). In addition, if an entity is not listed, it qualifies for inclusion in the database if the average sum of sales and total assets is at least Rs.200 million (≈US $4 million) as per the latest audited financial results. Accordingly, the firms in the sample generally do not include the smallest firms due to the requirements for firms to be included in

Prowess.[7] As a result, the sample is skewed towards large Indian firms. The database contains detailed information on the financial performance of companies culled out from their profit and loss accounts, balance sheets and stock price data. The database also includes information on the ownership type of the firm.

The selection of the sample firms proceeds in several stages. In the first step, we select all manufacturing firms for which information is available in the database for the period 1993-2012. This provides us with a total of 11,001 firms. We subsequently delete several firms from the sample. First, since our focus is on trade credit, which we would expect firms to resort to provided they reach some minimum maturity, we exclude 236 firms which are in existence for less than five years. Second, we delete merged firms, further lowering the sample size. Third, we delete firms with less than three consecutive years of data, further lowering the sample. In the final stage, we exclude firms for which ownership data is not reported, leaving us with a total of 8459 firms (Table II.2).

[7] The small and medium-sized firms (SME), as classified by the Indian Ministry of Small and Medium Industry, are those with gross fixed assets less than Rs.100 million (about US$ 2.3 million).

The composition of the sample by ownership and industry group is set out in Table 7. Nearly 90% of the firms belong to business group and Indian private categories. In terms of industry groups, food, textiles and chemicals are the most dominant, comprising nearly 40% of the firms over the sample period.

The Appendix provides the empirical definition of the variables, including data source and summary statistics. To moderate the influence of outliers, all variables are winsorized at 1% at both ends of the sample.

Table II.2: Selection of sample firms

Step	Procedure	Firms	Remaining
1	Number of selected manufacturing firms	11001	11001
2	Delete firms with less than 5 years in existence	(-) 236	10765
3	Delete firms which have been merged	(-) 843	9922
4	Delete firms with less than 3 consecutive years of data	(-) 1434	8488
5	Delete firms which report no ownership	(-) 29	8459

The table describes the selection of sample firms from the *Prowess* database
Source: Author

Table II.3: Classification of sample firms by ownership and industry groups

Panel A: By Ownership	**N. Firms**	**Percent to total**
Business groups	2265	26.8
Indian private	5650	66.8
Foreign	315	3.7
State-owned	229	2.7
Panel B: By Industry		
Food	1051	12.4
Textiles	1063	12.6
Cement	121	1.4
Electronics and electrical	772	9.1
Chemicals/Pharmaceuticals	1056	12.5
Metals and metal products	900	10.6
Plastic and rubber	519	6.1
Transport equipment	95	1.1
Miscellaneous manufacturing	1434	17.0
Others	1448	17.1

The table describes the categorization of sample firms according to ownership and industry
Source: Author's calculations

Table II.4 (Panel A) presents the AR/A, AP/A, WW index and Z score by years, separately for the whole sample (WS) and for unconstrained (UNC) and constrained (CONS) firms, respectively. The AR/A and AP/A has been declining over time not only for the entire sample, but for constrained and unconstrained firms as well. According to Petersen and Rajan (1997), this could be the result of technological advances (e.g., technological changes, growth in use of credit cards) that has lowered the time for collecting receivables.

The average AR/A for the entire period equals 0.17, while for constrained and unconstrained firms, it equals 0.13 and 0.14, respectively. Likewise, AP/A has averaged 0.15 over the period, with the value for constrained and unconstrained firms being 0.14 and 0.15, respectively. A t-test of difference suggests the differences across these firm types to be statistically significant.

Looking at WW scores, the value for constrained firms is, much higher than the number obtaining for unconstrained firms, indicating the significant differences in financial constraints across these firm types. On the other hand, the value of Z-score has been declining over the years, from -1.65 at the beginning of the period to -1.29 by 2012. A similar decline is in evidence for constrained and unconstrained firms, with the magnitude of the decline being much more pronounced for the latter. Firms with higher AR/A in particular, appear to exhibit lower financial constraint (Table II.4, Panel B).

Table II.4: Means of AR/A, AP/A, WW score and Z score by year

	AR/A			AP/A			WW index			Z score		
Panel A	WS	UNC	CONS	WS	UNC	CONS	WS	UNC	CONS	WS	UNC	CONS
1993	0.181	0.181	0.181	0.166	0.166	0.166	-28.76	-78.35	-1.02	-1.646	-1.646	-1.646
1994	0.169	0.147	0.138	0.150	0.135	0.130	-25.27	-78.28	-1.01	-1.598	-1.346	-1.354
1995	0.161	0.139	0.131	0.139	0.128	0.122	-22.65	-78.48	-1.03	-1.483	-1.186	-1.222
1996	0.164	0.138	0.126	0.140	0.134	0.122	-22.48	-77.41	-1.06	-1.392	-1.033	-1.152
1997	0.163	0.139	0.137	0.138	0.134	0.121	-23.18	-76.76	-1.05	-1.276	-0.971	-1.208
1998	0.169	0.157	0.156	0.144	0.149	0.136	-22.60	-76.58	-1.03	-1.221	-1.080	-1.239
1999	0.173	0.159	0.156	0.149	0.155	0.135	-21.23	-75.87	-1.02	-1.191	-1.059	-1.201
2000	0.177	0.159	0.154	0.155	0.163	0.138	-20.57	-75.11	-1.02	-1.243	-1.029	-1.151
2001	0.180	0.164	0.156	0.156	0.166	0.138	-20.63	-74.95	-0.98	-1.226	-0.895	-1.093
2002	0.182	0.166	0.155	0.158	0.169	0.145	-19.91	-74.90	-0.95	-1.179	-0.836	-0.996
2003	0.176	0.160	0.151	0.163	0.169	0.152	-17.67	-73.98	-0.85	-1.224	-0.922	-1.055
2004	0.173	0.151	0.135	0.161	0.162	0.140	-16.97	-72.81	-0.78	-1.263	-0.874	-0.939
2005	0.169	0.148	0.130	0.162	0.164	0.142	-15.95	-72.30	-0.75	-1.312	-0.936	-0.988
2006	0.169	0.144	0.122	0.163	0.164	0.139	-15.77	-70.69	-0.75	-1.309	-0.877	-0.899
2007	0.167	0.140	0.122	0.161	0.160	0.134	-15.64	-68.19	-0.69	-1.318	-0.849	-0.901
2008	0.161	0.127	0.116	0.157	0.153	0.134	-15.32	-66.33	-0.64	-1.247	-0.735	-0.844
2009	0.154	0.122	0.111	0.149	0.148	0.129	-15.27	-64.07	-0.62	-1.213	-0.706	-0.748
2010	0.155	0.118	0.109	0.148	0.141	0.124	-15.89	-62.59	-0.60	-1.226	-0.687	-0.785
2011	0.154	0.110	0.114	0.138	0.122	0.115	-18.95	-61.88	-0.57	-1.316	-0.748	-0.953
2012	0.158	0.110	0.121	0.133	0.110	0.113	-12.65	-36.59	-0.59	-1.293	-0.687	-0.988
Whole period	**0.167**	**0.142**	**0.133**	**0.153**	**0.152**	**0.142**	**-18.46**	**-69.83**	**-0.79**	**-1.291**	**-0.925**	**-1.032**
t-test (Whole period): UNC vs. CONS		8.477***			14.661***			368.245***			10.628***	

Panel B	AR/A	AP/A	WW index	Z score
AR/A				
AP/A	0.313***			
WW index	-0.018***	0.045***		
Z score	-0.360**	-0.006**	0.069	

***p<0.01; **p<0.05; *p<0.10

Source: Author's calculations

Table II.5 sets out the mean AR/A and AP/A by firm ownership, segregated by unconstrained and constrained firms, respectively. Except for foreign firms, the supply of trade credit is higher for unconstrained as compared to constrained firms. To see this, note that, the mean supply of trade credit by unconstrained business

groups equals 0.148, which is 15% higher than the value for constrained firms.

On the demand side, as expected, unconstrained firms appear to demand more trade credit as compared to constrained firms. The exception is foreign firms, for whom this difference is not statistically significant.

Table II.5: Means of AR/A and AP/A by firm ownership

Ownership	BGF			IPF			SOF			FF		
	WS	UNC	CONS	WS	UNC	CONS	WS	UNC	CONS	WS	UNC	CONS
AR/A	0.155	0.148	0.129	0.170	0.147	0.132	0.183	0.179	0.148	0.189	0.147	0.168
t-test of diff.		-3.440***			11.107***			4.468***			-3.419***	
AP/A	0.153	0.155	0.133	0.149	0.149	0.131	0.184	0.202	0.143	0.171	0.168	0.174
t-test of diff.		9.014***			11.613***			7.133***			-0.847	

***p<0.01; **p<0.05; *p<0.10

Source: Author's calculations

Table II.6 (Panel A) shows how degree of financial constraints during periods of tight and loose monetary policy, respectively. The WW index during periods of tight monetary policy (MYP) equals -16.9, which is 15% higher than the mean figure for loose period. A t-test indicates the differences in means are statistically significant. It therefore, appears that firms become more credit constrained during periods of tight monetary policy.

Panels B and C of Table II.6 presents means AR/A and AP/A for the whole sample and for unconstrained and constrained firms, during periods of loose and tight monetary policy. What is obvious is that during periods of tight monetary policy, constrained firms have much larger average AP/A as compared to unconstrained firms. Thus, constrained firms appear to demand more trade credit when monetary policy is tightened, consistent with Meltzer's (1969) predictions.

On the other hand, unconstrained firms have larger AR/A as compared to constrained ones, irrespective of the stance of monetary policy. Petersen and Rajan (1997) observe that firms with more access to credit from financial institutions, such as unconstrained firms, extend more trade credit to their customers. The evidence appears consistent with this hypothesis.

Table II.6: Classification of sample firms by ownership and industry groups

Panel A: **WW index**	N.Obs	Mean	SD
Loose MYP	46063	-19.986	33.903
Tight MYP	45967	-16.925	31.801
Aggregate	92030	-18.457	32.906
Panel B: **AR/Asset**	Whole sample	Unconstrained	Constrained
Loose MYP	0.171 (0.139)	0.168 (0.129)	0.140 (0.155)
Tight MYP	0.163 (0.148)	0.164 (0.133)	0.119 (0.161)
Aggregate	0.166 (0.144)	0.142 (0.156)	0.129 (0.158)
Panel C: **AP/Asset**			
Loose MYP	0.153 (0.147)	0.135 (0.116)	0.161 (0.193)
Tight MYP	0.152 (0.159)	0.142 (0.128)	0.145 (0.205)
Aggregate	0.153 (0.152)	0.139 (0.122)	0.152 (0.199)

Source: Author's calculations

V. Concluding Remarks

The Chapter provided the analytical framework for understanding the factors influencing the demand for and supply of trade credit. Towards this end, we highlight the database to be employed for the analysis, including summary statistics.

Chapter III: Trade Credit – Empirical Findings

This Chapter discusses the results of the regression exercise. Accordingly, we first discuss the existence of the trade credit channel of monetary policy and thereafter, focus on several related hypotheses. These include, inter alia, whether firm ownership matters for trade credit, the impact of the global financial crisis on trade credit and the interrelationships between trade credit and bank credit.

I. Introduction

The focus of this Chapter is to analyse the empirical evidence as regards the reduced form models presented in the previous Chapter. In this context, we first present some heuristic evidence as regards the behavior of bank credit and some of its components to glean the broad picture.

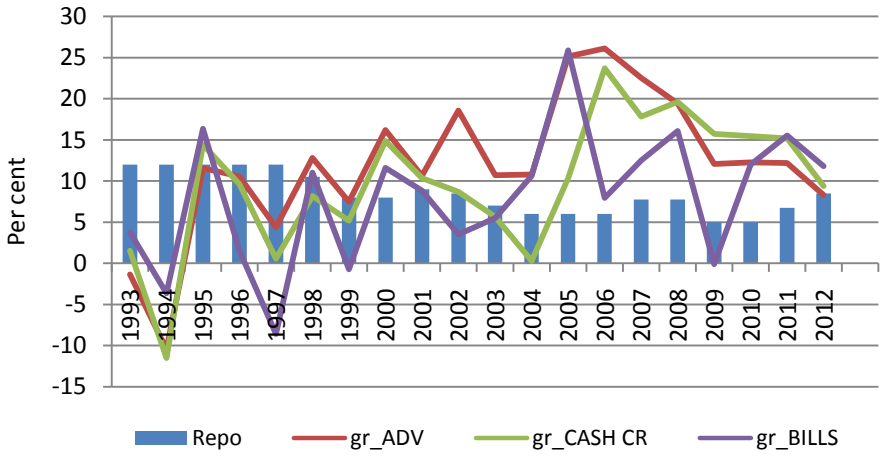
II. Heuristic Evidence

In Chart III.1, we depict the lending rate (proxied by the policy rate)[8] along with one period lagged growth in advances and its components (e.g., cash credit and bills).

[8] In the absence of a consistent policy rate over the period, the Bank Rate has been considered till 2001 and the Repo Rate, thereafter.

Without loss of generality, changes in policy rate does not appear to exert any impact on bank lending, although the evidence in terms of its sub-components is mixed. The raw correlation between the policy rate and the components is the lending variables are insignificant, except for cash credit.[9] Therefore, if anything, cash credit appears to decline in response to policy rate changes.

Chart III.1: Policy rate and change in gross bank credit



Prior to the empirical analysis, we present the correlation matrix among the major variables. Trade credit supply appears to bear a

[9] The correlation matrix is as under

	Repo Rate	Gr_advances	Gr_bills	Gr_cash credit
Repo Rate				
Gr_advances	-0.094			
Gr_bills	-0.063	0.319***		
Gr_cash credit	-0.215**	0.554***	0.261***	

***p<0.01; ** p<0.05

negative relationship with Z-score, consistent with the notion that financially distressed firms are less inclined to extend trade credit. Likewise, the correlation between monetary policy and trade credit supply is negative, although the magnitude (5.4%) is small in absolute terms. Among others, trade credit supply is negatively associated with business group firms and positively with other firm ownership groups. As compared to this, the correlation of trade credit demand is positive with foreign firms, suggesting that this category typically demands more trade credit. These raw correlations however, do not take on account either firm-specific controls or the business environment.

Table III.1: Correlation Matrix

	AR/A	AP/A	Z score	BGF	IPVT	FF	SOF
AR/A							
AP/A	0.009						
	(0.005)*						
Z score	-0.335	0.054					
	(0.000)***	(0.000)***					
MYP	-0.016	0.005	-0.033				
	(0.000)***	(0.175)	(0.000)***				
BGF	-0.054	-0.003	0.005				
	(0.000)***	(0.307)	(0.104)*				
IPVT	0.032	-0.003	-0.004	-0.858			
	(0.000)***	(0.299)	(0.283)	(0.000)***			
FF	0.031	0.014	-0.043	-0.119	-0.279		
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***		
SOF	0.019	0.002	0.047	-0.101	-0.237	-0.033	
	(0.000)***	(0.511)	(0.000)***	(0.000)***	(0.000)***	(0.000)***	

***p<0.01; **p<0.05; *p<0.10

III. Results and Discussion

III.1 Supply of Trade Credit

The results of the estimation process are set out in Table III.2.[10] Col.(1) includes the estimated parameters for the whole sample (WS), while Cols.(2) and (3) provide the results for unconstrained (UNCONS) and constrained (CONS) firms, respectively.

The coefficient estimates In Col.(1) suggest that a tightening of monetary policy raises the supply of trade credit. The magnitudes in Col.(1) indicate that a 10% tightening will improve the supply of trade credit by roughly 1%.

Our coefficient of interest are the interaction terms - $DTMP*DZscore_f$ (f=1,2,3). The coefficients *DTMP*DZscore1* is negative and statistically significant at conventional levels. In order words, the most creditworthy firms lower their supply of trade credit during periods of tight monetary policy. Economically, accounts receivables are

10 We employ panel data techniques with standard errors clustered at the firm level which is chosen based on Hausman test that suggests that fixed effects estimator is preferable to random effects because the regressors are shown to be correlated with the time-invariant firm-specific variables.

relatively liquid assets that can be quickly converted to cash in case of a liquidity shock. What this indicates is that less constrained firms tend to offer less trade credit under conditions of tight monetary policy in order to avoid exposing themselves to possible liquidity risks.

Expectedly, high growth firms offer more trade credit: a 10% increase in growth opportunities improves trade credit supply by 0.05%. Among the control variables, small and young firms extend more trade credit per unit of assets, consistent with Deloof and Jegers (1996). More specifically, small, young firms are more likely to have reputational issues and might therefore be asked by their customers to offer more trade credit.

Table III.2: Supply of Trade Credit

	(1)	(2)	(3)
Firm distress variables	WS	UNCONS.	CONS.
DZscore1 (least distressed)	-0.127	-0.087	-0.149
	(0.006)***	(0.008)***	(0.013)***
DZscore2	-0.072	-0.057	-0.074
	(0.005)***	(0.007)***	(0.015)***
DZscore3 (almost the maximum distressed)	-0.019	-0.009	-0.010
	(0.005)***	(0.007)	(0.016)
Policy variables			
DTMP	0.102	-0.001	0.003
	(0.045)**	(0.009)	(0.012)
DTMP*DZscore1	-0.014	0.012	0.009
	(0.005)**	(0.008)	(0.012)
DTMP*DZscore2	0.004	0.019	0.012
	(0.005)	(0.006)***	(0.014)
DTMP*DZscore3	-0.0001	0.011	-0.025
	(0.005)	(0.006)*	(0.016)
Controls			
Log Asset	-0.001	-0.006	0.0005
	(0.0009)	(0.001)***	(0.002)
Log Age	-0.0007	-0.004	0.005
	(0.005)	(0.008)	(0.009)
Tobin's Q	0.005	0.007	0.003
	(0.001)***	0.002)***	(0.001)**
Cash/A	-0.116	-0.148	-0.084
	(0.009)***	(0.022)***	(0.015)***
AP/A	0.195	0.223	0.046
	(0.014)***	(0.027)***	(0.010)***
Ownership			
BGF	-0.038	-0.041	-0.043
	(0.015)**	(0.021)**	(0.024)*
IPF	-0.021	-0.021	-0.029
	(0.015)	(0.021)	(0.025)
FF	-0.015	-0.015	0.004
	(0.017)	(0.023)	(0.039)
Industry*Year	YES	YES	YES
N.Observations	28302	15068	8527
Adjusted R-squared	0.2863	0.2196	0.2390

Standard errors (clustered by firm) are within parentheses
***p<0.01; **p<0.05; *p<0.10

Looking at ownership, the results are consistent across all specifications: business group firms offer less trade credit, irrespective of whether they are constrained or unconstrained. The effect is however, quantitatively small. Based on the estimates in Col.(1), it is observed that an average business group firms extends trade credit that is roughly 0.04% points lower than that of an average state-owned firm.

As is well acknowledged, business group firms have multiple entities which enables them to sell their products through these channels. They do not need to 'hardsell' their products by offering trade credit.

In order to glean a better understanding of how different firms respond to a monetary contraction, we segregate the sample into two categories: unconstrained and constrained. Clearly enough, these two types of firms have divergent capital structures and efficiencies in raising funds, and therefore, their behaviour with regard to trade credit is likely to be different.

Towards this end, we classify firms into quartiles based on their Z-score. Firms in the topmost quartile are those which are unconstrained whereas those in the lowest quartile are the maximum constrained. The Z-score varies over time and across firms and in turn, impacts the access to institutional loans for firms, depending on their balance sheet and other criteria.

The results for the sub-categories are presented in Cols.(2) and (3) of Table III.2. The estimated coefficients on DZscore for constrained firms are typically the highest (in absolute terms), indicating that these firms exhibit the sharpest response by lowering trade credit. Even among constrained firms, the magnitude declines (in absolute terms) as we move from the least to the most distressed, such that constrained firms with better access to institutional loans (i.e., least distressed) exhibit the maximum cutback in trade credit. For example, if we consider the moderately distressed firms (DZscore 2) across both constrained and unconstrained categories, the coefficient for the former is 1.3 times of the latter, suggesting that constrained firms effect a sharper cutback in trade credit supply.

The direct response of a monetary contraction is in evidence only for unconstrained firms, although there is no discernible response of distressed firms in response to a monetary contraction. Intuitively, constrained firms are already stretched in terms of their finances; monetary policy therefore, appears to exert limited impact on this category as compared to unconstrained ones.

The control variables also provide interesting contrasts. Thus, while the response as per size and age for unconstrained firms is the same as for the overall sample, the response of constrained firms is the obverse. More specifically, bigger and older constrained firms tend to increase trade credit supply, perhaps in order to increase their market share in the face of a monetary contraction.

III.2 Demand for Trade Credit

The results in Table III.3 highlight the demand for trade credit and its determinants. The results in Col. (1) pertain to the entire sample, whereas those in Cols.(2) and (3) are conducted separately for unconstrained and constrained firms, respectively.

Table III.3: Demand for Trade Credit

	(1)	(2)	(3)
Firm distress variables	WS	UNCONS.	CONS.
DZscore1 (least distressed)	0.060	0.023	0.173
	(0.009)***	(0.009)***	(0.036)***
DZscore2	0.003	-0.012	0.011
	(0.006)	(0.006)*	(0.022)
DZscore3 (almost the maximum distressed)	-0.008	-0.015	0.024
	(0.005)	(0.005)***	(0.019)
Policy variables			
DTMP	0.012	0.019	-0.002
	(0.070)	(0.009)**	(0.019)
DTMP*DZscore1	0.006	0.010	-0.008
	(0.007)	(0.009)	(0.022)
DTMP*DZscore2	-0.012	-0.009	-0.010
	(0.005)**	(0.006)	(0.022)
DTMP*DZscore3	-0.005	-0.007	-0.027
	(0.005)	(0.006)	(0.024)
Controls			
Log Asset	-0.005	-0.004	-0.010
	(0.001)***	(0.002)**	(0.009)
Log Age	0.035	0.028	0.112
	(0.007)***	(0.008)***	(0.042)***
Tobin's Q	0.018	0.007	0.038
	(0.004)***	(0.002)***	(0.013)***
Cash/A	0.039	0.053	0.089
	(0.019)**	(0.035)	(0.066)
Inventory/A	0.169	0.092	0.193
	(0.021)***	(0.023)***	(0.074)***
LTD/A	-0.015	-0.021	0.031
	(0.016)	(0.016)	(0.043)
AR/A	0.371	0.212	0.499
	(0.024)***	(0.024)***	(0.098)***
Ownership			
BGF	0.022	0.018	0.055
	(0.017)	(0.017)	(0.069)
IPF	0.003	0.003	-0.003
	(0.017)	(0.018)	(0.058)
FF	0.012	0.027	-0.031
	(0.018)	(0.019)	(0.075)
Industry*Year	YES	YES	YES
N.Observations	28302	15068	8527
Adjusted R-squared	0.1366	0.1396	0.1006

Standard errors (clustered by firm) are within parentheses; ***p<0.01; **p<0.05; *p<0.10

The evidence indicates that less distressed firms use more trade credit during periods of tight monetary policy. Assuming that these firms are most likely to be able to access institutional loans, these results suggest that the substitution between institutional loans and trade credit is lower for the least distressed firms.

When monetary policy is tight, it is more likely that firms will seek recourse to internal sources of funds, owing to the paucity (or costly) of outside finance. The coefficient estimate of DTMP*DZscore2 is negative and statistically significant, indicating that less distressed firms are the ones that are able to access institutional loans during periods of contractionary monetary policy.

The aforesaid evidence would also suggest that the impact of a contractionary monetary policy is likely to vary across firms and as a result, investigating the results across firms with differing financial constraints might provide insightful results. Therefore, advancing this argument further, we explore the results separately for unconstrained and constrained firms.

In Col.(1), smaller firms with high growth opportunities rely more on trade credit as an external finance of finance. In fact, even older firms exhibit greater reliance on trade credit, possibly because age reflects the duration of the relationship between supplier and buyer.

How about the results across constrained and unconstrained firms? In Cols. (2) and (3), the coefficient on DZscore1 for constrained firms is 7-times that for unconstrained firms: constrained firms appear to depend more highly on trade credit as compared to unconstrained ones.

As opposed to this, the coefficients on the interaction terms - DZscore*DMTP - are not significant for either constrained or unconstrained firms. In other words, demand for trade credit is not significantly different during tight periods of monetary policy for either constrained or unconstrained firms. The net impact of firm distress under a monetary tightening (i.e., the sum of the estimated coefficients for Zscore and DZscore*DMTP, when significant) is much larger for constrained firms that unconstrained ones.

To exemplify, the coefficient on D*Zscore*1(1+DMTP) equals 0.023 for unconstrained as opposed to 0.173 for constrained firms. In effect, constrained firms depend more on trade credit as compared to unconstrained firms with the same level of distress.

The differences in the coefficients on the control variables for unconstrained and constrained firms are no less compelling. In fact, when significant, the magnitude of the coefficients for constrained firms are anywhere between 3- to 4-times as compared to similar magnitudes for unconstrained firms. For instance, the coefficient on Age is four times in magnitude for constrained as compared to unconstrained firms, and for adjusted Q, it is 5-times as large. In essence, older, high growth constrained firms are more dependent on trade credit, reflecting their greater recourse to external finance (current assets) as compared to unconstrained firms.

Expectedly, firms which hold more short-term assets (inventories) demand more trade credit and this magnitude is roughly double for constrained as compared to unconstrained firms.

III.3 Demand for Net Trade Credit

To complete the analysis, we also report results on the demand for net trade credit (trade credit demanded *minus* trade credit supplied). The results are consistent with those reported earlier.

The coefficient estimates on D*Zscore* become less negative as firms increasingly become more distressed, suggesting that the substitution between trade credit and institutional finance declines, the more distressed is the firm. To see this, note that the coefficient on D*ZScore1* for the whole sample is -0.11, while that on D*Zscore2* is -0.04, roughly one-third in magnitude as that obtaining for the least distressed.

When we sieve through these results for the constrained and unconstrained firms, we find similar results. However, the coefficient on *DZScore3* is not statistically significant in all cases, showing that firms that are most distressed do not have any major demand for trade credit.

Table III.3: Demand for Net Trade Credit

	(1)	(2)	(3)
Firm distress variables	WS	UNCONS.	CONS.
DZscore1 (least distressed)	-0.112	-0.080	-0.190
	(0.008)***	(0.011)***	(0.028)***
DZscore2	-0.042	-0.031	-0.037
	(0.007)***	(0.009)***	(0.021)*
DZscore3 (almost the maximum distressed)	-0.002	0.009	-0.011
	(0.006)	(0.005)	(0.021)
Policy variables			
DTMP	0.059	-0.017	0.009
	(0.061)	(0.010)*	(0.021)
DTMP*DZscore1	-0.007	0.007	0.025
	(0.008)	(0.011)	(0.024)
DTMP*DZscore2	0.015	0.024	0.024
	(0.006)**	(0.008)***	(0.023)
DTMP*DZscore3	0.006	0.014	-0.0002
	(0.007)	(0.007)**	(0.026)
Controls			
Log Asset	0.004	-0.002	0.009
	(0.001)***	(0.002)	(0.009)
Log Age	-0.032	-0.026	-0.109
	(0.007)***	(0.009)***	(0.041)***
Tobin's Q	-0.020	-0.010	-0.037
	(0.004)***	(0.003)***	(0.013)***
Cash/A	-0.074	-0.099	-0.071
	(0.018)***	(0.032)***	(0.065)
Ownership			
BGF	-0.039	-0.046	-0.074
	(0.019)**	(0.024)**	(0.068)
IPF	-0.013	-0.018	-0.006
	(0.019)	(0.024)	(0.057)
FF	-0.016	-0.034	0.038
	(0.022)	(0.026)	(0.079)
Industry*Year	YES	YES	YES
N.Observations	28302	15068	8527
Adjusted R-squared	0.1185	0.1202	0.0897

Standard errors (clustered by firm) are within parentheses
***p<0.01; **p<0.05; *p<0.10

As earlier, there is evidence of a trade credit channel for the moderately distressed firms: in response to a monetary contraction, these firms increase their trade credit demand and especially the unconstrained ones.

The results of the estimation process are set out in Table 11.[11] Col.(1) includes the estimated parameters for the whole sample (WS), while Cols.(2) and (3) provide the results for unconstrained (UNCONS) and constrained (CONS) firms, respectively.

To sum up this section, our results suggest the following.

First, for the whole sample, it is the distressed firms that increase their demand for trade credit under a monetary contraction.

Second, constrained firms with better access to institutional finance tend to rely less on trade credit, irrespective of the stance of

11 We employ panel data techniques with standard errors clustered at the firm level which is chosen based on Hausman test that suggests that fixed effects estimator is preferable to random effects because the regressors are shown to be correlated with the time-invariant firm-specific variables.

monetary policy. In other words, constrained but more distressed firms use more trade credit than unconstrained firms with similar distress levels.

Third, the larger estimates (in absolute terms) of access to institutional loans for constrained firms supports the fact that the financial structure of firms has an important role to play in explaining the use of trade credit.

Fourth, the results of the models from the supply side are buttressed from the demand side as well, indicating that the existence of a trade credit channel is as much relevant as that from the supply side.

Fifth, monetary policy does not appear to exert any discernible influence on the demand for trade credit by firms with varying degrees of financial constraints.

And finally, there exist substantial differences in the coefficients on the control variables for unconstrained and constrained firms when we examine the demand for net trade credit. The magnitude of the

coefficients for constrained firms much larger as compared to similar magnitudes for unconstrained firms. This would suggest that, as compared to unconstrained firms, constrained firms with comparable characteristics are much more reliant on trade credit.

IV. Trade Credit and Crisis

The next question we focus on is: how did the behavior of trade credit evolve during the crisis? To investigate this, we consider both trade credit supply and demand and focus on not only the whole sample, but also separately on unconstrained and constrained firms, respectively.

Our definition of crisis follows from a recent paper by Eichengreeen and Gupta (2013). In their analysis of the deposit behaviour of banks during the crisis, Eichengreen and Gupta (2013) show that there was a flight of deposits away from private banks and towards state-owned banks during the crisis. We define the variable *Crisis* akin to their analysis. Accordingly, *Crisis* equals one for the years 2008-10, else zero. We interact this variable with DMTP and Z*Score* for each of the

firm distress categories and examine the response. Table Ⅲ.4 reports the results.

Firms generally lowered the supply of trade credit: the coefficients on D*Zscore* for the entire sample as well as for both unconstrained and constrained firms are negative and significant at conventional levels. Additionally, the crisis lowered the supply of trade credit: for the entire sample, the supply of credit was on average lower by 0.009% points as compared to non-crisis period.

Table III.4: Trade Credit and Crisis

	Dependent variable = AR/A			Dependent variable=AP/A		
	(1)	(2)	(3)	(4)	(5)	(6)
Firm distress variables	WS	UNCONS	CONS.	WS	UNCONS	CONS
DZscore1 (least distressed)	-0.142	-0.082	-0.140	0.060	0.024	0.168
	(0.005)***	(0.007)***	(0.009)***	(0.009)***	(0.008)***	(0.032)***
DZscore2	-0.082	-0.057	-0.071	-0.005	-0.015	0.014
	(0.004)***	(0.005)***	(0.010)***	(0.005)	(0.005)***	(0.019)
DZscore3 (almost the maximum distressed)	-0.028	-0.009	-0.022	-0.010	-0.016	0.018
	(0.004)***	(0.004)**	(0.009)***	(0.003)***	(0.004)***	(0.014)
Crisis	-0.009	-0.013	-0.012	0.009	0.014	0.014
	(0.003)***	(0.003)***	(0.006)**	(0.003)***	(0.004)***	(0.015)
Policy variables						
DTMP	-0.006	-0.005	0.001	0.005	0.006	0.0009
	(0.002)***	(0.002)**	(0.005)	(0.002)**	(0.002)***	(0.011)
DTMP*DZscore1*Crisis	-0.004	0.006	-0.008	0.006	0.026	0.003
	(0.004)	(0.009)	(0.007)	(0.007)	(0.011)***	(0.017)
DTMP*DZscore2*Crisis	0.007	0.009	0.007	-0.012	-0.017	-0.041
	(0.004)**	(0.006)	(0.009)	(0.005)***	(0.006)***	(0.017)**
DTMP*DZscore3*Crisis	0.013	0.008	0.014	-0.014	-0.026	-0.046
	(0.005)***	(0.006)	(0.015)	(0.006)***	(0.005)***	(0.026)*
Controls	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Ownership						
BGF	-0.036	-0.037	-0.038	0.021	0.019	0.063
	(0.015)**	(0.021)*	(0.026)	(0.017)	(0.017)	(0.069)
IPF	-0.019	-0.018	-0.025	0.004	0.004	0.009
	(0.016)	(0.022)	(0.026)	(0.017)	(0.017)	(0.059)
FF	-0.012	-0.008	0.004	0.012	0.028	-0.019
	(0.018)	(0.024)	(0.039)	(0.018)	(0.018)	(0.075)
Industry FE	YES	YES	YES	YES	YES	YES
N.Observations	28302	15068	8527	28302	15068	8527
Adjusted R-squared	0.2259	0.1737	0.2003	0.1304	0.1329	0.0842

Standard errors (clustered by firm) are within parentheses
***p<0.01; **p<0.05; *p<0.10

Our coefficients of interest are DTMP and the interaction terms. In Col.(1), the coefficient on DMTP is negative and significant with a

point estimate of -0.006. In other words, a contractionary monetary policy lowers trade credit supply.

On the other hand, the coefficients DMTP*D*Zscore2*Crisis* and DMTP*D*Zscore3*Crisis* are both positive and significant, so that a contractionary monetary policy raised the supply of trade credit during the crisis, entailing a net effect of 0.001% points (for moderately distressed firms) and 0.007% points (for almost the maximum distressed firms). Intuitively, the greater the firm distress, the less the likelihood of its ability to access outside finance, so that the more it will be inclined to provide sops to its suppliers to ensure its cash flows.

As compared to this, the coefficients on DTMP**DZscore2*Crisis* and DTMP**DZscore3*Crisis* are statistically significant and negative in the trade credit demand equation. In essence, this means that during the crisis, the more distressed firms lowered their trade credit demand in response to a monetary contraction, irrespective of their capital structure. The magnitude of the coefficient for constrained firms is 2-3 times higher as that for unconstrained ones (See, Cols. 5-6). Since

constrained firms do not have easy access to institutional loans, bank credit and trade credit are the main alternative financing channels for these entities. During the crisis, constrained firms are likely to be particularly disadvantaged by credit crunch owing to the high costs of short-term finance and the resultant difficulties in rolling it over. As a result, they tended to lower their dependence on trade credit.

V. Trade credit and firm ownership

Notwithstanding the existence of a manifold of studies on trade credit, there are admittedly very few studies that focus on the interlinkage between firm ownership and trade credit. In perhaps the only study on this aspect for India, Love and Martinez Peria (2005) undertakes univariate analysis and finds that foreign firms use more trade credit as compared to other firm ownership categories (government owned or Indian private firms). This, the authors argue, could be owing to the availability of trade credit for these firms from their foreign parent.

The present study extends previous research in several directions. First, we employ a much recent period than those utilized in previous

research. For instance, as compared to the period 1994-2003 as employed by Love and Martinez Peria (2005) we employ the period 1993-2012. Second, we employ a sample of over 8000 manufacturing firms as compared with 6000 firms, that constituted the Love and Martinez Peria (2005) sample.

Third, in addition to univariate analysis as in Love and Martinez Peria (2005), we also use multivariate regressions to examine whether firm ownership matters for trade credit. And finally, we examine whether the recent financial crisis impacted trade credit through its interaction with firm ownership.

The results in Table III.5 reveal the following. First, trade credit supply (account payables) is the highest for foreign firms and the lowest for business group entities. The magnitudes are broadly similar to those reported by Love and Martinez Peria (2005) in their analysis of financing structure for Indian firms. Second, demand for trade credit is the highest for foreign firms and the lowest for business group entities. As observed by Love and Matrinez Peria (2005), the higher

dependence on trade credit for foreign firms could be owing to their foreign parent.

Table III.5: Trade credit by firm ownership

Panel A **Entire period**	BGF		IPVT	FF	SOF
AR/A	0.157 (0.145)		0.174 (0.158)	0.193 (0.151)	0.187 (0.168)
AP/A	0.242 (2.671)		0.254 (5.223)	0.581 (6.687)	0.325 (1.843)
t-test of difference	AR/A	AP/A			
BGF vs. IPVT	15.33***	-0.46			
BGF vs. FF	-13.79***	-3.09***			
BGF vs. SOF	-8.97***	-2.09**			
IPVT vs. FF	-7.54***	-2.96***			
IPVT vs. SOF	-4.08***	-1.68*			
FF vs. SOF	1.35	2.24**			
Panel B **Crisis period**					
AR/A	0.138 (0.154)		0.169 (0.168)	0.177 (0.157)	0.171 (0.181)
AP/A	0.329 (3.481)		0.358 (7.752)	1.086 (9.889)	0.282 (1.074)
t-test of difference	AR/A	AP/A			
BGF vs. IPVT	-11.37***	-0.34			
BGF vs. FF	-5.99***	-1.96**			
BGF vs. SOF	-3.82***	0.70			
IPVT vs. FF	-1.47	-1.87*			
IPVT vs. SOF	-0.37	0.89			
FF vs. SOF	-0.59	2.08**			
Panel C **Non-crisis period**					
AR/A	0.162 (0.142)		0.175 (0.155)	0.196 (0.149)	0.191 (0.164)
AP/A	0.219 (2.424)		0.227 (4.304)	0.473 (5.784)	0.335 (1.975)
t-test of difference	AR/A	AP/A			
BGF vs. IPVT	-10.88***	-0.26			
BGF vs. FF	-12.19***	-2.43***			
BGF vs. SOF	-7.99***	-2.50***			
IPVT vs. FF	-7.78***	-2.35***			
IPVT vs. SOF	-4.49**	-2.29**			
FF vs. SOF	1.17	1.25			
Panel D **Non-crisis vs. Crisis period**					
	Crisis	Non-crisis			
AR/A	0.161 (0.165)	0.172 (0.151)			

AP/A	0.374 (6.796)	0.238 (3.876)	
t-test of difference			
AR/A	-8.84***		
AP/A	2.63***		
Panel E **Post-crisis**			
AR/A	0.160 (0.163)		
AP/A	0.220 (2.204)		
t-test of difference	Crisis vs. Post-crisis		
AR/A	0.047		
AP/A	2.81***		

***p<0.01; **p<0.05; *p<0.10

There also appears to exist significant differences in trade credit dependence across firm ownership. By way of example, supply of trade credit by foreign firms for the entire period was 0.19 as compared to 0.16 for business group entities. Likewise, trade credit demand by foreign firms at 0.58 was over double the amount recorded for group firms. These differences – both for supply as well as demand – are statistically significant at conventional levels.

Trade credit dependence appears to have been significantly lowered during the crisis. To see this, note that account payable for foreign firms during the crisis was 0.18 as compared to 0.19 during non-crisis years. The differences across firm ownership are observed to be statistically significant in most cases.

Overall trade credit supply during the non-crisis period was around 7% higher as compared to crisis period (Panel D). 0.172 As opposed to this, trade credit demand was nearly 60% higher during the crisis, indicating the possible mismatch between demand and supply during the crisis period. These differences, for both demand and supply are statistically significant at the 0.01 level.

Trade credit demand appears to have significantly dampened after the crisis (Panel E). For example, trade credit demand after the crisis stood at 0.22 as compared to 0.37 during the crisis. This is consistent with Love and Zaidi (2010) who report that, since the cost of credit increases (since firms offer higher discounts on cash repayments after the crisis), trade credit use becomes more expensive, leading to a fall in demand.

The balance of evidence indicates significant differences in trade credit dependence across firm ownership. To explore this further, we conduct multivariate regressions, where we regress trade credit supply (resp., trade credit demand) on the set of control variables as

in the baseline regressions, including dummies for crisis and periods of contractionary monetary policy.[12] Our coefficients of interest in these regressions lies in the interactive terms – DTMP*D*Zscore***Crisis**OWN (D*ZScore*=1,2,3 and OWN=BGF, IPVT and FF). Provided a monetary contraction impels firms belonging to a particular ownership and distress category to increase trade credit supply during the crisis, we would expect it to have a positive coefficient. The results are reported in Table III.6.

In Table III.6, the coefficient on DMTP is negative and significant in Cols. (1) and (2), and positive and significant in Cols.(4) and (5). In other words, a monetary contraction lowers the supply of trade credit, while raising the demand for it, since firms might find it difficult to access other alternate financing sources.

[12] For purposes of brevity, we do not report the coefficients on these variables.

Table III.6: Trade Credit, Ownership and Crisis

	Dependent variable = AR/A			Dependent variable=AP/A		
	(1)	(2)	(3)	(4)	(5)	(6)
Firm distress variables	WS	UNCONS	CONS.	WS	UNCONS	CONS
DZscore1 (least distressed)	-0.142	-0.082	-0.141	0.049	0.021	0.141
	(0.005)***	(0.007)***	(0.009)***	(0.008)***	(0.008)***	(0.027)***
DZscore2	-0.082	-0.057	-0.072	-0.011	-0.018	0.003
	(0.004)***	(0.005)***	(0.010)***	(0.005)**	(0.005)***	(0.017)
DZscore3 (almost the maximum distressed)	-0.027	-0.009	-0.032	-0.014	-0.018	0.011
	(0.004)***	(0.004)**	(0.010)***	(0.003)***	(0.004)***	(0.013)
Crisis	-0.008	-0.012	-0.013	0.004	0.012	0.004
	(0.002)***	(0.003)***	(0.006)**	(0.003)	(0.004)***	(0.015)
Policy variables						
DTMP	-0.005	-0.005	0.001	0.002	0.006	-0.003
	(0.002)***	(0.002)**	(0.005)	(0.002)*	(0.002)***	(0.011)
DTMP*DZscore1*Crisis*BGF	0.013	0.015	-0.007	-0.107	0.110	-0.192
	(0.007)*	(0.014)	(0.009)	(0.009)***	(0.015)***	(0.039)***
DTMP*DZscore2*Crisis*BGF	0.0008	0.007	0.002	-0.013	-0.016	-0.045
	(0.005)	(0.007)	(0.014)	(0.007)*	(0.007)***	(0.032)
DTMP*DZscore3*Crisis*BGF	0.0006	-0.0001	0.035	-0.009	-0.019	-0.009
	(0.007)	(0.008)	(0.047)	(0.008)	(0.007)***	(0.096)
DTMP*DZscore1*Crisis*IPVT	-0.015	-0.007	-0.008	-0.114	-0.130	-0.159
	(0.005)***	(0.015)	(0.008)	(0.009)***	(0.014)***	(0.026)***
DTMP*DZscore2*Crisis*IPVT	0.013	0.014	0.015	-0.005	-0.011	-0.026
	(0.006)**	(0.009)	(0.012)	(0.007)	(0.008)	(0.021)
DTMP*DZscore3*Crisis*IPVT	0.016	0.016	0.008	-0.009	-0.027	-0.035
	(0.006)***	(0.008)**	(0.016)	(0.006)	(0.007)***	(0.023)
DTMP*DZscore1*Crisis*FF	-0.010	-0.097	0.020	0.784	0.765	0.785
	(0.032)	(0.033)***	(0.050)	(0.026)***	(0.048)***	(0.062)***
DTMP*DZscore2*Crisis*FF	-0.031	-0.024	-0.092	0.008	0.003	0.009
	(0.016)*	(0.020)	(0.046)**	(0.022)	(0.025)	(0.055)
DTMP*DZscore3*Crisis*FF	-0.009	-0.006	-0.045	-0.011	-0.033	-0.172
	(0.017)	(0.020)	(0.096)	(0.013)	(0.014)**	(0.109)
Controls	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Ownership						
BGF	-0.036	-0.038	-0.038	0.022	0.024	0.056
	(0.016)**	(0.022)*	(0.027)	(0.016)	(0.016)	(0.068)
IPF	-0.019	-0.019	-0.025	0.007	0.011	0.004
	(0.016)	(0.022)	(0.026)	(0.017)	(0.017)	(0.059)
FF	-0.010	-0.007	0.004	0.014	0.034	-0.027
	(0.019)	(0.024)	(0.038)	(0.018)	(0.017)**	(0.074)
Industry FE	YES	YES	YES	YES	YES	YES
N.Observations	28302	15068	8527	28302	15068	8527

Adjusted R-squared	0.2265	0.1744	0.2007	0.2184	0.1729	0.2223

Standard errors (clustered by firm) are within parentheses
***p<0.01; **p<0.05; *p<0.10

The coefficients of interest are the four-way interaction terms. For the whole sample (Col. 1), the coefficient DTMP*D*ZScore***Crisis**BGF is positive and significant with a point estimate equal to 0.013. As compared to this, DTMP**D*ZScore***Crisis**IPVT is negative and significant with a point estimate equal to -0.015. These numbers are broadly equal in magnitude, although with opposite signs. This suggests that, during the crisis, a monetary contraction impacts firms *with the same levels of financial distress* across ownership differentially: raising the supply of trade credit by business group firms, while lowering supply by Indian private firms.

One possible reason could be the existence of an 'internal capital market' for business group firms (Gopalan *et al*, 2007) so that the trade credit available to these firms comes from other entities belonging to the same group.

As compared to this, demand for trade credit during the crisis appears to have declined significantly for business group and Indian private firms, while increasing significantly for foreign firms (Col.4).

Evidence proffered by Love *et al.* (2007) suggests that crisis-related events are likely to compel distressed firms to reduce their supply of credit to customers, while at the same time, increasing their own use of credit from suppliers. Our analysis complements these findings by indicating that this response of contraction in trade credit supply and an increase in trade credit demand is not likely to be uniform across firm ownership.

A related question of interest is: how did the response differ across firms with varying levels of financial distress? To explore this further, we repeat the analysis, separately for unconstrained and constrained firms, respectively.

While there appears to be no impact on trade credit supply, what is important is to note that there has been a significant increase in trade credit demand, especially by less distressed firms, although this

response differed across constrained and unconstrained firms. For instance, the least-distressed foreign firms across both constrained and unconstrained categories increased trade credit demand by broadly similar magnitudes (Cols.5 and 6), whereas private firms – both constrained and unconstrained - with the lowest distress levels lowered their trade credit demand, the magnitudes of which are also roughly similar in magnitude.

The exception to this was the business group entities. Whereas the constrained business group firms lowered their trade credit demand, the unconstrained business group firms actually increased their trade credit demand. One possible way to interpret these findings could be as follows. In the chaos of a crisis, everybody stops paying back their trade credit debt and even customers of these firms become less willing to accept more trade credit.

VI. Trade credit and firm characteristics

The analysis would suggest that trade credit dependence could differ across ownership and during the crisis. It is also possible that the dependence on trade credit could differ across firm characteristics.

We consider three firm-level characteristics: size, leverage and profitability.

Small firms with limited reputational collateral could well find it difficult to obtain trade credit. In a similar vein, if leverage acts as a constraint, then leveraged firms will demand more trade credit. As opposed to this, if leverage is an indicator of borrowing capacity (Dedola and Lippi, 2005), then firms might trade-off relatively expensive trade credit with bank credit. Third, expecting possible weaknesses, suppliers might be less inclined to extend trade credit to less profitable firms. On the other hand, provided profitable firms have higher future sales growth, extension of trade credit to these firms is likely to be higher.

To investigate this systematically, we classify firms based on size, leverage and profitability and consider the top and bottom 25 percentile of firms under each characteristic. Clearly, the top 25 percentile of firms by size would be the largest; the top 25 by leverage would be the most levered and finally, the top 25 by profitability would be the most profitable firms. A reverse logic

applies to firms belonging to the bottom 25 percentile. We run regressions as earlier, separately for the two percentile for each characteristic. The results are set out in Tables III.7 (trade credit supply) and III.8 (trade credit demand).

Table III.7: Trade Credit Supply and Firm Characteristics

	Dependent variable = AR/A					
	Size		Leverage		Profitability	
	(1)	(2)	(3)	(4)	(5)	(6)
Firm distress variables	Top 25	Bottom 25	Top 25	Bottom 25	Top 25	Bottom 25
DZscore1 (least distressed)	-0.076	-0.148	-0.091	-0.132	-0.070	-0.133
	(0.009)***	(0.013)***	(0.011)***	(0.011)***	(0.028)***	(0.049)***
DZscore2	-0.054	-0.079	-0.078	-0.057	-0.061	-0.071
	(0.007)***	(0.014)***	(0.010)***	(0.012)**	(0.009)***	(0.050)
DZscore3 (almost the maximum distressed)	-0.0057	-0.014	-0.021	-0.017	-0.023	-0.033
	(0.007)	(0.015)	(0.011)*	(0.011)	(0.006)***	(0.062)
Policy variables						
DTMP	-0.012	0.006	-0.008	0.021	-0.007	0.009
	(0.007)	(0.012)	(0.009)	(0.009)***	(0.005)	(0.062)
DTMP*DZscore1	0.007	0.004	0.006	0.003	-0.032	0.006
	(0.009)	(0.013)	(0.012)	(0.009)	(0.040)	(0.062)
DTMP*DZscore2	0.017	0.013	0.009	0.005	0.012	0.002
	(0.006)***	(0.013)	(0.011)	(0.011)	(0.011)	(0.062)
DTMP*DZscore3	0.009	-0.022	-0.006	-0.009	0.004	-0.007
	(0.007)	(0.013)	(0.013)	(0.013)	(0.006)	(0.079)
Controls	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Ownership						
BGF	-0.029	-0.042	-0.063	-0.023	-0.020	-0.043
	(0.019)	(0.027)	(0.035)*	(0.019)	(0.022)	(0.018)***
IPF	-0.019	-0.029	-0.042	-0.017	-0.007	-0.030
	(0.019)	(0.025)	(0.034)	(0.018)	(0.022)	(0.020)
FF	-0.011	-0.005	-0.055	0.008	0.009	-0.028
	(0.021)	(0.037)	(0.039)	(0.021)	(0.023)	(0.024)
Industry*Year FE	YES	YES	YES	YES	YES	YES
N.Observations	13673	9105	7214	10152	8011	9121
Adjusted R-squared	0.2350	0.2271	0.1796	0.2040	0.1731	0.1635

Standard errors (clustered by firm) are within parentheses
***p<0.01; **p<0.05; *p<0.10

Table III.8: Trade Credit Demand and Firm Characteristics

	Dependent variable = AP/A					
	Size		Leverage		Profitability	
	(1)	(2)	(3)	(4)	(5)	(6)
Firm distress variables	Top 25	Bottom 25	Top 25	Bottom 25	Top 25	Bottom 25
DZscore1 (least distressed)	0.013	0.169	0.048	0.162	0.061	0.084
	(0.009)	(0.038)***	(0.013)***	(0.036)***	(0.050)	(0.063)
DZscore2	-0.018	0.009	0.019	0.017	0.003	-0.068
	(0.007)***	(0.026)	(0.008)**	(0.020)	(0.012)	(0.059)
DZscore3 (almost the maximum distressed)	-0.019	0.014	0.006	0.012	-0.021	-0.063
	(0.006)***	(0.022)	(0.009)	(0.018)	(0.005)***	(0.065)
Policy variables						
DTMP	0.006	-0.008	0.001	0.002	0.011	-0.064
	(0.007)	(0.024)	(0.009)	(0.017)	(0.005)**	(0.071)
DTMP*DZscore1	0.011	0.013	0.028	0.012	0.084	0.071
	(0.009)	(0.026)	(0.014)**	(0.019)	(0.081)	(0.072)
DTMP*DZscore2	-0.004	-0.003	-0.002	-0.015	-0.002	0.064
	(0.006)	(0.029)	(0.009)	(0.018)	(0.014)	(0.072)
DTMP*DZscore3	0.0006	-0.026	0.002	-0.011	0.0008	0.114
	(0.006)	(0.026)	(0.010)	(0.020)	(0.006)	(0.089)
Controls	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Ownership						
BGF	0.033	0.017	0.014	0.072	0.0003	0.036
	(0.015)**	(0.075)	(0.029)	(0.027)***	(0.017)	(0.042)
IPF	0.019	-0.036	-0.017	0.057	-0.008	-0.002
	(0.015)	(0.068)	(0.028)	(0.024)***	(0.017)	(0.039)
FF	0.048	-0.102	-0.022	0.025	0.011	-0.006
	(0.017)***	(0.081)	(0.032)	(0.025)	(0.018)	(0.049)
Industry*Year FE	YES	YES	YES	YES	YES	YES
N.Observations	13673	9105	7214	10152	8011	9121
Adjusted R-squared	0.1687	0.1148	0.1260	0.1007	0.1137	0.0988

Standard errors (clustered by firm) are within parentheses
***p<0.01; **p<0.05; *p<0.10

Across all categories, there appears to be a significant decline in trade credit supply by firms across levels of financial distress, the magnitude

of which declines as one graduate towards more distressed firms. Intuitively, the lower the distress across any firm characteristic, the better the possibility of access to institutional finance, in turn, lowering the extent of possible distress.

VII. Trade Credit and Bank Credit

In Tables III.9, we run a 2SLS on bank credit and accounts receivables and a set of control variables. The findings suggest that bank credit and accounts receivables are simultaneously determined and positively related. An increase in bank credit leads to an increase in accounts receivables. In other words, it implies a complementary effect between bank loan and accounts payables.

The magnitudes of the coefficients are economically important, as well. To see this, note that the coefficient on AR/A in Table III.9 equals 0.26, so that a 10% increase in accounts payables raises bank credit by roughly 2.5% points. As compared to this, the coefficient on BKBRG/A is 0.07, indicating that an increase in bank borrowings by 10% improves accounts payables by less than 1% point. In other

words, accounts payables exerts a pronounced impact on bank borrowings and not *vice versa*.

Likewise, in Table III.10, accounts payables and bank loans are simultaneously determined and positively related. Therefore, an increase in bank credit helps to build up accounts payables. As earlier, it implies a complementary effect between bank credit and accounts payables. Although the magnitudes are lower than in the previous specification, they are directionally similar: the impact of accounts payables on bank credit is four-times the magnitude that of bank credit on accounts payable.

Table III.9: Trade Credit Supply, Bank Credit and Crisis

Dependent variable	AR/A	BKBRG/A	AR/A	BKBRG/A	AR/A	BKBRG/A
	(1)	(2)	(3)	(4)	(5)	(6)
	Whole sample		Unconstrained firms		Constrained firms	
BKBRG/A	0.072		0.003		0.012	
	(0.004)***		(0.001)***		(0.004)***	
(BKBRG/A)*Crisis	0.006		-0.005		0.077	
	(0.009)		(0.001)***		(0.026)***	
AR/A		0.258		0.302		0.074
		(0.012)***		(0.094)***		(0.035)**
(AR/A)*Crisis		0.001		-0.679		0.058
		(0.021)		(0.201)***		(0.068)
DZscore1 (least distressed)	-0.142	0.124	-0.080	0.298	-0.142	0.049
	(0.002)***	(0.004)***	(0.003)***	(0.034)***	(0.005)***	(0.016)***
DZscore2	-0.073	0.060	-0.046	0.079	-0.064	0.029
	(0.002)***	(0.004)***	(0.003)***	(0.028)***	(0.006)***	(0.016)*
DZscore3 (almost the maximum distressed)	-0.023	0.024	-0.004	0.048	-0.029	0.006
	(0.002)***	(0.004)***	(0.003)	(0.027)*	(0.007)***	(0.019)
Crisis	-0.008	0.006	-0.015	0.227	-0.017	-0.061
	(0.002)***	(0.003)*	(0.003)***	(0.037)***	(0.004)***	(0.011)***
Policy variables						
DTMP	-0.005	0.009	-0.007	0.029	0.002	-0.007
	(0.001)***	(0.003)***	(0.002)***	(0.019)	(0.004)	(0.009)
DTMP*DZscore1*Crisis*(BKBRG/A)	-0.013		0.0009		-0.064	
	(0.011)		(0.004)		(0.028)**	
DTMP*DZscore2*Crisis*(BKBRG/A)	-0.042		0.024		0.089	
	(0.014)***		(0.016)		(0.042)**	
DTMP*DZscore3*Crisis*(BKBRG/A)	0.025		0.079		-0.011	
	(0.016)		(0.019)***		(0.059)	
DTMP*DZscore1*Crisis*(AR/A)		0.048		0.652		-0.009
		(0.045)		(0.390)*		(0.118)
DTMP*DZscore2*Crisis*(AR/A)		-0.054		-0.162		-0.054
		(0.038)		(0.340)		(0.112)
DTMP*DZscore3*Crisis*(AR/A)		0.073		0.019		0.057
		(0.032)**		(0.259)		(0.122)
Controls	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Ownership						
BGF	-0.038	0.037	-0.039	0.057	-0.041	-0.006
	(0.005)***	(0.009)***	(0.006)***	(0.062)	(0.014)***	(0.037)
IPF	-0.024	0.087	-0.018	0.071	-0.025	0.041
	(0.005)***	(0.009)***	(0.006)***	(0.064)	(0.013)*	(0.035)
FF	0.009	-0.009	-0.015	0.034	0.006	-0.052
	(0.005)*	(0.009)	(0.007)**	(0.069)	(0.018)	(0.047)

Industry FE	YES	YES	YES	YES	YES	YES
N.Observations	28302	28302	15068	15068	8527	8527
R-squared	0.3006	0.1557	0.2399	0.1027	0.2295	0.1440

Standard errors (clustered by firm) are within parentheses

***p<0.01; **p<0.05; *p<0.10

Table III.10: Trade Credit Demand, Bank Credit and Crisis

Dependent variable	AP/A	BKBRG/A	AP/A	BKBRG/A	AP/A	BKBRG/A
	(1)	(2)	(3)	(4)	(5)	(6)
	Whole sample		Unconstrained firms		Constrained firms	
BKBRG/A	0.021		0.003		-0.018	
	(0.006)***		(0.001)***		(0.012)	
(BKBRG/A)*Crisis	-0.051		0.002		-0.159	
	(0.013)***		(0.002)		(0.077)**	
AP/A		0.085		0.209		0.037
		(0.009)***		(0.095)**		(0.012)***
(AP/A)*Crisis		-0.075		1.542		-0.041
		(0.018)***		(0.208)***		(0.026)*
DZscore1 (least distressed)	0.049	0.085	0.027	0.263	0.131	0.027
	(0.004)***	(0.004)***	(0.003)***	(0.033)***	(0.017)***	(0.014)**
DZscore2	-0.012	0.038	-0.016	0.113	-0.014	0.019
	(0.003)***	(0.004)***	(0.003)***	(0.028)***	(0.018)	(0.016)
DZscore3 (almost the maximum distressed)	-0.014	0.018	-0.019	0.086	0.0003	0.002
	(0.003)***	(0.004)***	(0.003)***	(0.027)***	(0.020)	(0.018)
Crisis	0.013	0.006	0.013	-0.075	0.021	-0.053
	(0.003)***	(0.003)*	(0.003)***	(0.035)**	(0.011)*	(0.010)***
Policy variables						
DTMP	0.003	0.009	0.006	0.031	-0.007	-0.008
	(0.002)	(0.003)***	(0.002)***	(0.019)	(0.011)	(0.009)
DTMP*DZscore1*Crisis*(BKBRG/A)	0.079		0.012		0.128	
	(0.016)***		(0.004)***		(0.085)	
DTMP*DZscore2*Crisis*(BKBRG/A)	0.038		-0.023		0.166	
	(0.019)**		(0.016)		(0.124)	
DTMP*DZscore3*Crisis*(BKBRG/A)	-0.022		-0.074		0.041	
	(0.022)		(0.019)***		(0.173)	
DTMP*DZscore1*Crisis*(AP/A)		0.048		1.375		0.035
		(0.045)		(0.279)***		(0.029)
DTMP*DZscore2*Crisis*(AP/A)		-0.054		-1.113		0.083
		(0.038)		(0.363)***		(0.129)
DTMP*DZscore3*Crisis*(AP/A)		0.073		-0.995		0.093
		(0.032)**		(0.332)***		(0.122)
Controls	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Ownership						
BGF	0.021	0.037	0.022	0.049	0.064	-0.010
	(0.007)***	(0.009)***	(0.006)***	(0.062)	(0.041)	(0.037)
IPF	0.004	0.087	0.006	0.076	0.007	0.038
	(0.007)	(0.009)***	(0.006)	(0.063)	(0.039)	(0.035)
FF	0.011	-0.009	0.029	0.035	-0.020	-0.049
	(0.007)	(0.009)	(0.007)***	(0.069)	(0.052)	(0.047)

Industry FE	YES	YES	YES	YES	YES	YES
N.Observations	28302	28302	15068	15068	8527	8527
R-squared	0.1431	0.1393	0.1630	0.1307	0.0943	0.0442

Standard errors (clustered by firm) are within parentheses
***p<0.01; **p<0.05; *p<0.10

As earlier, a relevant issue in this context is how did this behavior evolve during the crisis? In Table III.9, the coefficient on the interactive terms (BKBRG/A)**Crisis* and (AR/A)**Crisis* are both insignificant, implying that bank credit did not influence trade credit supply during the crisis in any significant manner.

As compared to this, in Table III.10, the coefficients (BKBRG/A)**Crisis* and (AP/A)**Crisis* are both negative and statistically significant at the 0.01 level. In other words, although bank credit and accounts payables are complementary, during the crisis, an increase in bank credit was accompanied by a decline in accounts payable and *vice versa*. In effect, although an increase in bank credit helps to build up accounts payables, during the period of crisis, the reduced demand for bank credit led to a concomitant decline in accounts payable.

A natural question to ask in this context is: did this response differ across unconstrained and constrained firms? Tables III.9 and III.10

report regressions separately for these two categories. As regards accounts receivables (Table III.9), the results for both unconstrained and constrained firms are akin to those obtained for the entire sample: accounts receivables increases bank credit and *vice versa*.

The only difference is that the coefficient on bank borrowings for constrained firms is significantly larger in magnitude (0.012 vs. 0.003) as compared to that for unconstrained firms. Economically, bank credit exerts a much larger effect on the supply of trade credit for constrained firms, because the latter are likely to be particularly disadvantaged because of increased costs of short-term debt and the resultant difficulties in rolling it over.

In contrast, in case of trade credit demand, while bank credit and accounts payables are complementary for unconstrained firms, bank credit does not affect accounts payables for constrained firms, suggesting that the difficulty of constrained firms in accessing bank credit does not influence their trade credit demand.

In sum, the evidence suggests that bank credit and trade credit are complementary, with each tending to reinforce the other. During the crisis however, bank credit and accounts payable were substitutes to each other.

VIII. Concluding Remarks

The Chapter discusses the empirical results of the trade credit channel of monetary policy and several robustness tests. The balance of evidence appears to support the existence of a trade credit channel of monetary policy in the Indian context. Robustness tests of the baseline results lend credence to these findings.

Chapter IV: Conclusions

This Chapter highlights some of the salient features of our study and syncopates the issues arising from the analysis, with emphasis on the Indian scenario.

A significant volume of research has focused on the external funding for firms. In this context, bank lending has been widely touted as an important channel of monetary policy transmission. However, several studies have failed to uncover the existence of a bank lending channel.

For example, employing data on German firms to study firm-bank relationships, Harhoff and Korting (1998) found that firms with long-lasting lending relationships are able to forego fast payment discounts offered by their suppliers. Likewise, in case of Austrain firms, Valderrama (2003) shows that these firms are able to lower their dependence on internal finance by using trade credit.

As Matutes (2005) remarks, these models infer that the presence of trade credit could explain why there has been no conclusive proof of

a bank-lending channel. These findings would suggest that the trade credit channel is likely to dampen the effects of contractionary monetary policies and make the recessions that generally follow such policies less severe.

In general, these works uncover evidence that larger firms with access to capital markets extend more trade credit. Additionally, the results also indicate that credit constrained firms increase their demand for trade credit during periods of monetary contraction. In doing so, the small firms do not voluntarily cut back on bank loans, but instead, switch to a less desirable alternative. This implies that there is a shock on the bank loan-supply side. Therefore, ignoring trade credit during tight monetary periods may explain the lack of consistent evidence for the importance of the bank-lending channel.

Towards this end, we introduce a comprehensive framework that explores the trade credit channel, from the standpoint of both supply (accounts receivables) and demand (accounts payables) sides. The level of financial constraints that firms encounter is likely to vary over the business cycles, which will, in turn, affect their decisions to offer or

use trade credit. Recognizing this possibility, we categorize the firms as either financially constrained or unconstrained, using an index of financial constraint that has been proposed in the literature.

Accordingly, the analysis exploited annual data on Indian firms for the period of 1993-2012 to explore the relevance and existence of a trade credit channel, especially when borrowing from financial institutions is difficult to obtain.

In our view, the study makes several contributions to the literature on trade credit.

The first and foremost contribution is the uncovering of an important channel of monetary policy, an area not adequately addressed in prior empirical research for India. Although the studies on the transmission mechanism of monetary policy in the Indian context is not new (Al Mashat, 2003; Singh and Kalirajan, 2007; Patra and Kapur, 2010; Mohanty, 2012), no prior research in India has focused exclusively on the existence of a trade credit channel of monetary policy.

Second, this study contributes to the literature by coming up with innovative variables within an empirical setup to estimate the determinants of trade credit, from both the demand and supply sides. While several studies on this aspect (e.g. Petersen and Rajan, 1997; McMillan and Woodruff, 1999; Cuñat, 2007; Fisman and Raturi, 2004; Van Horen, 2005 and 2007; Giannetti et al., 2008) have examined the determinants of trade credit, very few have admittedly done a careful investigation of understanding the monetary transmission channel using trade credit. We employ panel data techniques, so as to better understand the trade credit channel from the standpoint of both the demanders and suppliers.

Third, we classify firms based on their financing constraints, employing prior research that is grounded in microeconomic underpinnings. By isolating the demand and supply sides, we contribute to the literature by showing that the factors that affect trade credit demand are different from the factors that affect trade credit supply.

Fourth, it is often been argued that the demand for, and supply of trade credit is likely to evolve over the business cycle, depending on

firm-specific and other relevant macroeconomic considerations. The financing constraint that the firm encounters has an important role to play in this respect. However, systematic empirical investigation as to whether such behaviour is actually manifested in reality has been a moot issue. Our analysis contributes to the existing literature by providing evidence on the role of the trade credit for constrained and unconstrained firms. The analysis appears to suggest that the behaviour of trade credit differs across firm financing constraints.

Fifth, this analysis contributes to the literature by investigating how trade credit and bank credit evolved during the crisis for a leading emerging economy. Although there is some evidence forthcoming on this count, much of it pertains to advanced economies, thereby limiting their empirical relevance for emerging markets. By employing firm-level, microeconomic data for an extended time span, the analysis is able to shed light on the possible complementarities/substitutability between trade credit and bank credit, especially during the crisis.

Sixth, our analysis also augments the literature that explores whether the behaviour of trade credit differs across firm characteristics. More specifically, we complement extant research by exploring whether the behaviour of firms at the top and bottom end of the size distribution across to well-known characteristics (e.g., size, leverage and profitability) is different from that obtained for the entire sample. Given that these represent three of the major facets of firm operations and functioning, in a way therefore, the analysis represents a value addition on previous research.

The analysis provides evidence as to the existence of a trade credit channel in India. To be more specific, firms that are better able access to institutional loans supply more trade credit when monetary policy is tightened. In contrast, owing to lack of alternative financing sources, constrained firms do not increase their supply of trade credit. Therefore, by increasing the volume of trade credit, unconstrained firms help downstream firms during the periods of tighter monetary policy. Likewise, distressed firms increase their use of trade credit during periods of tighter monetary policy compared to less distressed firms.

More research would, of course be necessary to firmly re-establish these findings. More innovative ways of measuring financing constraints and alternate measures of computing financial distress could prove to be useful value additions. Addressing these elements comprises elements for future research.

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Appendix: Variable definitions, data source and summary statistics

Variable	Empirical definition	Data source	Mean (SD)
Dependent			
AR/A	Accounts receivable/ Asset	Prowess	0.167 (0.148)
AP/A	Accounts payable/ Asset	Prowess	0.152 (0.153)
(AR-AP)/A	(Accounts receivable - Accounts payable)/Asset	Prowess	-0.096 (4.631)
Independent			
Z score	Modified Altman Z score based on MacKie-Mason (1990) definition, multiplied by -1. Higher values indicate greater likelihood of financial distress	Prowess	-1.291 (1.342)
WW index	Index of financial constraint as computed by Whited-Wu (2006) defined as: -0.091 (PBDIT/A)-0.062 (Dividend/A)+0.021 (Long term debt/A) -0.044 (Asset/WPI) -0.035 (gr_Sales)	Prowess	-18.461 (32.89)
Log Asset	Log (total firm asset)	Prowess	5.521 (2.133)
Age	Log (1+ number of years since firm incorporation)	Prowess	1.203 (0.369)
TQ	(Market value of equity, MVE+book value of debt)/Asset, where MVE=Number of shares outstanding*Closing share price on NSE	Prowess	0.739 (0.814)
Liquid	Liquid assets/Asset	Prowess	0.052 (0.088)
Inventory/A	Inventory/Asset	Prowess	0.171 (0.146)
LTD	1- (Bank borrowings/Asset)	Prowess	0.719 (5.763)
BKDEBT	Bank borrowings/Asset	Prowess	0.189 (0.197)
d[MYP]	Index of monetary policy defined as follows: An increase in either the policy rate (repo rate from 2001 and Bank Rate prior to that) or cash reserve ratio (CRR) or both by more than 50 basis points (bps) between two consecutive months in a given year is coded as +1. An increase in excess of 25 bps upto 50 bps in either or both these variables between two successive months is coded as 0.5. An increase of upto 25 bps in either or both these variables is coded as 0.25. Reverse is the case in case monetary policy is expansionary. Provided there is no change in any measure during the year, it is coded as zero. The raw scores for a month are cumulated to arrive at an aggregate index in a given year. Provided the value of the aggregate index in a year is greater than (resp., less than) one, monetary policy is coded as contractionary (resp., expansionary). Monetary policy is deemed neutral if the index value in any year equals zero.	RBI	-0.338 (2.232)
D_Listed	Dummy=1 if a firm is listed on NSE, else zero	Prowess	0.340 (0.474)
Crisis	Dummy=1 for the years 2008-10,else zero	Eichengreen and Gupta (2013)	0.150 (0.357)
SOF	Dummy=1 if a firm is state-owned, else zero	Prowess	0.027 (0.162)
BGF	Dummy=1 if a firm belongs to a business group, else zero	Prowess	0.268 (0.443)
IPF	Dummy=1 if a firm is Indian private, else zero	Prowess	0.668 (0.471)
FF	Dummy=1 if a firm is foreign, else zero	Prowess	0.037 (0.189)