THE PARADOX OF PRIORITY*

Stanley D. Longhofer
Stephen L. Clark Chair of Real Estate and Finance
Wichita State University

João A.C. Santos
Senior Economist
Federal Reserve Bank of New York

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THE PARADOX OF PRIORITY

The ubiquity of bank seniority is now a widely accepted fact in the academic literature. At the same time, trade creditors are sometimes granted a purchase money security interest in the materials or equipment they provide the firm. These two conflicting facts present a puzzle: Why would banks willingly give up a valuable priority claim on the firm, but only with respect to a subset of the firm's assets?

We propose a resolution to this paradox of priority by arguing that trade creditors are better able to liquidate the materials they supply to a firm. When trade creditors have a security interest in these assets, their claims are state-contingent, and therefore dependent on the value of the assets pledged as collateral. Surprisingly, this ability of trade creditors to more efficiently liquidate the materials they supply to a firm also makes it desirable to subordinate the non-collateralized portion of their claims. Doing so increases the face value of a trade creditor's claim for a given level of borrowing, thereby increasing the "liquidation bang" from each trade credit buck. This combined priority structure maximizes social welfare by reducing the firm's overall cost of funding.

1. Introduction

Banks are generally the most senior creditor among lenders to small business borrowers. Mann (1997) and Schwartz (1997) present evidence that banks not only take senior claims over other creditors, but also collateralize as much of their debt as possible and use loan covenants to limit the firm's ability to undertake additional debt without the bank's permission. Schwartz also notes that small retailers are generally required to make payments weekly, or even daily, to prevent another lender from obtaining de facto seniority through a shorter term. Berger and Udell (1998) report that over 90 percent of bank loans to small business borrowers are collateralized, while Carey (1995) finds that a substantial majority of bank-debt loan agreements with large firms contain a senior covenant, regardless of whether the borrower has any public debt outstanding.

Although bank seniority is ubiquitous, there are important exceptions. For example, banks sometimes allow a borrowing firm's trade creditors to collateralize their claims.[1] Furthermore, even when a bank has previously perfected a security interest in after-acquired materials, the Uniform Commercial Code grants a trade creditor's purchase money security interest first priority over the assets it financed, in violation of the general first-in-time, first-in-right, principle.[2]

Our goal in this paper is to explain this paradox of priority. In particular, why would banks that generally demand universal seniority over the creditors of their small business borrowers let other creditors establish security interests in the equipment and materials they sold to a firm, effectively subordinating the bank's claim with respect to these particular assets?

We develop a simple model that demonstrates the optimality of granting a bank priority over a firm's cash revenues while at the same time allowing the firm's trade creditor to collateralize the good it supplies. Central to our result is the assumption that the trade creditor

[1] Although empirical research on the priority structure of trade credit is virtually non-existent, our anecdotal conversations with commercial bankers indicated that banks will permit a firm's suppliers to finance and collateralize equipment purchases. Further research into the prevalence of this practice would be useful.

[2] Similar priority is given to providers of capital leases. Barclay and Smith (1995) discuss a lessor's repossession rights should the lessee default on a promised payment.

values this good more highly than does the bank. Collateralizing the trade creditor's claim therefore ensures that the asset is liquidated as efficiently as possible in default. At the same time, subordinating the remainder of the trade creditor's claim increases its riskiness—and hence the face value of the trade creditor's debt—thereby increasing the liquidation benefit received from each trade credit dollar borrowed. Put together, this priority structure maximizes the total profit to be earned by the firm, resolving the paradox of priority.

Making the bank senior while granting the trade creditor a secured claim over the firm's tangible asset effectively gives the trade creditor a state-contingent priority claim. If the value of the tangible asset is high, the trade creditor's claim is enhanced, reflecting the benefit it provides through its ability to liquidate the asset more efficiently. In contrast, if the value of the tangible asset is low, the trade creditor's claim is diminished as well.

In the next section, we briefly review recent research on bank lending, trade credit, and collateral, and discuss how our paper fits in this diverse literature. In section 3 we develop a model that illustrates the tradeoffs between seniority and collateral. Using it, we provide a simple yet subtle resolution to the paradox of priority. Section 4 considers some of the more stringent assumptions in our model, and explains why our results would remain robust to a relaxation of these assumptions. In the conclusion we discuss some of the more interesting empirical implications of our analysis.

2. Literature Review

Although the priority assignment of the firm's various debt obligations has been the subject of extensive research, to our knowledge we are the first to consider the appropriate priority assignment for trade credit claims. In particular, we explain why it may be desirable to collateralize a trade creditor's claim and yet subordinate any unsecured portion of this claim to a bank lender.

A number of theoretical arguments have been advanced to explain the desirability of bank seniority. Gertner and Scharfstein (1991) show that granting a bank seniority can ameliorate the firm's underinvestment incentive that arises when it has long-term public debt.

Diamond (1993) suggests that a short-term (bank) lender's incentive to monitor is improved when it is granted seniority over the firm's long-term (public) debt.[3] Welch (1997) argues that by making the "stronger" creditor (the bank) senior, firms are able to reduce the deadweight costs of the negotiation that occurs among creditors following the onset of financial distress. Longhofer and Santos (2000) propose that bank seniority plays an important role in encouraging banks to form ongoing relationships with their small business borrowers. The model in the present paper differs from these perspectives, suggesting instead that bank seniority arises because it is desirable to subordinate the trade creditor's claim, rather than out of any direct benefit associated with the bank itself.

Stiglitz and Weiss (1981) and other early studies on the role of collateral in bank lending generally focus on its use in resolving credit rationing problems.[4] Chan and Kanatas (1985) also suggest that a firm's willingness to put up collateral can signal the quality of its project, even in the absence of credit rationing problems. In contrast, Stulz and Johnson (1985) argue that collateral can be used to mitigate underinvestment problems by limiting the extent to which existing creditors can benefit from new investment financed by the collateralized debt. Still other research looks at how collateral can improve a bank's monitoring incentives (Rajan and Winton, 1995; Gorton and Kahn, 2000); at the firm's risk-shifting incentive (Boot, Thakor, and Udell, 1991); or at the efficiency of the renegotiation that occurs in bankruptcy (Bester, 1994; and Hege and Mella-Barral, 1999). We examine instead how collateral can be used to alter the priority position of a creditor that would otherwise be subordinated to the bank's claim. Indeed, in many of the papers listed above it is the bank that perfects a security interest in the firm's assets, as opposed to the firm's trade creditor in our model.

Our motivation for collateralization lies in the differential valuation some creditors have for the firm's assets. In this respect our model bears a resemblance to Frank and Maksimovic (1998), who argue as we do that trade creditors may value certain assets more highly than the

[3] See also Berglöf and von Thadden (1994), Repullo and Suarez (1998), and Park (2000).

[4] See also Wette (1983), Bester (1985), Stiglitz and Weiss (1986), Besanko and Thakor (1987), Berger and Udell (1992), Petersen and Rajan (1997), and Danielson and Scott (2000). These models generally focus on "outside" collateral, in which a security interest is established in an asset that would otherwise be beyond the reach of the firm's creditors.

firm's other lenders.[5] While we focus on how this differential valuation can explain a paradoxical priority assignment, they concentrate instead on the supplier's superior access to financing as a motivation for trade credit.[6]

Finally, Habib and Johnson (1999) also consider how different investors value a firm's assets, analyzing how collateral and priority can be used to ensure the efficient redeployment of these assets across states. In contrast to their paper in which seniority and collateral play independent roles, we provide a specific rationale for the *simultaneous* use of collateral and seniority assignments.

3. A Model of Bank and Trade Credit

Consider a one-period world in which an entrepreneur requires outside funding of I to invest in a project. These funds come from two different sources: a bank and a trade creditor. To simplify the analysis, we exogenously assume that the firm borrows I_T from the trade creditor and $I_B = I - I_T$ from the bank. Each lender provides the entrepreneur with funds at date 0 with the promise that it will be repaid out of the firm's assets (including both the project's cash revenues and the firm's physical assets) at date 1.[7]

At date 1 the project matures. With probability p, the project is successful, generating cash revenues of X; with probability $1-p$ the project fails and pays x, with $0 \le x < X$. The project's expected return is expressed as $\mu \equiv pX + (1-p)x$.[8]

In addition to the cash return generated by the project, the firm also retains a physical

[5] Petersen and Rajan (1997) suggest this as a rationale for trade credit as well. This is also consistent with Shleifer and Vishny (1992), who argue that asset ownership can affect its liquidation value. See also Gertner, Scharfstein, and Stein (1994), who list more efficient redeployment of assets as an advantage of internal as opposed to external markets.

[6] Other research explaining the existence of trade credit focuses on the cash management economies it can engender (Ferris, 1981); its use by a supplier to price-discriminate among its customers (Brennan, Maksimovic, and Zechner, 1998); the opportunity it provides a firm to evaluate the quality of the product prior to payment (Smith, 1987; Long, Malitz, and Raviv, 1993); or the interaction of trade credit with ongoing firm relationships (Wilner, 2000).

[7] Because we use a one-period model, the timing of the claims cannot be used to grant one creditor a de facto senior claim by giving it a shorter term. This seems reasonable in light of Schwartz's (1997) evidence that the repayment requirements of bank loan agreements are designed to prevent such priority expropriation.

[8] To simplify the analysis, we assume that both the level of the firm's cash revenues and the value of the physical asset a (introduced below) are perfectly observable by all parties without cost. We could endogenize the use of debt contracts by employing a costly state verification assumption (following Winton, 1995). Doing so would complicate the analysis without affecting our central results.

asset *a*. The value of this asset can be thought of as the net present value of its future operation or its salvage value in a resale market. The key characteristic of this asset is that, unlike cash, its value depends on *who* disposes of it. We assume that the entrepreneur is able to enjoy the full value of this asset, *a*. The trade creditor and the bank, however, can only dispose of this asset at a discount; we let λ_B and λ_T denote the fraction of the asset's value that can be realized by the bank and the trade creditor, respectively, where $\lambda_B < \lambda_T \leq 1$.

The central intuition we are trying to capture is that the asset is a raw material or machine that is obtained from the creditor to use in the firm's production process. Because this asset is likely modified to meet the particular needs of the firm, its highest value is obtained when it remains in the hands of the entrepreneur. If the firm is liquidated and the asset is turned over to its creditors, however, it is reasonable to suppose that the trade creditor will be able to more efficiently transform and dispose of this asset, obtaining a higher salvage value from it than could the bank.[9]

As with the cash return, the tangible asset's value is stochastic.[10] With probability *h*, $a = a_H$; with probability $1-h$, $a = a_L < a_H$. The probability *h* is independent of the success of the project, consistent with the notion that *a* represents the long-term productive value of the asset and not the firm's short-run circumstances. To reduce notational requirements, we assume that $a_L = 0$, implying that the expected value of the asset is $\bar{a} = ha_H$.[11]

Finally, we assume that[12]

$$pX \geq I > x + a_H \tag{1}$$

The left-hand side of this assumption implies that when the project succeeds, the cash revenues are sufficient to pay off the face value of all creditors' claims without liquidating the physical

[9] This implies that the bank cannot costlessly sell the asset to the trade creditor in default for λ_T per unit. This would be the case, for example, if the trade creditor's valuation of the asset were private information.

[10] This assumption is crucial to our analysis, as is the assumption that the physical asset and the firm's cash revenues are not perfectly correlated. Unless there is uncertainty about the payoff the trade creditor will receive in default, the priority assignment of the cash revenues will not matter.

[11] This assumption is merely for expositional convenience, reducing the number of cases we need to consider in deriving firm profit below. All of our results continue to hold under the more general assumption that $a_H > a_L > 0$.

[12] Note that these conditions are sufficient but not necessary for all of the results that follow.

asset.[13] The right-hand inequality implies that when the project fails, its payoff is insufficient to repay the firm's debts, even if the physical asset is liquidated at its maximum value. This assumption ensures that at least one of the creditors' debt contracts will be risky.

Because the firm obtains funding from two creditors, a priority assignment becomes important. Furthermore, because the firm has two distinct types of assets (cash and a physical asset), it is possible for priority to be assigned differently with respect to each.

DEFINITION: *A lender's debt is said to be* collateralized *if that lender is given first claim to the physical asset, a, when the firm defaults on its debt. A lender is said to have* seniority *if it has first claim on the firm's cash revenues (and the firm's physical asset if it has not been pledged as collateral).*

This definition allows us to explore the central question behind the paradox of priority. Under what circumstances will one lender be granted seniority over the firm's cash revenues while the other lender's debt is secured by the physical asset?

In what follows we assume that any funds borrowed from the trade creditor are collateralized by the physical asset; later we formally justify this assumption, proving that it is always optimal to collateralize the trade creditor's claim.

The firm's ex ante expected profit can be written as

$$\begin{aligned}\Pi &= p\max\{X+\overline{a}-L_T^*-L_B^*,0\}+(1-p)\max\{x+\overline{a}-L_T^*-L_B^*,0\}\\ &= p(X+\overline{a}-L_T^*-L_B^*)\end{aligned} \tag{2}$$

where L_T^* and L_B^* are the face values of the debt negotiated at date 0 with the trade creditor and the bank, respectively. Intuitively, the firm's project is successful with probability p. In this case, the firm receives all of the cash revenues X as well as the physical asset (with expected value $\overline{a}$), and makes the promised payment to each creditor. With probability $1-p$, the project fails and the firm receives nothing (because of the assumption that $I > x + a_H$ in (1) above). L_T^* and L_B^* are determined in equilibrium by the trade creditor's and the bank's zero profit conditions, which in turn depend on the priority assignment between the creditors.

[13] To see this, note that if the creditors were certain to receive nothing when the firm defaults, $L_B + L_T$ would be equal to I/p. Thus, $pX \geq I$ ensures that $X > L_B + L_T$.

Consider first what happens when the bank is senior. In this case, the bank's zero profit condition can be written as

$$I_B = pL_B + (1-p)[\min\{L_B, x\} + h\max\{\lambda_B(a_H - L_T/\lambda_T), 0\}] \tag{3}$$

while the trade creditor's is

$$I_T = pL_T + (1-p)[h\min\{L_T, \lambda_T a_H\} + \max\{x - L_B, 0\}] \tag{4}$$

To understand these expressions, note that because $X \geq I/p$ from (1), when the firm's project is successful both the bank and the trade creditor receive the full face value of their claims, L_B and L_T, respectively. On the other hand, when the firm's project is unsuccessful the cash revenues *x* are first distributed to the (senior) bank, while the trade creditor has first claim on the physical asset *a*, which it liquidates at a value of λ_T per unit. If the trade creditor's claim can be fully repaid using the physical asset (which happens only if $a = a_H$ and $L_T < \lambda_T a_H$), the bank receives any remaining units of the asset ($a_H - L_T/\lambda_T$), which it liquidates at a value of λ_B per unit. Similarly, if the bank's claim can be fully repaid with the firm's cash revenues (i.e., $x > L_B$), the trade creditor receives any cash that remains ($x - L_B$).[14]

Solving (3) and (4) for L_B and L_T and substituting into (2) allows us to solve for the firm's expected profit when the bank is senior, Π^S:

$$\Pi^S = \begin{cases} \mu + \overline{a} - I - (1-p)[(1-\lambda_B)\overline{a} - h(1-\lambda_B/\lambda_T)L_T^{*S}] & I_T \leq \bar{I}_T \\ \mu + \overline{a} - I - (1-p)(1-\lambda_T)\overline{a} & I_T > \bar{I}_T \end{cases} \tag{5}$$

where $L_T^{*S} = I_T/[p + (1-p)h]$ is the equilibrium face value of the trade credit when the bank is senior, and $\bar{I}_T \equiv \lambda_T[pa_H + (1-p)\overline{a}]$. Note that $I_T = \bar{I}_T$ is the level of borrowing at which the trade creditor receives all of the physical asset in default (e.g., $L_T^{*S}(\bar{I}_T) = \lambda_T a_H$).

Π^S is depicted graphically in the Figure, which shows that equilibrium firm profit increases weakly with the amount borrowed from the trade creditor. Intuitively, as long as the face value of the trade creditor's debt is less than the highest possible value of the physical asset, $\lambda_T a_H$ (which is true for $I_T < \bar{I}_T$), additional borrowing from the trade creditor results in more of the physical asset being liquidated at the trade creditor's higher valuation if the firm defaults. Beyond this point, all of the physical asset is distributed to the trade creditor in default. Hence,

[14] Note that this accounts for all possible cases, because if $L_T \leq \lambda_T a_H$, $L_B \geq x$ by our assumption that $I > x + a_H$.

an increase in I_T has no effect on expected profit, merely raising L_T^* and lowering L_B^* by offsetting amounts.

- - - - - Insert Figure approximately here - - - - -

Consider now what happens when the bank is junior with respect to the firm's cash revenues (and continue to assume that the trade credit is collateralized). In this case, the trade creditor's claim is first satisfied using the physical asset; if the physical asset is insufficient to fully repay its claim, the trade creditor is then given the firm's cash revenues. In contrast, the bank receives payment in default only if the trade creditor is paid in full.

This implies that there are three ranges of I_T to consider when the bank is junior: $L_T \le x$, $x < L_T \le \lambda_T a_H$, and $L_T > \lambda_T a_H$.[15] In the first range, the trade creditor's claim is riskless, even though some of the firm's cash revenues will be required to repay the trade creditor when $a = 0$. The second range consists of I_T such that $x < L_T \le \lambda_T a_H$. For this level of lending, the trade creditor's claim will no longer be riskless. Nevertheless, when the tangible asset's value is high ($a = a_H$) it alone will be sufficient to repay the trade creditor's claim. Finally, in the third range where $L_T > \lambda_T a_H$, part of the firm's cash revenues must be given to the trade creditor in default, regardless of the value of the physical asset.

Following the logic outlined above, we can derive the firm's expected profit when the bank is junior, Π^J:

$$\Pi^J = \begin{cases} \mu + \bar{a} - I - (1-p)[(1-\lambda_B)\bar{a} - h(1-\lambda_B/\lambda_T)I_T] & I_T \le x \\ \mu + \bar{a} - I - (1-p)[(1-\lambda_B)\bar{a} - h(1-\lambda_B/\lambda_T)L_T^{*J}] & x < I_T \le \bar{\bar{I}}_T \\ \mu + \bar{a} - I - (1-p)(1-\lambda_T)\bar{a} & I_T > \bar{\bar{I}}_T \end{cases} \tag{6}$$

where $L_T^{*J} = [I_T - (1-p)(1-h)x]/[p + (1-p)h]$ is the equilibrium value of the trade credit when the bank is junior, and $\bar{\bar{I}}_T \equiv \bar{I}_T + (1-h)(1-p)x$ is the level of trade credit for which $L_T^{*J} = \lambda_T a_H$.

[15] Strictly speaking, we have assumed that $\lambda_T a_H > x$ in defining these ranges. This assumption implies there exists a point at which the firm's cash assets are insufficient to fully repay the trade creditor's claim when $a = 0$ (represented by the first kink in Π^J as shown in the Figure). This is tantamount to assuming that the variation in the value of the physical asset is quite large. None of our results are affected in any way by this assumption. The only effect the alternate assumption would have is that the kink would occur to the right of $\bar{I}_T$, the point at which firm profit becomes constant in I_T when the bank is senior.

Π^J is depicted by the dashed line in the Figure. Careful examination of expressions (5) and (6) show the close similarity between Π^S and Π^J. For low levels of trade credit ($I_T \leq x$), firm profit increases more slowly with I_T when the bank is junior.[16] The reason for this is subtle but intuitive. Giving the trade creditor priority with respect to the firm's cash asset makes its debt less risky, thereby reducing the face value of the trade creditor's claim, given any fixed I_T. As a result, if the firm defaults, less of the physical asset will be required to provide the trade creditor its promised payment L_T^*, and relatively more is given to the bank with its lower liquidation value.

This effect is the central result behind our solution to the paradox of priority. In essence, the goal in assigning priority is to ensure that the trade creditor liquidates as much of the physical asset as possible if the firm defaults. Given a fixed level of trade credit borrowing, the only way to increase the trade creditor's claim on the physical asset is to increase the total required repayment, or the face value of its claim. This is accomplished by making the trade creditor's debt more risky through subordination to the bank's claim with respect to the firm's cash revenues. Because the bank has priority over the firm's cash revenues, the trade creditor expects less cash in default, and hence requires a higher face value for its debt. This higher face value in turn allows the trade creditor to liquidate more of the physical asset. In other words, by giving the bank priority over its cash revenues, the firm gets more liquidation bang for each trade credit buck.

In contrast, firm profit is unaffected by the priority assignment for relatively high levels of trade credit (for $I_T \geq \bar{\bar{I}}_T$, $\Pi^S = \Pi^J$). If the trade creditor's claim is large enough, all of the physical asset is committed to the trade creditor, ensuring that the asset is always liquidated efficiently in default. In this range, borrowing more from the trade creditor has no impact on the total value to be distributed if the firm defaults, and hence simply raises L_T and lowers L_B by offsetting amounts, leaving firm profit unchanged.

Thus far, we have shown that it is optimal for the firm to subordinate the trade creditor's

[16] Note that if we had assumed $a_L > 0$, then for $I_T \leq a_L$, the trade creditor's claim would be riskless, making the priority assignment irrelevant. This would be true regardless of the priority assignment of the cash revenues.

claim once it has been collateralized. We have done this under the assumption that the trade creditor's claim is collateralized, a simplification that has greatly facilitated the exposition of our analysis. We now formally present our complete resolution to the paradox of priority.

PROPOSITION: *The optimal priority assignment grants the bank seniority over the firm's cash revenues and collateralizes the trade creditor's claim with the physical asset.*

Formal proof of this proposition is straightforward and omitted for brevity. Its intuition, however, is instructive. In default, the trade creditor's valuation of the physical asset is greater than the bank's ($\lambda_T > \lambda_B$), whichever lender has priority with respect to the firm's cash revenues. As a result, granting the trade creditor priority with respect to this asset always increases the amount collected by the lenders in default, thereby reducing the total face value of lender claims. At the same time, for any given fixed level of $I_T < \bar{\bar{I}}_T$, firm profit is maximized by subordinating any uncollateralized portion of the trade creditor's claim. As discussed above, doing so makes the trade creditor's debt more risky and thereby raises its face value, allowing more of the physical asset to be distributed to the trade creditor in default.

Firm profit—and hence social welfare—is therefore maximized through a priority assignment that grants the bank seniority over the firm's cash revenues while granting the trade creditor a collateralized claim over the firm's physical asset. This structure maximizes firm profit for two reasons. First, the trade creditor's collateralized position helps ensure that the firm's asset is liquidated efficiently in default. Second, subordinating the remainder of the trade creditor's claim raises the face value of its debt, allowing it to liquidate even more of the asset in default. This further reduces the firm's total borrowing cost.

4. Model Extensions and Robustness

The model presented above provided a simple solution to the paradoxical priority assignment of granting bank lenders universal seniority over a firm's assets while at the same time allowing trade creditors to collateralize their claims with the materials and equipment they supplied. The simplified structure of our model might lead one to question its robustness under more general assumptions. We address some of these concerns now.

Endogenizing I_T and I_B

Our model exogenously assumes a fixed level of borrowing from the bank and the trade creditor. We have, however, solved a version of the model in which both I_T and I_B are fully endogenous choice variables for the firm.[17] As can be imagined, endogenizing these variables greatly complicates the analysis. Yet the essential tradeoffs that lie at the heart of our resolution to the paradox of priority are unaffected. For this reason, we chose the simpler structure presented in this paper. Here we consider how the level of borrowing from each creditor can be endogenized and some of the additional insights this provides.

Suppose that I_T and I_B were choice variables for the firm in our model. Given the higher valuation the trade creditor places on the physical asset, the firm would choose $I_T \geq \bar{I}_T$ (i.e., where $L_T^* \geq \lambda_T a_H$) so that the trade creditor would always receive all of the available physical asset in default. Beyond this point, higher levels of trade credit borrowing would have no effect on the firm's expected profit, simply raising L_T^* and lowering L_B^* by offsetting amounts. As a result, one optimal choice for the firm would be to obtain all of its funding from the trade creditor so that $I_T = I$ and $I_B = 0$.[18]

This outcome is driven by the fact that the only factor affecting the choice between bank and trade credit borrowing is the creditors' relative valuation of the physical asset. Extensive research, however, has argued that bank lending is unique, providing benefits not obtained through financing by other creditors.[19] Combining the essential benefits of borrowing from a bank with the higher valuation the trade creditor places on the physical asset, therefore, allows us to obtain a unique interior solution for the optimal level of trade credit borrowing, I_T^*, and bank borrowing, I_B^*.

To clarify this intuition, consider what happens in our model if banks are "relationship lenders," as in Longhofer and Santos (2000). If the firm does not borrow enough from its bank, the bank will not invest in a costly relationship with the firm, thereby preventing it from

[17] A copy of this model is available from the authors upon request.
[18] Of course, in practice such a choice is likely infeasible because of a trade creditor's limited ability to provide general funding to the firm.
[19] See Bhattacharya and Thakor (1993) and Freixas and Rochet (1997) for reviews of the contemporary banking literature.

obtaining needed funding in bad states of the world. When we introduce a physical asset that the trade creditor values more highly than the bank, we can show that in equilibrium the firm borrows as much as it can from the trade creditor while still maintaining enough bank borrowing to ensure that the bank builds a relationship. In this setting, the basic resolution to the paradox of priority remains the same: The trade creditor's claim will be collateralized by the physical asset, but any uncollateralized portion of this claim will be subordinated to that of the bank.

Although we have formally endogenized the simultaneous use of collateralized credit and senior bank debt by adapting Longhofer and Santos (2000), the fact that the trade creditor values the physical asset more highly provides a resolution to the paradox of priority regardless of the underlying motivation for bank lending. As long as the trade creditor's collateralized claim does not impact the bank's marginal behavior, this mixed priority structure will be preferred under a variety of rationales for bank lending.[20]

Stochastic Asset and Risky Trade Credit

Another key assumption in our model is that the value of the firm's cash revenues and the value of its physical asset are independent. Strictly speaking, our results require only that there be uncertainty about the value of the physical asset in default so that the trade creditor's claim is risky.

To see this, suppose that the value of the physical asset were some known level $\hat{a}$. If $I_T \leq \lambda_T \hat{a}$, the trade creditor's claim would be riskless with $L_T^* = I_T$. Since the trade creditor would never need to receive any of the firm's cash revenues in default, the priority assignment of these revenues would be irrelevant. If $I_T > \lambda_T \hat{a}$, however, the physical asset would always be liquidated efficiently in default, which we have noted makes the priority assignment once again irrelevant. As a result, there must be some uncertainty about the value the physical asset will take when the firm defaults if the priority assignment of the cash revenues is to matter in our

[20] Much recent work focusing on the benefits of bank lending has also argued that bank claims should be senior to those of the firm's other creditors (e.g., Gertner and Scharfstein, 1991; Diamond, 1993; and Welch, 1997). In such models, the effects we outline simply magnify the desirability of making the bank senior while collateralizing the trade creditor's claim. In contrast, models that suggest that bank loans should be subordinated (such as Rajan, 1992) introduce an additional trade-off in our model, making it possible that the trade creditor should be granted universal seniority over all the firm's assets.

model.

Finally, strict independence between the values of the cash revenues and the physical asset is not necessary, although it greatly simplifies the analysis. Given our two-state model, if there were *perfect* correlation (either positive or negative) between the value of the cash revenues and the value of the physical asset, all parties would know the value of the physical asset in default. Imperfect correlation, however, results in uncertainty about the value of the physical asset. Hence, our basic result remains unchanged: It is optimal to grant the bank a senior claim to the firm's cash revenues.

5. Concluding Remarks

We have outlined a straightforward rationale for a puzzling priority structure: universal bank seniority with collateralized trade credit claims. In our model, the trade creditor's claim is collateralized because it values a subset of the firm's assets more highly than the bank would in default. At the same time, this higher valuation makes it desirable to subordinate the remainder of the trade creditor's claim. Doing so increases the face value of the trade creditor's claim for a given size loan, causing more of the physical asset to be distributed to the trade creditor in default.

An interesting aspect of our proposed priority assignment is that it effectively makes the priority of the trade creditor's claim contingent on the value of the asset serving as collateral. When the asset has a relatively high value, the trade creditor is able to extract more value in default. When the physical asset is worth very little, there is less benefit from trade credit borrowing and less reason to give the trade creditor any claim on the firm's assets. Securing the trade creditor's claim therefore provides a valuable state contingency that could not be obtained solely with a bank seniority covenant.

The effect we analyze is particularly important in explaining the use of trade credit by small business borrowers. Because these firms are relatively more likely to become financially distressed than large corporations, the implicit benefits of trade credit are even higher for small

businesses.[21]

Our paper also provides insight into optimal priority assignments among creditors. Winton (1995) demonstrates that debt with priority assignments is the optimal financial contract in a costly state verification environment with multiple investors. If the value of the physical asset were fully observable to all agents, our model would essentially be a simplified version of Winton's, and the optimality of debt contracts would follow immediately. Although Winton's framework implies priority assignments are desirable, his model gives no guidance as to how they should be assigned. In contrast, our paper offers a positive rationale for subordinating the trade creditor's claim, thus providing a focal point for assigning priority among creditors in Winton's model.

In addition, our analysis is unique in the attention it pays to the priority structure of trade credit. The limited research on trade credit focuses on the characteristics of firms that extend and use trade credit, rather than its priority assignment. Similarly, most research on collateral has directed its attention to bank debt or the use of outside collateral, and has virtually ignored its use by trade creditors.

Finally, while our model is characterized in terms of trade credit, we can generalize our results to any creditor with a superior ability to extract value from one of the firm's assets in default. An example is factors that make loans to retail stores. Although they do not physically supply the merchandise they finance, their ability to distribute seized inventory and obtain a relatively high liquidation value helps explain their use by retail firms and the collateralized nature of their claims. Similarly, the effects we analyze can help explain the priority granted in bankruptcy to firms that lease their products to end users (see Habib and Johnson, 1999).

We conclude by outlining some interesting empirical implications that arise out of our model, in the hope of spurring new research on the priority of trade credit. First, and most important, our results imply that businesses that rely on very firm-specific inputs and equipment

[21] Although Petersen and Rajan (1997) show that large publicly traded firms tend to use more trade credit, this is likely due to their superior access to such credit rather than a greater need for it. In fact, Petersen and Rajan show that among firms included in the Survey of Small Business Finance, firm size does not affect trade credit borrowing once supply effects have been considered. We presume that similar conclusions would hold if small businesses were compared with large publicly traded firms.

(for which there is a limited aftermarket) will tend to collateralize their trade credit while making their bank debt senior with respect to their other assets. For these firms, there is likely a great difference between the bank's and trade creditor's liquidation valuations of the physical asset (i.e., λ_T is significantly higher than λ_B). In contrast, a trade creditor is less likely to possess an advantage in standardized raw materials that can easily be valued and sold, limiting its value as a collateralized creditor.[22]

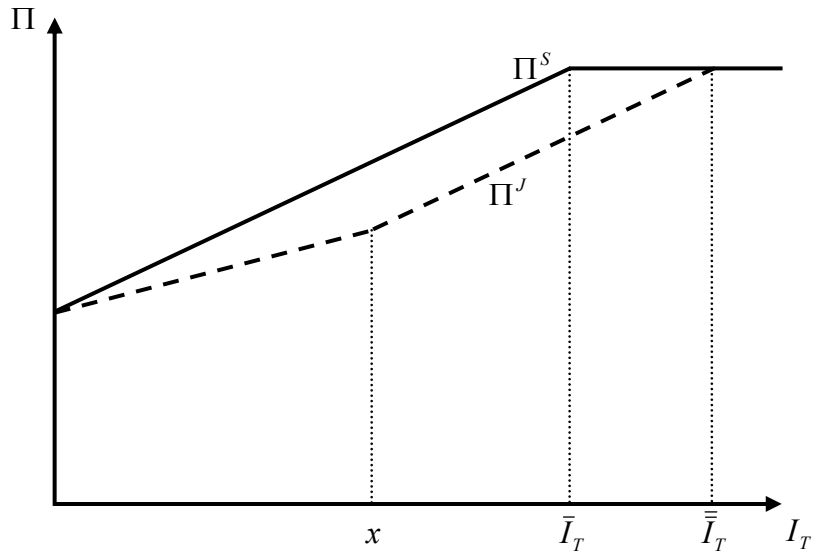
Second, firms operating in industries or sectors with unstable demand for their products will be more likely to collateralize their trade credit while subordinating the balance of these claims. This corresponds to the parameter p in our model, the chance that the firm's project succeeds. In such industries, maximizing the liquidation value of the firm's assets becomes even more important, because of the greater likelihood that the firm will default and the asset will be transferred to its creditors. Similarly, our model suggests that the assignment of collateral to subordinated trade credit is more valuable in uncertain economic times when the firm's likelihood of default is higher.[23]

[22] Petersen and Rajan (1997) provide evidence suggesting that firms in mining and manufacturing industries tend to use a higher proportion of trade credit than do firms in retail trade and service, consistent with what our theory suggests. Their results, however, are mute with respect to the relative priority and collateral position of this trade credit.

[23] This is consistent with evidence provided by Calomiris, Himmelberg, and Wachtel (1995), who show that trade credit provision becomes more prevalent in recessions. The rationale for this in our paper, however, is different from the credit rationing explaination they suggest.

Figure. Expected Firm Profit, Bank Seniority, and the Level of Trade Credit

Firm profit is weakly increasing in the level of trade credit borrowing regardless of the bank's priority position. For levels of trade credit less than $\bar{\bar{I}}_T$, firm profit is higher when the bank is senior. This is because subordinating the trade creditor's claim raises its face value, allowing the trade creditor to liquidate more of the physical asset in default.



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