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# Inventory composition and trade credit

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ABSTRACT

This empirical paper uses a panel of about half a million observations for French firms across economic sectors to investigate how the type of inventories can affect firms' incentives to use trade credit. We find evidence that trade credit extended is influenced by the extent to which firms hold different types of inventories. Moreover, we show that the strength of the relationship varies across economic sectors. Finally, we find that as buyers process goods, the sellers' incentives to extend trade credit diminish.



## 1. Introduction

In this paper we use a specialised dataset with a finer than usual categorisation of the structure of the inventories at the firm level to investigate the relationship between trade credit and the type of inventories held by firms. We argue that inventory composition alters the incentives for firms to extend and receive trade credit through three different channels.[1]

Firstly, the inventory management motive of trade credit recognises firms' incentives to sell on credit and minimise inventory costs when product demand is uncertain. Empirically, we find that firms with large shares of inventories in raw material form increase their extension of trade credit (relative to sales). As this is the last type of inventories to leave storage, firms reduce inventory costs through sales of final goods financed by trade credit, if necessary. Therefore, the composition of inventories affects trade credit offered by suppliers.

Secondly, the diversion motive of trade credit acknowledges that trade credit usage is correlated with the characteristics of the traded goods. In other words, suppliers of services and (specialised) differentiated products are more willing to sell on credit than suppliers of (homogeneous) standardised products (Giannetti, Burkart, & Ellingsen, 2011). Taking into account product characteristics, we suggest that the strength of the relation between inventory composition and trade credit extended varies across economic sectors. Our results show a stronger relation in sectors producing specific goods relative to standardised manufacturing, retail, and wholesale. Large holdings of raw materials will give manufacturers of specialised goods, already more willing to extend trade credit, an even stronger incentive to reduce inventory costs by selling on credit.

Finally, we analyse the uptake of trade credit and investigate how the diversion and the collateral liquidation motives are influenced by the composition of a downstream firm's inventory. Consistent with these theories, our results suggest that the characteristics of the inputs purchased affect trade credit taken.[2] More importantly, however, our data show that sectors that undertake little or no transformation of their inputs – wholesale and retail sectors for example – receive more trade credit than other sectors. This is consistent with the collateral liquidation theory of trade credit since sellers lose their advantage relative to banks in liquidating collateral as their customers transform inventories from raw material form to work in progress, semi-finished and finished goods. We refine the original test proposed by Petersen &

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[1] These channels have been discussed in the literature - but not in relation to inventory composition. Section 2 describes these channels more in detail and introduces the link with the composition of inventories.

[2] According to the diversion theory, firms that purchase a higher proportion of differentiated inputs receive more trade credit from their suppliers than firms that buy more standardised inputs. The collateral liquidation motive, however, suggests that the higher the proportion of service inputs relative to standardised inputs, the lower the volume of trade credit taken.

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Rajan (1997), which used average data for the firms in the same two-digit SIC industry,[3] as we can construct the proportion of processed goods in total inventories as a liquidation cost measure at the individual firm-level.

To summarise, using a panel of around 80,000 French firms in several economic sectors, our paper shows that suppliers with large ratios of raw materials in total inventories manage their inventory costs by selling their products on credit (*inventory management channel*), especially when facing a negative demand shock. Moreover, since suppliers of specialised goods have greater incentives to obtain sales through trade credit, the impact of the inventory composition on trade credit extended varies across economic sectors (*diversion channel*). Finally, when examining trade credit taken, we find that firms with a high proportion of processed inventories receive less trade credit, indicating that sellers lose their collateral liquidation advantage as goods are processed (*collateral channel*).

The following section presents briefly the background literature that motivates our empirical models for the use of trade credit. Section 3 describes the data and summary statistics. In Section 4, we present our empirical models and the methodology used. Section 5 presents our empirical work and in the final section we conclude.

## 2. Related literature

There has been a long running debate about the motives suppliers and customers face in offering or receiving trade credit, many of which are summarised and then evaluated in Petersen & Rajan (1997).[4] We summarise below three strands of this literature and dwell more on the papers more closely related to ours. Our aim is not to test these motives but to explain how inventory composition may impact on these motives for trade credit usage.

### 2.1. Inventories and trade credit

The literature by Bougheas, Mateut, & Mizen (2009); Daripa & Nilsen (2011); Emery (1987); Ferris (1981) and Petersen & Rajan (1997), explores inventory transaction costs as a motive for offering trade credit. The underlying argument suggests that suppliers may offer trade credit as an incentive to customers to hold higher stocks of inventories — shifting inventory holding from seller to buyer.[5]

Consider the implication of the composition of inventories for inventory storage costs. As raw materials are the last type of inventories to leave storage, firms with large shares of raw materials have a stronger incentive to stimulate sales through trade credit and lower their storage costs. This discussion leads to our first hypothesis:

**H1.** The ratio of raw materials in total inventories is positively correlated with trade credit extended.

### 2.2. Specialised goods and trade credit

Burkart & Ellingsen (2004); Cuñat (2007) and Fabbri & Menichini (2010) stress that trade credit usage is greatly influenced by the nature of the transacted good. Burkart & Ellingsen (2004) point out that the advantage of trade credit lies in its illiquid nature, which is not easily diverted as cash inputs might be. Giannetti, Burkart, & Ellingsen (2011) further note that the more standardised the product transacted, the easier it is to divert its use to other purposes, and the easier it is to find alternative suppliers, so customer–seller relationships are weak and price discrimination through trade credit may be harder. As a product becomes more specialised in nature it has fewer alternative uses and fewer suppliers, which strengthens the relationship between customer and supplier. Giannetti Burkart, & Ellingsen (2011) establish that manufacturing firms that sell or buy differentiated goods use more trade credit (extended and taken) than those with standardised goods, or those from other industrial sectors do.

Cuñat (2007) argues that buyers and sellers of specialised products enter symbiotic relationships in which neither has the incentive to damage the trust that exists between them. When goods are specialised, and sellers are difficult to replace, credit enforcement is easier for suppliers than for financial intermediaries. Moreover, suppliers offer credit when banks will not and insure against liquidity shocks. In these circumstances, trade credit volumes increase where the transacted good is specialised.

From the discussion above it results that trade credit is more prevalent in transactions involving specific goods. Our conjecture is that the relation between inventory composition and trade credit usage is particularly strong in sectors trading specialised goods.

**H2.** The relationship between trade credit extended and inventory composition is stronger in sectors trading specific products.

### 2.3. Collateral liquidation and trade credit

The theory supported by Frank & Maksimovic (2005) and Longhofer & Santos (2003) refers to the collateral liquidation motive. A producer firm has advantages in selling a repossessed good when a customer fails to pay for it compared to a bank that might seize the good as collateral in the face of non-payment of a loan.[6] The firm has an established sales network and can redirect the good to its other customers, while a bank has no such network.[7]

The lower transaction costs in repossession induce a seller to offer the goods on trade credit since they are easily redirected if the customer fails to pay for them. This comparative advantage will be more pronounced for differentiated goods because they are tailored to the needs of fewer customers, and it is harder to identify suitable buyers and to obtain reference prices (Fabbri & Menichini, 2010). Therefore trade credit should be greater where suppliers can enforce payments more readily through the threat of termination of the specialised supply and seizure of goods supplied, and buyers should have less incentive to renege on payments of trade credit where it is offered.

Petersen & Rajan (1997) argue that as inventories become more specialised they are more difficult to dispose of, making it less likely that a seller will have a strong advantage over any other creditor in the disposal of repossessed goods. They propose using the fraction of a customer firm's finished goods in its total inventory as a measure of liquidation costs for suppliers. However, they are able to calculate this

[3] Huyghebaert (2006) and Atanasova (2012) employed similar industry-level indicators.

[4] A list of the most prominent theories includes information asymmetry (Smith, 1987), of which signalling (Biais & Gollier, 1997) and financial monitoring advantages (Mian & Smith, 1992, Jain, 2001) are subsets, price discrimination arguments (Brennan, Maksimovic, & Zechner, 1988), product quality (Lee & Stowe, 1993, Long, Malitz, & Ravid, 1993, Smith, 1987), redeployment of goods after default (Frank & Maksimovic, 2005), opportunistic behaviour (Burkart & Ellingsen, 2004; Fabbri & Menichini, 2010) and inventory transactions costs (Bougheas et al., 2009; Daripa & Nilsen, 2011; Emery, 1987; Ferris, 1981). Klapper, Laeven, & Rajan (2012) show that a mixture of financial, product quality, and bargaining power factors affect trade credit terms.

[5] There are subtle differences between the theories proposed. In Bougheas, Mateut, & Mizen (2009) it is the supplier facing stochastic demand. The supplier's incentive to shift inventories to the customer via trade credit is limited only by its need to obtain liquidity to meet its own obligations. In Daripa & Nilsen (2011), the downstream buyer, facing stochastic demand, must decide whether to hold inventory to meet sales or to order inputs only when final demand materialises. This decision is influenced by inventory financing costs. Trade credit arises then whenever upstream firms find it optimal to offer their buyers an incentive to purchase inventories and continue production.

[6] We focus solely on the incentives that collateral liquidation creates for the extension of trade credit. Atanasova (2012) provides a detailed analysis of substitutability and complementarity between bank loans and trade credit.

[7] Using similar arguments, Eisfeld & Rampini (2009) show that leasing is associated with a repossession advantage relative to secured lenders. This implies that leasing instead of borrowing in order to purchase assets increases debt capacity and relaxes financial constraints for firms.