Economic Motivations for Vendor Financing: Theory and Evidence

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ECONOMIC MOTIVATIONS FOR VENDOR FINANCING: THEORY AND EVIDENCE

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Abstract

Vendor financing is shown to have advantages over competitive bank financing in cases where: there is some "market power" in the product market; there are positive margins in the product market; credit can be used to segment the demand and extract additional economic rents; funding, collateral or security disposition rates favor the vendor; or there is asymmetric information and differing abilities to assess credit risk among the various participants in the credit market. Further, the theory employed predicts that the "optimal" risk exposure for vendor financed operations exceeds that of the traditional lenders, even in cases of purely competitive lending environments. Summary evidence from one vendor finance operation is then presented that is largely consistent with the theory.

Introduction and Background

The purpose of this paper is to investigate the economic incentives for input supply firms to offer credit in conjunction with their products. Although these types of vendor finance programs have been in existence for nearly half a century, several have recently increased in both scale and visibility. These vendor finance programs have become the subject of much additional debate -- by traditional lenders who are uncertain whether to view the "new" entrants in the credit market as competition or opportunity; by other vendors interested in the value of financing their own customers' purchases; and by customer-borrowers interested in the "best deal" they can get. Furthermore, an accurate understanding of the incentives and impacts on the market of these relatively unregulated lenders is needed by policymakers and regulators as they design and implement guidelines for behavior.

At the center of the debate are the economic motivations of the supply firms who chose to create a financing unit. Although there has been relatively little formal treatment of the economics of intermediation by these lenders operating in agricultural markets, there have been several studies and hypotheses put forth related to automotive, industrial supply, and consumer products vendor finance operations. The question remains as to what form of history may repeat with agricultural input supply firms. Will the vendor finance companies largely displace bank supplied financing as has been somewhat the case with automobiles? Or, perhaps only a small number of specific-need borrowers will develop relationships with their suppliers to formalize common trade credit into real debt relationships as has been the case with some industrial supply vendors (Remolona and Wulfekuhler).

There have been many reasons cited for, or explanation of, vendor financing. For example, it may be that the firm is able to stimulate sales of its products through creative financing for customers who, in the absence of the vendor supplied financing, could not purchase the products. For this practice to improve firm profits, it must be the case that the firm earns at least as much on

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the additional product sales as the financing costs. Furthermore, the financing contracts must be designed to effectively attract additional sales, rather than simply substitute for other financing (or cash) by current customers. Next, vendor financing may simply be used in attempts to solidify market share. Or, there may be real cost advantages conveyed to the vendor through reductions in information collection costs because much of this function is accomplished in the course of doing other business with the customer. Furthermore, in addition to shared delivery costs for point-of-sale financing, "scope" economies of providing financing along with the product may also come about because of reduced transactions costs on the part of the borrower.[2] Or, the lending operation may serve as a direct profit center; or a means of accomplishing related diversification for risk management. Further, the bonding costs for the vendor may be lower than for a traditional lender. Hence, what may appear to be an unacceptable credit risk to a bank may be an acceptable credit risk to a vendor, because the borrower needs to maintain relationships with the supplier other than credit alone. Finally, as is argued later, the vendor may use credit terms to effectively offer different price schedules to segments of demand with differing elasticities to more perfectly discriminate according to willingness and ability to pay. Thus, the credit function can be used to move toward a more monopolistic outcome, exploiting market power in the goods market and extracting more rents from the customers than would be the case under uniform pricing without credit.

Other studies have addressed related issues such as the market valuation effect of forming a captive finance unit. Lewellen; Roberts and Viscione(b); and Dipchand, Roberts and Viscione each found that the formation of a captive finance company effectively increased the parent firm's total borrowing capacity. To the extent that this additional capacity is used, the effect may be to expropriate value from existing bondholders toward equity holders (Kim, McConnell, and Greenwood). Roberts and Viscione(a) also consider agency theory implications to the management of the financing function through the formation of a captive. They conclude that the separation of management and credit, but the joint contribution to one firm's performance, potentially reduces monitoring costs and improves overall performance. Staten, Gilley, and Umbeck indicate that indirect lending may reduce a bank's cost of screening potential borrowers. However, issues of the relative merits of the "two-desk" strategy versus formation of a captive are left largely unresolved. Finally Brennan, Maksimovic, and Zechner offer a theory of financial intermediation that indicates some conditions under which vendor financing improves the profitability of firms. Further, they derive "industrial organization" impacts (numbers of firms in equilibrium) and indirectly demonstrate that it may be optimal for only some firms with market power to offer financing to thereby "divide" the customers among differing firms depending on their relative demand elasticities. In other words, it may be optimal for one firm to service the less elastic demand at a high price and another firm to service the more elastic demand customers with credit and somehow share the cartel-like profits.

As noted in the literature, classical economic models with no frictions, no market power, and no information asymmetries leave little room for strategic behavior among financial intermediaries. However, the purely competitive paradigms do not permit many of the interesting or realistic solutions. For example, firms with some market power may chose to cross-subsidize activities away from the activity that is somewhat insulated from the effects of perfect competition. Considering local supply firms, there is likely to be some proximity-conferred market power enabling a situation where price may be greater than marginal product cost and where cross-subsidization of the financing operation may be sustainable. Again, classic theories with perfect competition would prohibit cross-functional subsidies, as the primary activity would simply be "bid away" from the subsidizing firm. Hence, elements of imperfect competition, resulting in some market power (quasi-monopoly supply) are important for much of the theory developed and presented below.

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[2] This "one-stop" shopping concept has also been imitated in the form of "two-desk" lending operations where a bank or other traditional lender simply sets up a lending branch at the point of sale (Staten, et. al).

Framework to Evaluate Economic Motivations

In order to better understand the motivations and practices that are observed in the market, an economic framework is needed. Below, a simple structure is presented that is then used to demonstrate expected outcomes in a simple intermediation market when multiple players (such as pure intermediaries and vendor finance operations) are present. It is recognized that there are a myriad of situations involving competition among vendor finance operations and traditional lenders. Rather than attempting to depict various specific markets, several "boundary" cases are examined to impart structure to the entire market. A simple graphic will help illustrate this point.

Figure 1 maps the competitive structure of the market (from pure monopoly, to pure competition) against the level of informational uncertainty about the borrower (from purely asymmetric where the borrower knows credit risks exactly and the lender cannot tell at all, to actuarially fair and exactly observable credit risk). Clearly there are other important features of the credit market that could be contrasted with the present two thereby increasing the dimension of the map. Some of these features are examined (i.e., collateral coverage rates) but are left off this figure for clarity. Two interesting extremes are identified in the graph. First, consider the perfect monopolist's case when exact information about the borrower is available (lower left). The monopolist can design price discriminating supply schedules to completely extract all the producer's surplus in the system. At the top right, the credit market breaks down because the purely competitive nature of the industry means that in equilibrium the lenders will just break even and the asymmetric information situation means that at any interest rate, only borrowers who know themselves to be of higher risk than reflected in the interest rate will present themselves to the offer. Hence, the average risks presented by the borrowers will always be above the level reflected as actuarially fair in the interest rate (this situation is similar to the "Market for Lemons" problem described by Akerlof). However, there are still many other cases of interest. For example, with any level of market power, and hence the potential to cross-subsidize activities from the partially monopolistic activity to another, the amount by which a manufacturer would or should be willing to subsidize a lending operation is potentially positive. Further, the design of the sales offer (price and financing terms) should be such to exploit any self-identification motives present among the borrowers. These and a few related issues are addressed in turn.

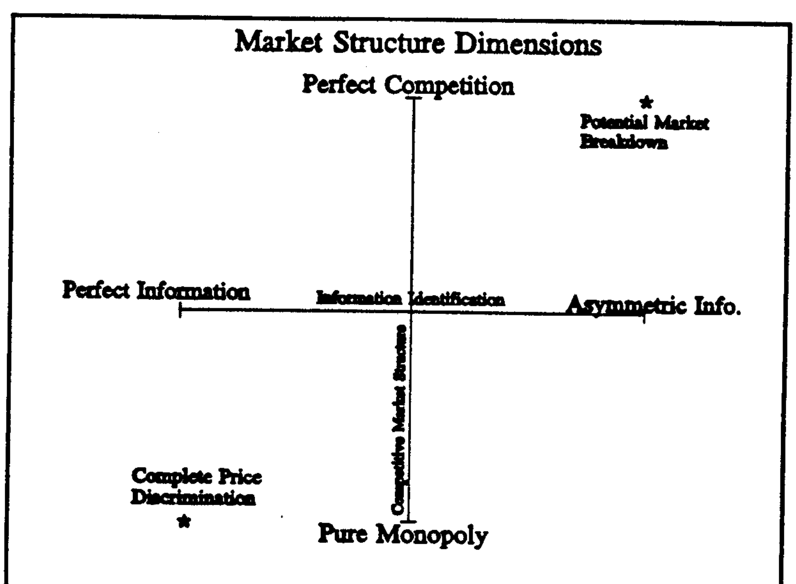

Figure 1

For ease of notation, the paper considers the number of $1 loans to be made in a "banker's discount" framework. That is, the loans are made such that the future value is one dollar, and the interest rate is the amount that needs to be charged to convert the current value to $1 in the future. This convention significantly simplifies the exposition that follows, but does not affect any result that does not depend on loan size. Figure 2 reinforces some of these concepts.

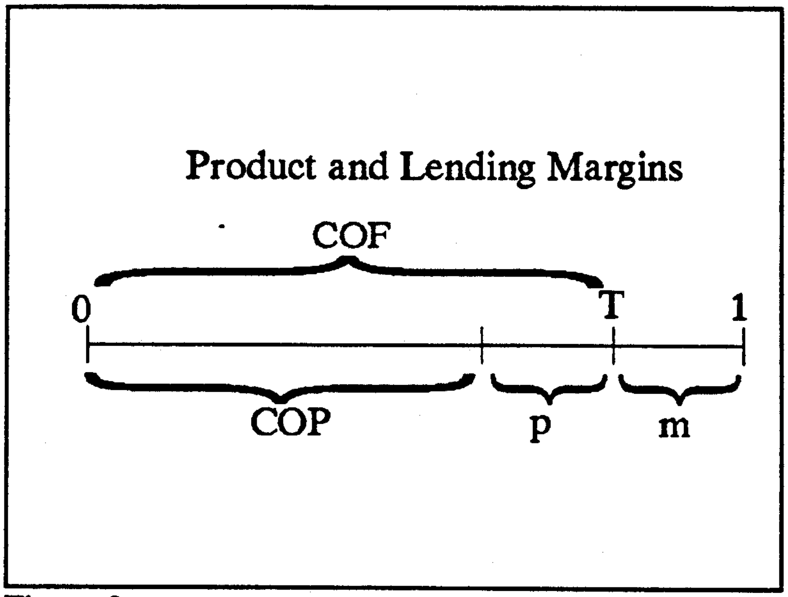

Figure 2

In Figure 2, the following are used:

T = price of product
COF = total cost of funds to acquire product sold
COP = cost of production
m = lending margin = (1-T)
p = manufacturing margin

The purely competitive interest rate must be m/(1-m), and for simplicity, this rate is assumed to exactly offset additional expenses such that the net economic rents to pure lenders are zero. The lenders are assumed to access a perfectly elastic supply of funds at COF sufficient to finance all borrowers in the market. In this framework COF is the total cost of acquiring the resources that are transferred to the borrower. It is convenient to think of the lender simply buying the input at price T and giving it to the borrower in return for $1 promised future payment. Again, the problem has been placed on this scale for later convenience; and this scaling should not affect any important interpretations.

In what follows, three cases are examined in which banks' and vendor finance units' behavior depend on the competitive structure of their businesses and on varying abilities to discern credit risks. Implications are drawn from the models that can then be compared and contrasted with observations to both validate the structure of the model and improve understanding of the observed behavior. Following these, some summary empirical evidence is provided from one such vendor finance operation. Finally, conclusions and summary remarks are given.

Case 1: Some market power in the product market; purely competitive lending environment; perfectly identifiable credit risks.

In this first case, assume that the borrowers have been correctly and precisely classified and ranked such that the individual (marginal) probability of default can be exactly identified. For exposition sake, the borrowers are sorted with the resulting marginal default function as D(n) shown in Figure 3. A lender faced with such blissful knowledge will lend to the point that the marginal return from lending is equal to the marginal cost. The lender's total profit π, as a function of the number of loans, n, is:

$$\pi(n) = m(n-\int_0^n D(k)dk)-c\int_0^n D(k)dk*(1-m) \qquad (1)$$

where c is the "collateral loss rate", $0<c<1$. It can be thought of as 1 less the proportion of principal collateralized. Hence, if $c = 1$, there is no collateral coverage and defaulted payments are full losses. If $c = 0$, then there is full collateral on principal value and there is no additional loss from default other than unearned margins. Equation (1) indicates that the profit is equal to the number of nondefaulted loans times the margin earned per loan less the total number of defaulted loans times the principal value as adjusted for collateral recovery. The profit maximizing lender will lend to the point that $d\pi/dn = 0$ or:

$$\frac{d\pi}{dn}=m(1-D(n))-c(1-m)D(n)=0 \qquad (2)$$

which holds at $D(n^*) = m/[c(1-m)+m]$. Notice that if there is no collateral ($c=1$), the lender will lend until the marginal default rate is equal to the margin earned on each unit. In the case of partial recoveries, $0<c<1$, $n^* = D^{-1}(m/[c(1-m)+m])$. In these circumstances, the lender will lend to even riskier borrowers, as expected. Because D(n) is monotonically increasing in n, dD(n)/dn is everywhere positive and therefor e dn^*/dc takes on the same sign as $dD(n^*)/dc$. It is easily shown that $dD(n^*)/dc <0$ if $m^2 - m <0$ (as is the case for $m<1$ in this example) implying that more collateral coverage permits lending to riskier customers. A vendor finance company may very well be better able to deal with specialized collateral than a traditional lender thereby reducing the value of c relative to a traditional lender who recovers the same item as security. For example, a John Deere dealership may be better able to dispose of a repossessed tractor than a local bank; hence the vendor finance unit of John Deere should be able to make loans to some riskier borrowers than the bank because of its lower implied c.

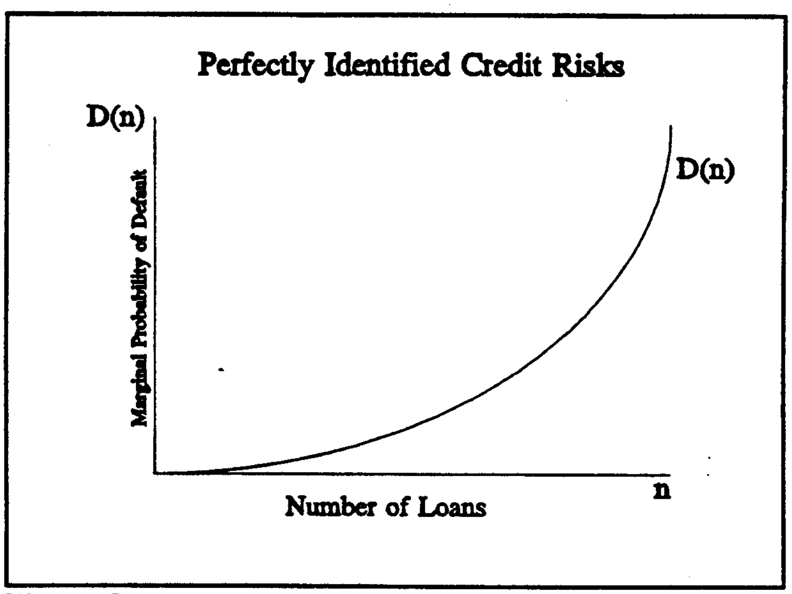

Figure 3

The impact of additional product margin in addition to the lending margin can also be easily established by considering the product margin to simply increase the lending margin to the total margin, (m+p), as in Figure 2. From equation (2) above, it is easily confirmed that $dn^*/dm > 0$, hence, the vendor finance operation *if viewed simply as a financing operation*[3] will always optimally lend to more risky borrowers than the traditional lender if there is any market power which permits T to exceed COP.

It is instructive to work out similar conditions for the vendor finance unit to highlight the interaction between the product margin, lending margin, and collateral coverage rate. For the manufacturer with a vendor finance program, the profit function becomes:

$$\pi(n) = (m+p)(n-\int_0^n D(k)dk) - c\int_0^n D(k)dk*(1-m-p) \qquad (3)$$

Again setting $d\pi/dn = 0$ and solving implies that $D(n^*) = (m+p)/(m+p+c-cm-cp)$ which is everywhere greater than $m/[c(1-m)+m]$ (and also greater than m) in the relevant cases $0<c<1$, and $(m+p)<1$. This result shows that the vendor finance unit will again finance more risky borrowers than the lender in the purely competitive banking-only business. Again notice that if c=0, the firm will lend to everyone (always earning p, whether through payment or sale of collateral) and if c=1, the vendor will lend until the marginal default rate equals the combined product and lending margin. The optimal level of lending can be found at $n^*=D^{-1}((m+p)/(m+p+c-cm-cp))$. The sign of $dn^*/dc < 0$ again as expected, indicates that the lender with the higher valued or less costly to dispose collateral will find lending more profitable to any given borrower and will in equilibrium lend to more borrowers.

Case 2: Perfectly competitive banking system; borrowers risk-classified according to distribution on returns; both lenders competing for market share; vendor sets price T and interest rate, r_v separately from bank.

Consider the next case where there are two classes of borrowers, rich-low risk, and poor-high risk; and those with some potential to default have insufficient cash to buy outright and hence require financing if they are to use the product at all. Further, the only collateral pledged is the return on the product itself. Hence, it is convenient to view both the product and the loan as lasting only one period (i.e., seed, chemicals, etc.) and generating an uncertain return, $\tilde{R}$ over that period.

In contrast to the previous case which considered only the financing decision for the class of purchasers who use credit, the situation now admits the possibility of using credit to discriminate among borrowers according to their risk class while selling some product for cash as well. Again, the risk of default is observable among potential customers, but that default risk is now captured in the form of a distribution of returns that each individual farmer faces. Presume that there are some number N_r of rich farmers each of whose returns distribution, $\tilde{R}_r$ is sufficient that there is no possibility of default. The competitive banking system will be forced to "break even" on this class or borrowers again implying an interest rate of (m/(1-m)) to this class of borrowers. Next, consider one of the N_p "poor" farmers whose returns distribution $\tilde{R}_p$ includes some outcomes less than 1 or T(1+r), in which case he/she would default on the loan and simply turn over the realized returns to the lender.[4] Before the returns are realized, the farmer knows the distribution, but not the actual, or realized level (this situation may very well corresponds closely to the realities of farming).

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3 In other words, the internal transfer of the product to the lending operation takes place at a price of COP, hence all returns accrue to the intermediation function alone.

4 The value of scaling the problem to number of $1 loans should now be more apparent as it simplifies the computation of probability weighted returns as the fraction of $1 is now also equivalent to the "return".

It will also be convenient to utilize two other measures $h^{+}_{i,k}$ and $h^{-}_{i,k}$ which correspond to the conditional expectation for a variable i over the domain that the variable is greater or less than k respectively, scaled for the probability of meeting that condition. For example, suppose $\tilde{R}_p$ takes on values from R_{min} to R_{max}. Then $E[\tilde{R}_p | \tilde{R}_p > k] = [\int_k^{R_{max}} f(R_p)R_p dR_p]/[1-F(k)] = h^{+}_{R_p,k}$, and $E[\tilde{R}_p | \tilde{R}_p < k] = [\int_{R_{min}}^{k} f(R_p)R_p dR_p]/[F(k)] = h^{-}_{R_p,k}$, where f(.) is the probability density function, and F(.) is the cumulative distribution function. Note that $[1-F(k)]*h^{+}_{R_p,k} + [F(k)]*h^{-}_{R_p,k} = E(R_p)$ by definition. Further, $h^{+}_{R_p,R_{min}} = h^{-}_{R_p,R_{max}} = E(R_p)$ as well. These measures are closely related to the incomplete expectation frequently used in the insurance literature, but differ by the weighted value of the variable beyond the boundary k. The incomplete expectation, $IE_{R,k}$ is defined as $[\int_{R_{min}}^{k} f(R_p)R_p dR_p] + k*[1-F(k)]$. These measures are useful in describing expected values of positions that are contingent or dependent upon the outcomes of other variables. For example, the lender may wish to compute expected values of loan positions recognizing that if the borrower earns more than the debt obligation, they will simply pay the face value; but under default, there is some distribution of recovery values. Hence, the expected value of the total loan position contingent on earnings R, is the face value (FV) times the probability of being paid that amount plus $h^{-}_{R,FV} * F(FV)$ which is the expected value of payments on R given that they are less than FV.

In this framework, "k" is the point that determines default corresponding to outcomes less than the future loan payment, $T(1+r_v)$. If the farmer earns more than enough to pay back the loan, then he/she will simply pay the lender and keep the difference. If, on the other hand, the returns do not meet the debt obligation, the farmer simply turns over the realized proceeds and terminates the debt through partial default. A bank lending to this class of farmers will be forced to add a risk premium to the interest rate in an amount to compensate for the average losses on defaulted loans to break even. This rate can be found as the rate r_b, that is the solution to:[5]

$$T(1+r_b) = \frac{(1-[F(T(1+r_b))][h^{-}_{R,T(1+r_b)}])}{(1-F(T(1+r_b)))} \tag{4}$$

It is apparent that if $T(1+r) < R_{p,min}$ there is no chance of default and even the "riskier" farmers are "risk-free" in terms of lending. On the other hand, if $T(1+r) > R_{p,max}$ then no farmer will be able to purchase the input. However, if $R_{p,max} > T(1+r) > R_{p,min}$, there is some possibility that there will be a price-interest rate combination attractive to both the farmer and the vendor. Suppose the vendor offers financing at rate r_v which is positive, but less than the "default adjusted" rate banks are required to charge to breakeven on the high risk class of borrowers. The vendor's problem is now to maximize profits over the joint choice of T and r_v.

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5 To see this, consider the average "loss" on defaulted loans, or $T(1+r_b)-h^{-}_{R,T(1+r)}$ and since only the fraction $F(T(1+r_b))$ default, the remaining loans must generate enough additional margin that the sum of the returns on defaulted and nondefaulted loans returns to 1. A discrete example will help illustrate. Suppose R is distributed uniformly on the interval (0,3). Then, by definition, $f(R) = 1/3$, $F(k) = k/3$, $h^{-}_{R,k} = k/2$, and $[1-F(k)] = (k-3)/3$. The choice of the interest rate, r_b can be made such that the incomplete expectation over R is 1. Hence, $h^{-}_{R,T(1+r_b)}*F(T(1+r_b))+T(1+r_b)*[1-F(t(1+r_b))] = 1$; or the average payoff in default times the probability of default plus the face value times the probability of nondefault equals the competitive rate of return, or 1. Solving for $(T(1+r_b))$ in the discrete example given above implies that $T(1+r_b) = (3-3^{1/2})$ or approximately 1.2679. A fairly good first order approximation is to notice that from the competitive interest rate, returns below 1 will default and on average return 1/2 in that state. The remaining 2/3 of the loans must generate the additional margin or the losses (1-(1/2)(1/3)) must be "spread" over 2/3 of the loans. Hence, (1-(1/2)(1/3))/(2/3) = 1.25. The difference is due to the fact that the approximation ignores the fact that the slightly higher interest rate also marginally increases the likelihood of default.

Before turning directly to that issue, it is first important to understand the farmer's decision framework. As depicted in Figure 4, the credit customer receives inputs worth +T and then at the end of the production cycle either receives $R_p > T(1+r_v)$ and pays off the loan worth $T(1+r_v)$ or earns $R_p < T(1+r_v)$ and simply surrenders that return as payment on the debt. Although the relative probabilities (labeled (*p*) and (*1-p*)) of the two types of return outcomes delineated at $T(1+r_v)$ are simply the integrals of $f(R_p)$ split at $(T(1+r_v))$, the relative weights in the "upstate" and "downstate" are immaterial as the sign of the expected value of the sum of the two outcomes depends only on whether the expression on the top line in the figure is positive (and, hence the expected value of the two outcomes will be positive for any $p>0$ because the other component will equal 0)[6]. Under this scenario, the farmer will accept and fully finance inputs T any price less than $R_{p,max}$ so long as there is no equity commitment and no additional costs of default. However, under the more usual arrangement of partial financing (positive equity commitment), and other costs of default (such as reputation damage and the like), additional constraints are imposed on the farmer's behavior. For convenience, it is assumed that the farmers are only willing to finance if the expected returns on their purchase at T increase their expected return on equity. Hence, the inputs are accepted only in cases where the leverage is expected to have a positive boost to return on equity. Finally, the lender is also expected to have some control over the extreme-risk borrower and exclude those for whom there is no possible solution to the risk-premium-equation (4) above. The details of the mechanisms are not important at this point, only there are no "free" options to default, and some level of improvement by the farmer (i.e., an increase in expected returns) is expected from the use of the input.

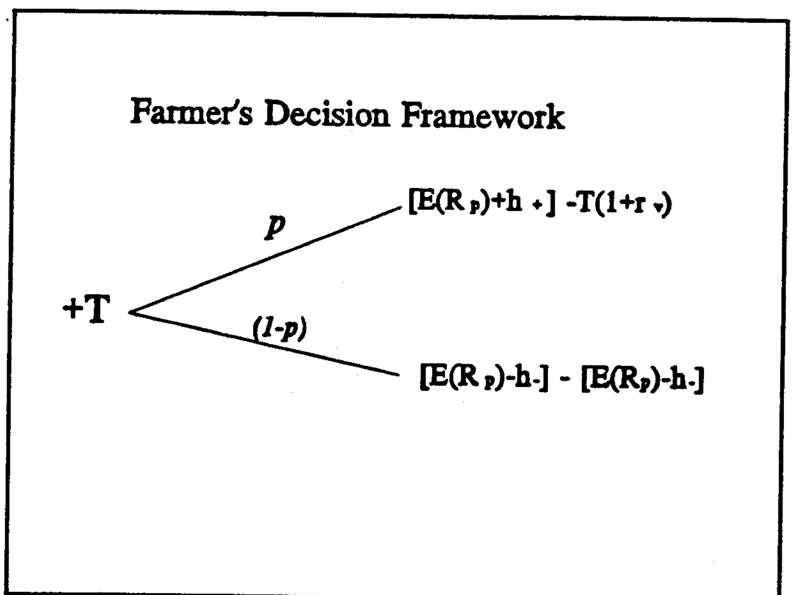

Figure 4

[6] The operational convenience this affords is that, because the decision does not depend on relative probabilities of outcomes, we may proceed as though the farmers are risk-neutral and prices will, in equilibrium return to their expected values (see Ingersoll). Risk neutral pricing is not necessary, but convenient in that we do not need to understand the differing risk attitudes among the farmers, and instead can assume purchase will occur if expected returns are positive. Again, it does not mean we are unconcerned with risk, it simply means that the risk-neutral solution has a unique parallel under risk.

Returning to the issue of jointly determining T and r_v to maximize profits for the vendor, assume that the representative returns distributions for poor and rich farmers are as shown in Figure 5. Then, it is clear that an interest rate adjusted for default will deter the rich farmers from purchasing on credit as they will instead use cash. However, the poor farmers who do not have sufficient cash will still find it to their advantage to purchase on credit if:

$$T(1+r_v)<E(R_p)+h^{*}_{R_p,T(1+r)} \tag{5}$$

implying that they are "better off" with the input. Hence, one strategy for the vendor finance unit to employ would be to set the highest price consistent with purchase by both classes of farmers and charge an interest rate that is as high as possible that permits purchase by poor farmers. The positive level of interest rates and the risk premium will deter the rich farmers from financing; and the interest rate is as high as possible to be consistent with purchase by poor farmers.

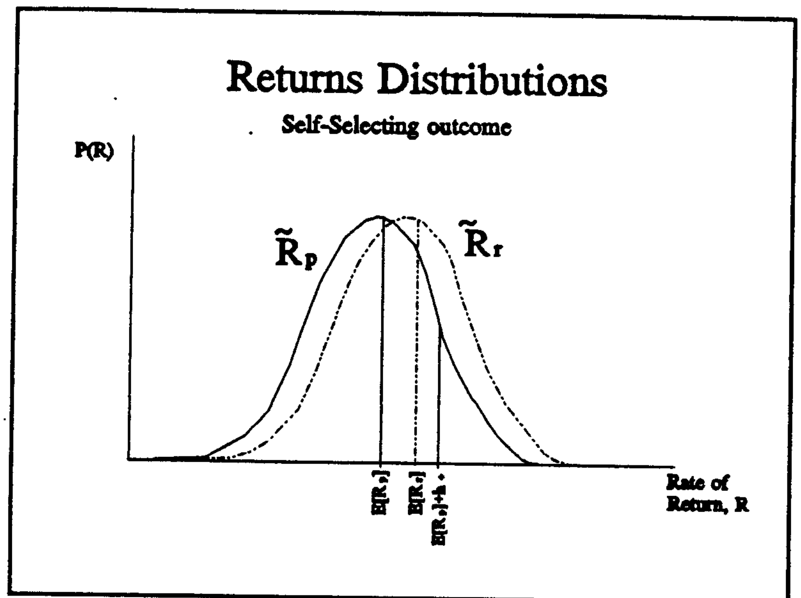

Figure 5

Setting T = E[R_r] extracts all the rents possible from the rich farmers; and solving for the maximum r^*_v consistent with the decision framework (equation (5)) of the poor farmer implies r^*_v = $[(E(R_p)+ h^{*}_{R_p,T(1+r)})/T - 1]$. The vendor's profit in this case is $\pi = N_r(E[R_r]\text{-COP}) + N_p(E[R_p]\text{-COP})$.[7] Comparing this to the maximum profit to the vendor with no financing where $\pi = (N_r+N_p)(E[R_p]\text{-COP}) = N_r(E[R_p]\text{-COP}) + N_p(E[R_p]\text{-COP}$, it is apparent that the vendor earns more from implementing its own vendor finance operation than from relying on external financing of its

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[7] To see this, consider the discrete analog case where one half of the poor borrowers default and one half payoff the loan at the "default" adjusted interest rate. It is then easily shown that the expected value of the payments from the poor group equals the expected value of the returns because the interest rate was chosen to exactly offset losses from the defaulting group with gains from those who do not. Algebraically, total expected profits in this case are equal to: $E(\pi) = N_r(E[R_r]\text{-COP}) + (P(R_p>T(1+r)))^{*}N_p\{[(1+r^*_v)T]\text{-COP}\} + (P(R_p<T(1+r)))^{*}N_p\{(E(R_p)\text{-}h^{*}_{R_p,T(1+r)})\text{-COP}\}$. Substituting $r^*_v = [(E(R_p) + h^{*}_{R_p,T(1+r)})/T - 1]$ and recognizing that $(P(R_p<T(1+r))) + (P(R_p>T(1+r))) = 1$ gives the stated result.

purchasers.[8] Importantly, the banks will be unable to compete for the financing of the poor farmer purchases because the rate of return on the lending operation is actually negative. To see this, notice that the vendor nominally lent to the poor borrowers an amount in total equal to N_p*T and received only $N_p(E[R_p])$. Substituting $E[R_r] = T$ implies a rate of return to lending equal to $\{(E[R_p]/E[R_r])-1\} < 0$. Hence, the traditional lenders will neither want nor be able to compete for this business, and the rich farmers will "self-select" cash due to the positive additional interest rate. The vendor has thus been able to extract all the economic rents from the rich farmers by judiciously setting price, and has been able to extract additional manufacturing margin from the additional sales to the poor farmers. Further implications of the model remain consistent with the earlier section in that the expected average credit quality is less than in cases without vender intermediation, and that the manufacturing margin positively affects the amount of lending undertaken. Even in cases where $E(R_r)>E(R_p)+h^+$, the vendor may find it advantageous to "subsidize" poor borrowers with a negative effective interest rate, if they can effectively exclude the rich farmers from taking advantage of the negative interest rate.[9]

Case 3. Some Self-Selection; incentive alignment motives; and information revelation.

In contrast to the previous cases, suppose that each farmer, i, has a returns distribution that is known to him/her (i.e. they know the likelihood and extent to which their outcomes may deviate from that which is expected), but this information is unobservable to the lenders. Further, before the uncertainty is resolved (i.e., before the production cycle), the farmer will pay cash for a product if $T<E(R_i)$ and will finance it if the contract (price and interest rate) permits an increase in the expected value over T for the equity committed. In other words, the expected rate of return is higher than the cost of debt, so any degree of leverage is preferred.[10]

Although the lenders are unable to determine the individual's riskiness, assume that the "distribution of riskiness" is at least known. The lender may attempt to set an interest rate such that $T(1+r)<E[R]+\gamma^*$ where γ^* is the critical level below which farmers will have no incentive to finance and above which the remaining farmers will generate more product margin than they cost in default expenses. However, if this is all the structure imposed on the problem, the credit market can break down if farmers fully self-select. This breakdown occurs if there is no solution to the following two equations.

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8 The highest price that can be set to sell to both groups of farmers and rely on external financing is to set the price equal to $E[R_p]$. Then, both groups purchase and the banks just break even on the financing of the poor farmer's purchases. Brennan points out that in some cases (i.e., if there are relatively few poor farmers) it would be more profitable to sell only to the rich farmers at a higher price. However, this condition is already precluded in cases where $R_p+h^+>R_r$, as we have assumed, because that case permits charging the rich farmers the highest price they can pay already. However, the possibility that it would be more profitable to restrict sales only to rich farmers should be pointed out for logical completeness.

9 Price discrimination (in its legal forms) exploits the relative elasticities of segments of demand. Much as a phone company may be able to charge the less elastic business users higher rates during typical business hours, the vendor may be able to reduce its rates to poor farmers through a creative interest rate program that somehow screens out rich farmers.

10 Using earlier notation, this is equivalent to accepting an option to default and an expected return equal to $(p)\{E(R_i)+h^+_{R,T(1+r)}-T(1+r)\}$.

$$T(1+r^{*})<E[R]+\gamma^{*} \quad (6)$$

and,

$$[E(T(1+r^{*})|R>(T(1+r^{*}))]+E[R|R<T(1+r^{*})]]-T>0 \quad (7)$$

Equation (6) simply insures that farmers will buy and finance product at price T. The first term in equation (7) reduces to the probability that the return is sufficient to pay the loan times the loan payment; the second term adds the payoffs in cases where there are shortfalls; and then the principal lent is subtracted. The feasibility of the solution depends upon the distribution of returns, but it is easy to construct cases where there is no solution.

Cases where there are no solutions are again similar to the "Market for Lemons" problem popularized by Akerlof. The analogy is that at any rate, r, only customers whose risk adjusted interest rate (that they know from private information) should be higher than r will present themselves to the market. Hence, at a rate r, the pool of potential borrowers will possess higher risks than reflected in rate r, hence, to service that pool, a higher r is needed, but at that rate, only the portion that are still favorably misclassified will remain in the pool; and so on until there are no applicants left because the only rate at which the average borrower's risk will not exceed the offered rate is when the rate is higher than would correspond to the riskiest borrower. But, the vendor sponsored finance, while not guaranteed to be feasible, at least has a higher chance of obtaining so long as there are positive manufacturing margins that are fungible with the lending margins. In other words, if the manufacturing unit "sells" the product to the lending unit at an internal transfer price that results in a profitable financing operation, there remains some possibility of a functioning credit market that effectively discriminates by borrower characteristics.

A further possibility is that the different lenders have differing abilities to assess the risks of the borrowers, hence further polarizing the activities toward lending to higher risk borrowers with a better ability to distinguish risks. The obvious outcome is that the lender is better able to extract the farmer's rents if the risk assessment is more accurate (and hence fewer profitable borrowers are excluded more unprofitable borrowers are excluded).

Also, it remains likely in this case as well that the same borrower is of different risk to the different lenders because of different bonding costs due to other relationships the customer has with the input supplier. Further, the likelihood that the vendor would be better able to dispose of specialized collateral than a traditional lender again favors the vendor.

Empirical Evidence

To date, the evidence collected directly from these types of vendor finance operations is broadly consistent with the theory. Operational differences make direct observation of an isolated lending function difficult. But on balance, the theory suggests that the vendor's portfolio of loans should be riskier than that of a bank, and yet that the performance should reflect losses that are subsidized at least partly by manufacturing margins.

A few summary measures are presented from Growmark's F.S. Credit (FS) program as "case" evidence of one of the (apparently well run) vendor finance programs serving agriculture. These measures are given in terms of performance ratios and the like rather than in absolute numbers both to partially protect information and to make the comparisons to other sized institutions more apparent.

First, consider the composition of the loan portfolio. An examination of the distribution of the debt to equity and debt to asset ratios at application gives a coarse measure of the riskiness of the borrowers. As shown in Figure 6, a significant portion of the portfolio (perhaps as high as 20 percent according to a Farm Credit System employee) is represented by loans that probably would not have been made by banks or the Farm Credit System.

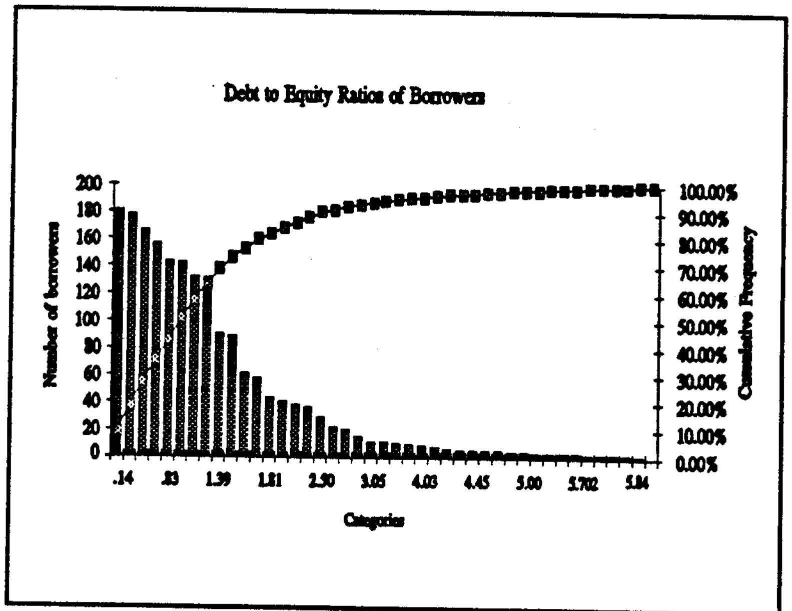

Figure 6

Corresponding to those crude measures of risk at application are measures of performance in the portfolio. Figure 7 shows the loan loss experience of FS compared to banks of various size over various recent calendar quarters. It is important to note that the bank numbers are averages over a large number of institutions that fall into the various size categories and the FS numbers are from one institution. Also, the sample periods available were not identical, yet the overlapping sample periods give some indication of the correspondence. The rates are left in quarterly measures (not annualized) to highlight the seasonal nature of the vender operation. To get annual equivalents, one would simply combine any four adjacent quarters. Given the types of loans in the portfolio, the loss levels may actually be quite low. Further, the accounting convention used at FS is highly conservative and quickly moves defaults to a loss category, even though prospects for recovery may be quite good. In fact, judging by the past seven years, the pattern suggests that the losses could be largely recovered in future periods.

A couple of profitability measures are of interest as well. As shown in Figure 8, the quarterly ROA performance is highly variable and has obvious seasonality. The ROA compares quite well with the bank counterparts, but the operation is leveraged less than a typical bank thereby mitigating some of the benefit to ROE, as can be seen in Figure 9.

Again, it is difficult to get a "clean" read of these issues because the sharing of resources with local delivery points and the allocations of shared costs with the parent company make individual measure of performance difficult to determine. For example, in one major equipment manufacturer's operations, the marketing department pays for many interest rate incentives programs, and even some of the default costs to the lending operation. This practice is probably appropriate for two reasons. First, the interest rate incentives are probably true marketing tools, and the higher quality loans (in essence, partially guaranteed by the marketing department) help maintain the company's low funding costs. Further, it is expected that loans that seem like bad risks to a traditional lender would perform a bit better than expected in the traditional lender's portfolio reflecting the improved bonding that the other relationships provide. This performance may also reflect differing abilities to screen applicants, and perhaps reflect better effective collateral positions as well.

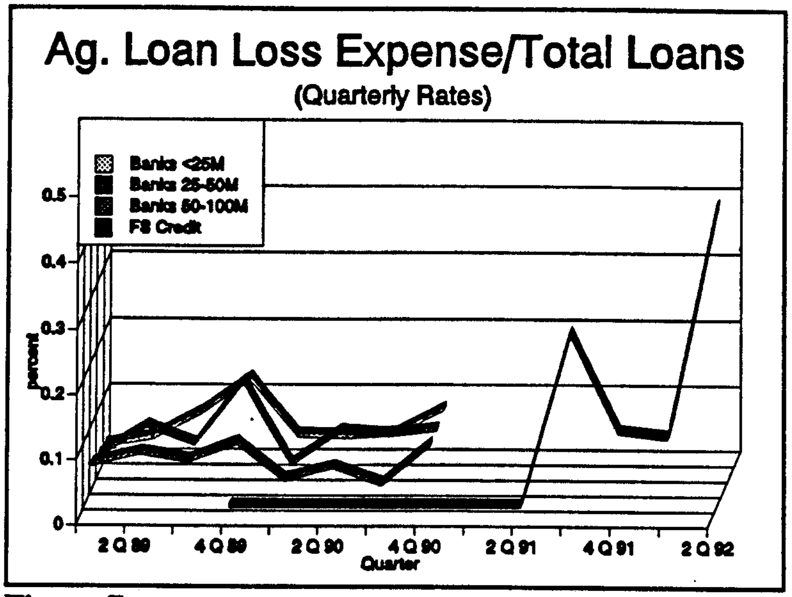

Figure 7

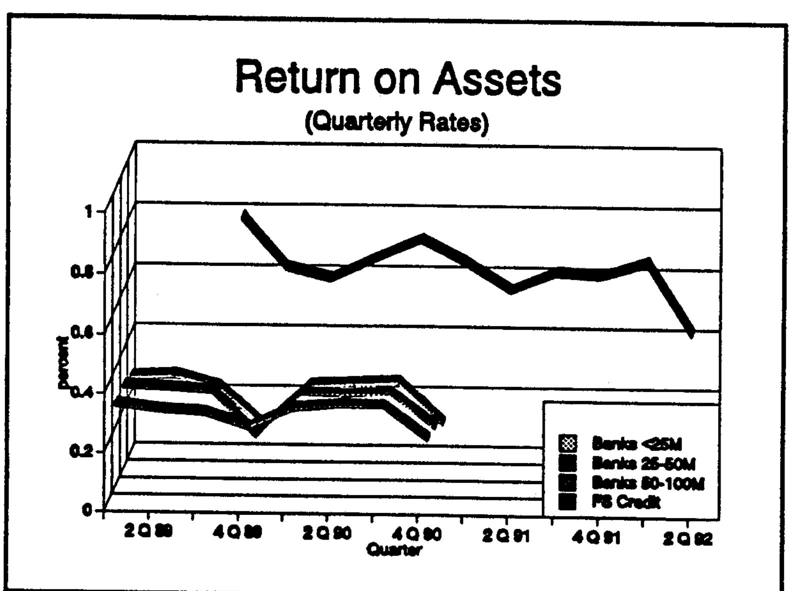

Figure 8

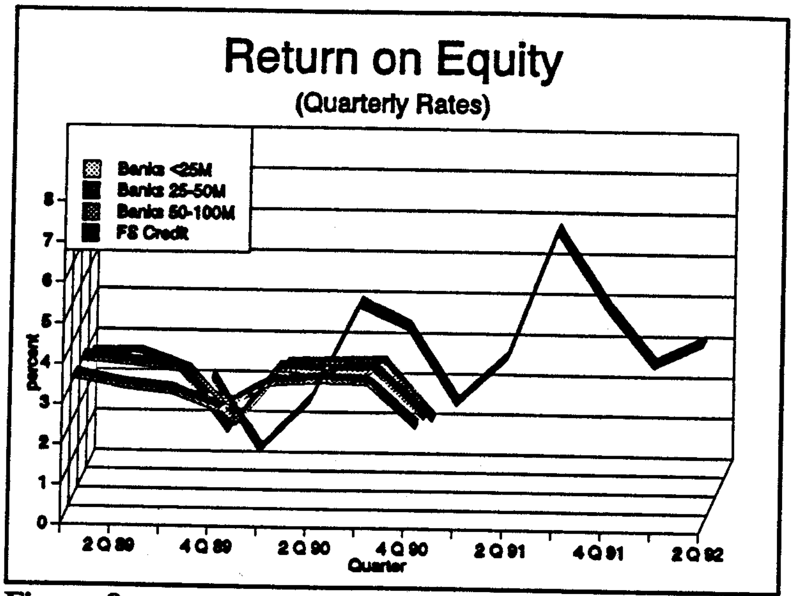

Figure 9

Summary and Concluding Remarks

A simple model of vendor financing was constructed that demonstrated some behavioral differences between a bank and a vendor finance unit. It was shown that the "optimal" risk level up to which to lend was positively related to the total margin and negatively related to "c", a measure of collateral loss rate. In cases where there is some market power, credit can be used to segment the demand and effectively offer different price schedules to segments with differing demands. Further, the banks have no incentive to compete for this business since the rate of return on a lending program that would compete with the vendor would actually be negative. However, total profits for the vendor firm go up because of the positive manufacturing margins earned on incremental sales. In cases where the risks of the individual borrowers were not exactly identifiable, it was argued that the vendor still has advantages if they held superior knowledge, had reduced bonding costs, or improved collateral or security disposition rates. Further, summary evidence from one vendor finance operation is largely consistent with the theory, except that the performance is perhaps a bit better than expected.

Several industrial organization questions remain. For example, why should the vendor become its own parallel lender rather than simply subsidize the banks for making poorer quality loans?[11] Further, given the virtual equivalence between negative lending margins and a reduction in production margin captured, there must be some level of market power for the subsidizing activity to remain. As mentioned, local suppliers may have sufficiently isolated markets that other firms cannot compete in the primary product lines by supplying to the rich farmers alone at lower prices. Hence, the existence of some market power may result in segmented pricing schedules; the existence of which raises other welfare question. These issues, and ancillary investigations such as the impact on total debt supplied deserve fuller attention in the future as well.

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[11] In fact, each of the "Big Three" automakers' captive finance units have at one time in history made that offer to banks (Andrews; Brennan).

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