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Trade Credit and Informational Asymmetry

JANET KIHOLM SMITH*

ABSTRACT

Commonly used trade credit terms implicitly define a high interest rate that operates as an efficient screening device where information about buyer default risk is asymmetrically held. By offering trade credit, a seller can identify prospective defaults more quickly than if financial institutions were the sole providers of short-term financing. The information is valuable in cases where the seller has made nonsalvageable investments in buyers since it enables the seller to take actions to protect such investments.

TRADITIONAL EXPLANATIONS FOR THE widespread use of trade credit fall into two categories. The financing motive holds that capital market imperfections enable sellers to finance buyer purchases at lower cost than financial institutions. Ferris [4] argues that trade credit provides payment flexibility and thus reduces the overall need for buyers and sellers to maintain precautionary balances. Emery [3] contends that noncompetitive rents of financial institutions can be circumvented by sellers and buyers through provision of trade credit. However, the financing motive is not sufficient to explain why small suppliers offer trade credit, the wide cross-sectional variation in terms, or why large buyers often take the "prompt payment discount" late.

A second set of explanations is best described as pricing motivations for trade credit provision. Nadiri [10] argues that availability of alternative payment terms can increase product demand but does not indicate why the offered terms could not be duplicated by financial institutions. Schwartz and Whitcomb [14] argue that trade credit is used to circumvent Robinson-Patman and similar prohibitions on price discrimination. The correctness of this position depends on the charge to users of trade credit exceeding the cost of provision by the seller.¹ Although the explanation is possible in principle, an empirical question remains as to why variations in actual credit terms appear to be based on product market, rather than buyer, characteristics.

The literature also contains analyses of the impact of changing macroeconomic conditions on trade credit terms and aggregate credit flows. Schwartz [13], for example, employs a financing motive for trade credit to conclude that restrictive monetary policy can be partly mitigated by liberalization of trade credit terms by firms with relatively easy access to capital markets. However, a microeconomic

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¹ Cost-based price differences are legal under the Robinson-Patman Act (1936).

model of the decision to supply trade credit is required to explain many puzzling aspects of trade credit such as the typically high implicit interest rates and the wide variation in payment terms across industries.² This paper provides a new perspective on the rationale for trade credit that addresses these issues.

Trade credit is viewed as a contractual device for dealing with informational asymmetry in intermediate goods markets.³ Terms are established to function as a screening contract that elicits information about buyer default risk. High implicit interest (or penalty) rates that accompany trade credit facilitate the sorting of low from high default risk buyers. In this view, trade credit is provided because the value of default risk information to a seller who has made a nonsalvageable investment in the buyer can exceed its value to prospective third-party financiers. This occurs if the seller can take actions to protect the nonsalvageable investment after high default risk is signaled by the buyer's acceptance of trade credit terms. The theory contributes to the trade credit literature by providing an explicit rationale for the selection of trade credit rates and terms that is subject to empirical verification. The theory differs from both the financing- and pricing-motive hypotheses by its emphasis on the use of credit terms as a screening device.

Traditional explanations for trade credit depend on the risk-adjusted cost of capital differing between buyer and seller. Unspecified capital market imperfections and frictions have been simply assumed to account for the difference. The theory presented here suggests the net cost of capital divergence can arise from the value of the trade credit signal to the seller.

In Section I, conditions are developed for emergence of trade credit in intermediate goods markets when information about buyer default risk is asymmetrically held and buyers face uncertainty about seller performance. When purchasing goods, buyers maximize surplus with respect to choice of the financing alternative (borrowing from a financial institution or accepting trade credit from the seller). The seller's objective is to maximize profit with respect to payment terms and the interest rate that is implicitly defined when trade credit terms are quoted. Testable propositions of the model are discussed in Section II. Conclusions are presented in Section III.

I. A Model of Trade Credit Terms with Informational Asymmetry

A. Assumptions

Consider a market with three types of risk-neutral participants: buyers and sellers of intermediate goods and financial institutions. Buyers, who are middle-

² Textbooks routinely point out the high expense of using trade credit. See, for example, Brealey and Myers [2], p. 640; Van Horne [16], p. 438; Weston and Brigham [17], p. 225.

³ The notion that aspects of financial contracts and institutional arrangements can be explained by problems arising from informational asymmetries is explored by Leland and Pyle [9], Jaffey and Russell [5], and Ross [11], among others. See also James [6] for an application to compensating balance requirements, Kanatas [7] for an application to back-up loan commitments for commercial paper, and Rothschild and Stiglitz [12] for an insurance market application.

men, are identical except that they differ in the probability of default. The periodic return to middleman activity, R , is a random variable, and different buyers face different probability distributions of returns, denoted $F(R, \theta)$, where $f(R, \theta)$ is the density function and θ corresponds to greater risk in the sense of mean-preserving spreads.⁴ Information about default risk is asymmetrically held so that the buyer has superior information concerning θ . Therefore, sellers and financial institutions face uncertainty about buyers. In turn, buyers may face uncertainty about the seller's contractual performance. The seller may behave opportunistically by delivering inferior goods or otherwise not satisfying contract terms.

Buyers demand financing of inventory and accounts receivable. Following Stiglitz and Weiss [15], financial institutions face an adverse selection problem when attempting to ration credit by price. Instead, they offer low interest rates and ration by credit evaluation. The seller may also provide credit but does not perform any credit analysis *ex ante* and instead supplies credit to any buyer of his or her product subject to limitations developed below.

Sellers offer contractual payment terms from a feasible set that includes contracts for cash on or before delivery (COD or CBD), cash due in a specified period with no prompt payment discount (e.g., net 30, net 60) and contracts with credit options (e.g., 2/10 net 30, effectively 44 percent per annum). With COD and CBD contracts, the buyer may borrow from a financial institution to make the payment to the seller. In contrast, sellers offering trade credit options can presume that a buyer who takes the cash discount satisfies financing demand through a third party at a low interest rate. However, if the buyer purchases the goods and pays late (e.g., at the end of thirty days), the buyer has implicitly borrowed at a higher rate defined by the trade credit terms. Such action indicates that lower cost third-party financing was not available to the buyer.

In many markets, competition may require sellers to make investments in relationships with buyers in advance of exchange. For example, sellers may invest in salespersons who are expected to develop specific knowledge of an individual buyer's operations. The seller may further invest in buyers through entertainment expenditures and development of buyer-specific equipment, literature, manuals, "free" samples, etc. When such investments are nonsalvageable, their value is lost if the buyer fails or terminates the relationship.⁵ For such investments to be warranted, the expected present value of the stream of quasi-rents generated by the investment must equal the initial outlay. The investment is assumed for convenience to be a nondepreciating sunk cost (although it can accumulate in value). The annuity of quasi-rents can take a variety of forms such as a price premium for the seller's product or a premium paid in reciprocal business. For simplicity, the quasi-rent is assumed to be reflected in price.

⁴ If $\theta_i > \theta_j$, every risk averter would prefer firm j to firm i : $E(R_i) = E(R_j)$; $\int_0^y [F_i(R) - F_j(R)]dR \geq 0$ for all $y \geq 0$. The Stiglitz and Weiss [15] equilibrium model with credit rationing provides the basis for the lender's profit maximization problem.

⁵ For a discussion of investment in specialized assets and related problems arising from contracting, see Klein, Crawford, and Alchian [8] and Williamson [18].

B. Model Structure

B.1. The Buyer's Selection among Payment Options

Buyer j 's selection of the lending source (seller versus financial institution) and, hence, payment terms will depend on j 's estimate of θ_j . The buyer will compare the quoted interest rate with his or her estimate of risk, θ_j , and select the lending source accordingly. To see this, consider the return, π , to the buyer from middleman activity when borrowing B , the value of the merchandise. Let $\hat{r}$ represent the interest rate charged by the financial institution. The cost to the buyer of arranging financing is C and is incurred as a one-time cost per lending source. The net return from middleman activity is expressed as

$$\pi(R_j, \hat{r}) = \max\{R_j - (1 + \hat{r})B; -C\}. \quad (1)$$

The buyer must repay either the promised amount or the maximum possible from sale of goods. If the buyer defaults, $R_j < (1 + \hat{r})B$, C is lost since, if the buyer were to apply for a loan from an alternative higher risk lender, C would again be incurred.

The return to the financial institution $l(R_j, \hat{r})$ is

$$l(R_j, \hat{r}) = \min\{R_j; (1 + \hat{r})B\}. \quad (2)$$

In setting the interest rate, the lender faces an adverse selection problem if loanable funds are allocated by price.⁶ Since different borrowers have differing probabilities of repayment that are not known to the lender, increasing the interest rate causes the average riskiness of the applicant pool to increase as high-quality borrowers exit the market. For any given interest rate, r , there is a critical risk value, $\hat{\theta}$, such that firm j borrows if and only if $\theta_j \geq \hat{\theta}$. The critical value of θ is determined by satisfying an equation that sets the buyer's expected return over the distribution of returns equal to zero.

$$\pi(\hat{r}, \hat{\theta}) = \int_0^\infty \max\{R_j - (1 + \hat{r})B; -C\} dF(R_j, \hat{\theta}) = 0. \quad (3)$$

Since each buyer maximizes expected profit given r and the buyer's perception of θ , the lender can screen for a particular $\hat{\theta}$ by appropriate choice of r .⁷ If $\theta_j < \hat{\theta}$, the firm will elect not to borrow at rate $\hat{r}$ since $\pi(\hat{r}, \hat{\theta}) < 0$.

This screening attribute of interest rates can also be exploited by sellers through an offer of trade credit. As shown in the next subsection, the interest rate, r^* , implicitly defined by trade credit terms, will be set optimally to screen for a risk class of buyers for which $\theta \geq \theta^*$.

⁶ See Jaffey and Russell [5] and Stiglitz and Weiss [15].

⁷ Differentiating (3) yields

$$\frac{\partial \theta}{\partial r} = \left[B \times \int_{(1+r)B-C}^\infty dF(R, \hat{\theta}) \right] + \partial \pi / \partial \hat{\theta} > 0.$$

Expected profits of the financial institution decrease as r increases since the critical value of θ increases. Profits for the buyer are modeled as a convex function of R , implying that expected profits increase with risk.

In addition to the buyer's estimate of θ , the buyer's choice among payment terms and lending source depends on the seller's ability to behave opportunistically. Payment terms can be selected to protect against this type of opportunism. The buyer may be reluctant to agree to COD terms, for example, if unable to inspect the merchandise at the time of delivery, but terms such as net 15 may be acceptable to allow verification of seller performance.⁸

The presence of seller-made nonsalvageable investment in buyer j 's business also serves to protect the buyer from opportunism since it provides information that seller k has a financial stake in continuing the relationship. Thus, the seller's investment, denoted I_{jk} , facilitates exchange by reducing uncertainty about seller k .⁹ Expressed in general form, the buyer will choose payment terms that yield maximum surplus, S_j , given θ_j and I_{jk} :

$$S_j(t_k^* | \theta_j, I_{jk}) > S_j(t_m^* | \theta_j, I_{jm}). \quad (4)$$

The buyer will select contract type t and contract terms λ from firm k provided the terms (e.g., 2/10 net 30) are expected to yield a greater surplus than alternative terms available from all other sources—for example, contract terms ∂ available from seller m (e.g., terms of net 15). The buyer therefore maximizes over available contracts from all sources. If the buyer selects credit terms from firm k when k also offers cash terms, the choice reveals more information about θ_j than seller k could accumulate without the screening device. The acceptance of trade credit signals the seller to monitor firm j .

B.2. The Seller's Decision Regarding the Offer of Trade Credit Terms

Consider the return, X , to seller k extending credit to buyer j . Let r^* represent the interest rate implicitly defined by trade credit provisions, λ , and γI_{jk} be the periodic stream of quasi-rents accruing from seller k 's investment in buyer j . The return is

$$X(R_j, r^*, \gamma I_{jk}) = \min\{R_j - I_{jk}; (1 + r^*)B\}. \quad (5)$$

The seller will select trade credit provisions in light of the buyer's decision process described in equations (3) and (4). The seller knows that, if the buyer has a low probability of default such that $\theta_j < \theta^*$, the buyer will select lower cost

⁸ There are, of course, alternative market responses to the potential for seller cheating such as product warranties or willingness to accept return of defective products. However, such warranties or promises are not credible from a seller with no reputation. Hence, the option of inspecting the product prior to payment is the obvious market solution to the problem when seller reputation is lacking.

⁹ If the stream of quasi-rents accruing from the investment, I_{jk} , is viewed as a perpetuity, then

$$I_{jk} = \left[\frac{\gamma(I_{jk})}{i} \right] \left[1 - \left(\frac{1}{1+i} \right) \right]^t,$$

where t is the duration of the business relationship and i is the cost of capital for the investment. If the return is composed of the dollar-value equivalent of reciprocal or long-term buying agreements, the price paid for merchandise purchased from any one seller may be nominally identical to the price paid for merchandise from another seller who has not made a nonsalvageable investment.

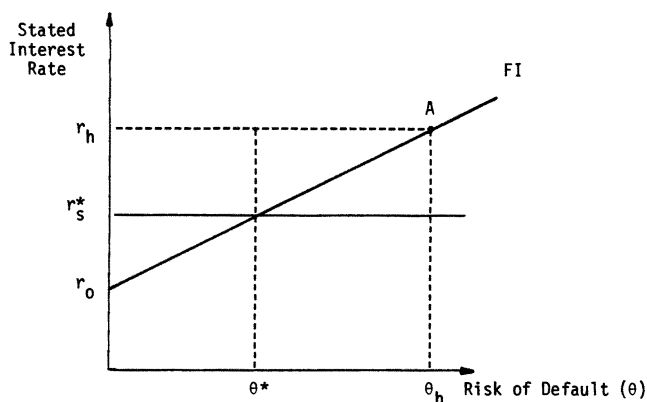


Figure 1. The Relationship of Stated Interest Rate to Default Risk and the Gain from Trade Credit Provision

third-party financing. The seller can identify the buyers for whom $\theta \geq \theta^*$ by quoting r^* and allowing buyers to self-select between the two payment options and therefore the lending source. Since, if $\theta_j < \theta^*$, the buyer will borrow from a financial institution, a buyer who takes the cash discount is presumed to be a good risk. The seller's investment in the buyer is secure relative to the target level of default risk. If the trade credit option is selected, the seller knows to monitor the buyer. The seller can then investigate to distinguish between buyers who require temporary assistance (and who the seller has an incentive to subsidize in the short run) and those likely to default and who are not expected to generate sufficient future quasi-rents to justify continued extension of credit. A financial institution may have similar incentives. The distinction is that, in the presence of a nonsalvageable investment, the seller has potentially more to lose in a decision to no longer offer credit and insist on COD terms.

The screening process is effective in sorting if it is sufficiently more costly for high default-risk buyers to signal financial health than low default-risk buyers. To falsely signal, a high-risk buyer must secure a loan at an interest rate that exceeds the trade credit rate. False signalling will not occur if C (the cost of arranging alternative financing) is greater than the gain from false signalling or if the buyer effectively posts a bond such as industry-specific capital or a reciprocal investment in the seller.

B.3. Resulting Equilibrium

Figure 1 depicts the equilibrium in which all market participants are behaving optimally. The full range of financial institutions offer an array of interest rates as indicated by line segment r_0FI , where r_0 is the interest rate where default risk is zero. The stated interest rate, r , increases with default risk, θ . The seller offers trade credit terms defining r_s^* to all buyers, knowing that buyers for whom $\theta < \theta^*$ will elect to borrow from financial institutions at lower rates.¹⁰ The selling

¹⁰ In principle, sellers could offer different terms to different buyers based on the varying degrees of nonsalvageable investment actually made. For a variety of practical and legal reasons (e.g., Robinson-Patman Act), this is seldom done. The main exceptions are where the seller can easily distinguish among classes of trade such as wholesale and retail.

firm can offer a lower interest rate than financial institutions at risk levels above θ^* if there is an expected gain associated with monitoring and perhaps subsidizing buyers who select trade credit. This expected gain explains why sellers are able to finance buyer purchases at a lower cost, thereby linking this signalling theory of trade credit with the traditional financing motive.

At some risk level above θ^* , such as θ_h , the seller's monitoring indicates that default risk of the buyer is such that the expected value of remaining nonsalvageable capital is negative. Cash-basis-only selling is expected beyond this point. The buyer may have additional high-cost financing alternatives at risk levels above θ_h as indicated by *AFI*. For any risk level above θ^* , the vertical distance between r_h and r reflects the value of quasi-rents preserved by trade credit provision. The vertical difference between r and r_s^* above θ^* reflects an expected loss of the seller's nonsalvageable investment.

Excess profits are not necessarily generated by the use of trade credit. The profit motive causes the firm to introduce trade credit, but competition ensures that the gains from sorting and monitoring are passed on to the extent they can be duplicated by competitors. The availability of trade credit removes an impediment to trading that is equivalent to reducing transactions cost. Hence, market-wide efficiency gains result to the extent credit is available at a lower price, and an increase in the number of mutually beneficial exchanges occurs.

II. Model Assessment

The theory suggests that predictable cross-sectional patterns will emerge in payment terms for sales in intermediate goods markets and in sellers' decisions to supply or not supply credit. Cash or net terms are expected when seller-made nonsalvageable investments in buyers are not significant. Cash terms are expected when sellers have sufficient reputational capital relative to buyers to guarantee performance of the contract or have relatively less ability to behave opportunistically. (Cheating is easy to discern *ex ante*.) Net terms are expected when buyers are unable to distinguish high-quality from low-quality sellers. The period of time over which payment may be delayed (the net period) will be a function of the time required to verify seller performance. Trade credit terms are designed to prompt middlemen buyers to make choices between cash discounted and net payments, inclusive of an interest charge. The self-selection contract is an economically justified pricing practice in the presence of buyer-specific nonsalvageable investment.¹¹

The theory suggests that trade credit terms will be relatively uniform *within* an industry since sellers and buyers face similar market conditions, including

¹¹ Sellers may, of course, invest in reputational capital not specific to any one buyer, but we assume that the buyer recognizes an ability to cause depreciation of the value of this brand-name capital by revealing information to the market and other buyers about cheating on the part of the seller. Hence, the value of this ability to reduce the seller's reputation is reflected in the value of I . As a definitional note, when a seller ships merchandise to a buyer and does not require prepayment, the seller creates a buyer-specific investment since, if the buyer defaults, the value of the merchandise may be partially lost.

competitive requirements for nonsalvageable investment in distribution.¹² The theory also implies that wide variation and implicit interest rates may exist across industries since market conditions and investment requirements in buyers may vary significantly. These implications are consistent with observed practice.¹³

A frequent observation is that trade credit financing with deep cash discounts is offered in "risky" industries (e.g., women's clothing) to encourage early payment. (See Weston and Brigham [17].) The theory presented here suggests a more comprehensive interpretation. A cash discount, combined with net terms, determines a sufficiently high r^* to allow the seller to identify a particular risk class of buyer. Hence, r^* will be higher in "riskier" industries. For example, Dun and Bradstreet report payment terms of 8/10 E.O.M. (implicit interest rate of 348 percent) for Women's Blouses and Waists, Women's Coats and Suits, and Women's and Misses and Juniors' Dresses, as opposed to terms of net 30 for less style-oriented clothing such as Men's and Boys' Coats and Men's and Boys' Trousers (zero financing cost for thirty days). To the extent that women's clothing in the above categories is subject to significantly more volatility in value than men's and boys' clothing in the above categories, the reported payment terms are consistent with theoretical predictions.¹⁴

The analysis in Section I assumes identical buyers except for unobservable differences in probability of payment. It is, of course, possible for buyers to invest in reputational capital that allows sellers to improve a priori estimates of default risk. Related to this possibility is the common observation that large firms frequently take unearned cash discounts. This behavior is consistent with the theory. If a buyer (GM, for example) has a significant amount of reputational capital, the seller will not benefit from observing a trade credit contractual choice. If GM does not pay cash within the discount period, a seller is not motivated to change behavior or insist on monitoring. In contrast to other buyers, GM has independently developed sufficient reputational capital that the seller need not be concerned with default. If the buyer in such a situation takes an "unearned" cash discount, the difference in price (cash price minus net price) can represent a quasi-rent on the buyer's reputational capital. While others have interpreted such behavior as an opportunistic exercise of market power (see discussion in

¹² The cash date and net date in a trade credit offer can be expected to reflect the nature of the inventory cycle, physical properties of the product (perishability, retail turnover time, cost of discerning quality, etc.), and other industry or product characteristics that affect the optimal timing of information arrival.

¹³ See Dun and Bradstreet, *Handbook of Credit and Collection* (1970), for a listing of common trade credit terms across retail and wholesale industries.

¹⁴ Monitoring of the buyer may be difficult if buyers are geographically dispersed or if value of inventories changes rapidly. In such cases, there may be little buyer-specific investment by the seller. One might expect factors to substitute for seller monitoring in these cases. Factors have a comparative advantage in monitoring relative to the seller when the level of nonsalvageable investment is low and the cost of monitoring is high. For example, factoring in the garment industry is common. The theory predicts that more reliance will be placed on factoring of high-style clothing where value of the inventory may drop precipitously. In such markets, factors are likely to have a comparative advantage in monitoring and collecting debts. The use of trade credit to initially segment buyers is a predictable response, as is the use of factoring of the receivables of the self-selected class of buyers.

Areeda [1]), the theory here suggests a different interpretation. Since the buyer has effectively supplied the information the seller is seeking (by offering trade credit), the "unearned" cash discount represents a price concession attributable to the buyer's reputational capital.

III. Conclusion

As pointed out by Williamson [18], "The organization of economic activity is massively influenced by the degree to which the transactions under examination are supported by assets that are specific to the parties." This paper reaffirms the general proposition that contractual arrangements will be matched to the underlying attributes of a transaction. Trade credit terms are expected to emerge in the presence of buyer-specific investments and are designed to prompt middlemen buyers to make a choice between a cash discounted payment and net payment. This choice reveals information to the seller concerning buyer default risk. The selling firm is thereby alerted to this risk earlier if offering trade credit than if selling on cash or net terms and relying exclusively on information generated by financial markets. The screening process allows more flexibility in designing procedures to preserve buyer-specific nonsalvageable investments. It signals the seller when monitoring efforts are warranted. Monitoring will indicate whether to continue to extend credit to the buyer or to modify subsequent sales contracts (COD sales only). Information concerning buyer default risk is valuable to the seller only in the presence of nonsalvageable investments. If such investments were in place and the seller offered COD or CBD terms only, the result could be sacrificed investment in the riskier class of buyers. Properly structured trade credit terms allow the seller to protect these investments by preserving present and future sales to firms not able to secure alternative low-cost financing. The incentive to protect these investments induces sellers to offer credit to a specific risk class of buyers at rates lower than those financial institutions would offer.

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