THE JOURNAL OF FINANCE • VOL. XXXIX, NO. 4 • SEPTEMBER 1984

Taxes and the Theory of Trade Debt

IVAN E. BRICK and WILLIAM K. H. FUNG*

ABSTRACT

In this paper, we show that taxes motivate the flow of trade credit without involving the assumption of credit market imperfections. The direction of trade credit flow depends on the distribution of marginal tax rates among buyers and sellers. In equilibrium, the trade credit decision follows a tax-induced clientele on both the supply and demand side.

A GLANCE AT the balance sheet of a typical corporation reveals the sizeable investment firms make in accounts receivable.[1] In spite of its quantitative importance, the analysis of trade credit policy figures far less prominently than other corporate policies in the finance literature. Although there exists a body of literature on the subject, its focus is on the monetary policy implications of trade credit flow; and therefore holds only indirect relevance to micro aspects such as the trade credit decision as part of corporate policy. In this paper, we examine the trade credit decision as a short-term financing decision. The decision to either grant or issue trade debt is analyzed in the familiar framework of Miller [12]. This approach establishes the link between existing paradigms on the financing of firms and the formulation of trade credit policies.

The existing literature provides three possible motives for trade credit. They are, respectively, the transaction motive, the price motive, and the financial motive. The first two motives have been discussed extensively elsewhere; see, for example, Smith [18] for a summary. It is at the third motive, the financial motive, that the present paper is directed.[2]

Past studies on the financial motive such as Brechling and Lipsey [3], Jaffee and Modigliani [7], Laffer [10], Schwartz [15], and Schwartz and Whitcomb [16, 17] have essentially assumed imperfections in the credit market, such as credit rationing or market segmentation, as the main motivation for the flow of trade credit. We depart from this line of attack and follow a more traditional route in the finance literature by assuming a perfect competitive capital market as our starting point and then demonstrate how taxes motivate the flow of trade credit.

* Graduate School of Management, Rutgers University. We would like to thank Jack Broyle, Ian Cooper, Julian Franks, Stewart Hodges, E. Han Kim, Stephen Schaefer, Bob Schwartz, and David Whitcomb for helpful suggestions. Comments from a referee of this *Journal* are gratefully acknowledged. We, of course, retain full responsibility for any errors. An earlier version of this paper was presented at the ninth annual meeting of the European Finance Association, Jerusalem, Israel, 1982.

[1] Summary statistics can be found in the U.S. Federal Trade Commission, "Quarterly Financial Report for Manufacturing, Mining and Trade Corporations," Second Quarter 1976, Tables G-2 and K-2. Similar figures are also reported in Schwartz and Whitcomb [16, 17].

[2] Restricting our analysis to the financial motive limits the positive aspect of our conclusions. Interactions between different motives are not captured in our model of trade credit flow. Although incomplete, our analysis does further the insight into the existence and flow of trade credit.

The paper is organized as follows. Section I establishes the standard irrelevance proposition in a perfect market. By introducing taxes into our analysis, the flow of trade credit is motivated without assuming further market imperfections. Section II considers the possibility of equity financed trade debt.

I. The Impact of Taxes

Throughout the paper, we assume an exogenously determined term structure of interest rate, unaffected by trade credit arrangements.[3] Given a perfect capital market, it is clear that the choice between cash versus credit is a matter of indifference for both buyer and seller. To derive this formally, take the conventional credit term d_N/D net N for an arbitrary good with list price P_L. Here, d_N denotes the percentage discount on the list price P_L if paid within D days. The full price is paid for payments between D days plus one to day N. We assume, without loss of generality, that D is zero. The respective cash flow positions of both buyer and seller on day D can be summarized as follows:

	Cash Transaction	Credit Transaction
Seller	$P_L(1 - d_N)$	Present Value (P_L)
Buyer	$-P_L(1 - d_N)$	−Present Value (P_L)

Clearly, with a perfect capital market and an exogenously determined term structure of interest rate, to avoid riskless arbitrage, $(1 - d_N)$ will be set at $1/(1 + r_N)$, where r_N denotes the appropriate interest rate from day D to day N. In this case, both parties will be indifferent to the choice of transaction. This is, in essence, the same conclusion reached in Schwartz and Whitcomb [17]. The only difference between the derivation employed here as opposed to Schwartz and Whitcomb's is that given a perfect capital market, the appropriate discount rate for a promised payment (from the seller's point of view, or a promised cash outflow from the buyer's point of view) can only be the interest rate for the appropriate maturity and does not depend on any specific equilibrium pricing model for risky assets. In this case, as in most other analysis of economic decisions under perfect market conditions, the irrelevance proposition obtains.

Extending the analysis to a world with taxes complicates both the cash flows and the choice of discount rate. Depending on how tax liabilities are computed, the choice between cash versus credit transaction affects the timing of tax payments. Consider the following schematic on the possible transactions that may arise.

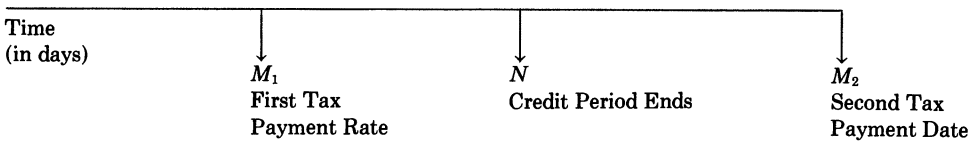

Figure 1.

[3] We have implicitly assumed that the production and inventory decisions are also exogenously determined.

From the buyer's point of view, the tax deduction from the purchase is received either on day M_1 or day M_2 depending on the buyer's accounting procedure and inventory turnover rate. Similarly, the same factors are at work in determining the timing of tax credit on purchases for the buyer.[4] Therefore, differences in accounting procedure and inventory turnover rate result in the seller incurring tax liabilities at a different date from when the buyer receives the tax deduction. We simplify the exposition of these cash flows via the following procedures.

First, we standardize the tax payment dates by assuming that taxes due are paid immediately as the cash flow arises. In other words, taxes are paid immediately for a cash sale and at day N for a credit sale. This generates a present value difference between our assumed tax payments and actual tax payments as depicted in Figure 1.

Next, we adjust for this present value difference by redefining the effective tax rates of agents as the present value of future tax payments per dollar of taxable revenue. Defined this way, it is possible for the buyer and seller to have identical tax rates in the normal sense, but due to timing differences in tax payments, their effective tax rates will differ.[5]

In order to proceed with our analysis, we need to determine the appropriate discount rate. Initially, we propose the after-tax interest rate. As suggested earlier, a credit sale, from the seller's point of view, represents a promised cash inflow. Therefore, in the absence of default risk considerations, the after-tax interest rate is the appropriate opportunity cost. From the buyer's point of view, taking on credit is properly compared to a debt-financed purchase. Once again the after-tax interest rate is the appropriate discount rate.[6]

Given the definition of an effective tax rate and the choice of discount rate, abstracting from the transaction cost of credit arrangements, the indifference cash discount d_N for the seller must satisfy:

$$P_L(1 - d_N)(1 - t_s) = (P_L(1 - t_s))/(1 + r_N(1 - t_s)) \tag{1}$$

where t_s is the effective tax rate of the seller. Solving for $(1 - d_N)$ we obtain:

$$(1 - d_N) = 1/(1 + r_N(1 - t_s)) \tag{2}$$

From the buyer's point of view, the difference between credit cost versus cash

[4] We assume that taxes are due on a quarterly basis, with day M_1 the end of the first quarter and day M_2 the end of the second quarter. Consider the following example for the buyer and the seller. Assuming the accrual basis of accounting, the tax liability for the seller is always paid at day M_1. However, the tax deduction for the buyer depends on when the cost of purchase is recognized as an expense. It is quite likely that the cost of the purchase is in fact expensed after day M_1 whenever the buyer employs the FIFO method for evaluating inventory or if the buyer has a low inventory turnover. In such cases, the buyer first receives the tax deduction at time M_2.

[5] What we attempt to capture here are the timing differences induced by different inventory decisions of the sellers and the different accounting practices they may follow. Therefore, given these exogenous decisions, the effective tax rates may well differ despite homogeneous marginal tax rates in the normal sense. This is similar to the notion of an effective tax rate endogenized by the investment decision of firms, which in turn determines tax liabilities, as in Cooper and Franks [4].

[6] This is consistent also with the Modigliani and Miller [13] framework where firms are 100% debt financed.

cost, i.e., the cost of (credit − cash), depends on:

$$P_L(1 - t_b)/(1 + r_N(1 - t_b)) - P_L(1 - d_N)(1 - t_b) \tag{3}$$

Substituting Equation (2) into Equation (3) for the term $(1 - d_N)$, it can be seen that the positivity of Equation (3) depends upon:

$$\frac{1}{(1 + r_N(1 - t_b))} - \frac{1}{(1 + r_N(1 - t_s))} \tag{4}$$

This indicates distinct preference for a specific mode of transaction depending on the size of the effective tax rates t_s and t_b. We summarize the comparisons from the buyer's point of view in Table I.

This preference structure is derived treating trade credit as a source of financing to the buyers. Therefore, when $t_b > t_s$ the buyer will find his own tax shelter more attractive than the implicit tax shelter offered by the seller through the credit term. Conversely, when $t_b < t_s$, the buyer will be able to take advantage of this transfer of tax benefit which reflects higher tax shield in present value terms than is otherwise available. Finally, in the case of identical effective tax rates, the choice will be one of indifference. Viewed this way, the trade credit decision is essentially a financing decision. Therefore, similar analyses apply as in the literature on corporate financial policy. The insight here is that taxes induce a choice between cash versus credit, which in turn motivates the flow of trade credit without resorting to other market frictions such as credit rationing.

Next, we discuss the equilibrium implications on trade credit policy. We begin by analyzing the simple case when all suppliers of trade credit face the same effective tax rates t_s. In this case, given a fixed quantity supply and demand of goods, the trade credit terms are completely determined by Equation (2). This occurs because as long as the goods in question have homogeneous physical attributes, the identity of the sellers can differ only through differences in their effective tax rates. Therefore given the assumption of identical effective tax rates across sellers together with an exogenously determined term structure of interest rate, the sellers' response to changes in the demand for cash and/or credit must be homogeneous. This type of supply side response function is analogous to that of Miller [12] in his analysis of corporate financial policy. Under this scenario, sellers will find it a losing proposition to depart from the term set forth in Equation (2).[7]

Should an individual seller offer cash discounts higher than that indicated in Equation (2), other suppliers could arbitrage by buying out his goods for cash and offer the same goods to the market at the appropriate terms. The converse also holds for lowering cash discounts.[8] An alternative way of viewing this would

[7] It is useful to note that in the analogy to Miller [12], the sellers should be compared to the bondholders and the buyers become the borrowers. Therefore, the homogeneity in tax rates is assumed on the opposite side in contrast to Miller [12].

[8] It must be noted that our model attempts to explain the flow of trade credit via the effect of taxes and cannot be readily extended to explain the size of trade credit terms in practice (which includes other factors such as credit risk and transaction costs etc.). See Lewellen et al. [11] for an analysis of observed trade credit terms.

Table I

Buyer's Preference for Cash vs. Credit

$t_b = t_s$	indifference holds
$t_b > t_s$	cash transaction is preferred
$t_b < t_s$	trade credit is preferred

be to assume that in equilibrium the list price is such that the seller earns only *normal* profit (in the sense of no economic rent). It now follows that sellers offering a greater (or smaller) cash discount than that implied by Equation (2) must earn *below normal* profit or, equivalently stated, would find offering greater (or smaller) cash discount to be a negative NPV transaction.

On the demand side, there will be a tax-induced clientele effect among the buyers in the cash versus credit decision as indicated in Table I. This is analogous to the notion of a financial leverage clientele of Kim et al. [9]. However, there is no individual optimal credit policy for suppliers of trade credit in equilibrium. Instead, there is an optimal aggregate mix of cash and credit transaction for the market as a whole. A solution that closely resembles that of Miller [12].

We now extend our equilibrium analysis to accommodate the possibility when sellers, or the supply side of trade credit, have heterogeneous effective tax rates.

Suppose a seller exists with tax rate, $\bar{t}_s < t_s$, where t_s represents the tax rate as in the homogeneous tax case. In this case, the implicit interest charge in the credit term offered by this seller will be higher than those with tax rates $t_s > \bar{t}_s$. It follows that the indifferent cash discount for this seller is proportionally higher than every other seller in the supply side as Equation (2) indicates. Faced with these parameters, this seller will not be able to compete in the credit market and will transact only in cash. Furthermore, should this seller set the cash discount at

$$(1 - d_N) = 1/(1 + r_N(1 - \bar{t}_s)) > 1/(1 + r_N(1 - t_s))$$

then, in a competitive market with no barrier to entry, either existing sellers or intermediaries with a higher effective tax rate, t_s, will enter the resale market by purchasing goods from this seller with cash and offer the same goods to the market for credit at an implicit interest charge of $r_N(1 - t_s)$ or, equivalently, at a higher cash price.[9] This form of intermediation is consistent with the existence of large retail stores purchasing goods from smaller manufacturers with cash (or relatively smaller credit periods) and offer the same goods to the market at credit terms or via direct store credit facilities. A similar form of tax arbitrage was also used by Brealey and Young [2] in their discussion of leasing.

In order to avoid arbitrage given fixed demand, the equilibrium cash price must be grossed up to reflect the highest effective tax rate on the supply side. Note that this *does not imply* that in equilibrium all effective tax rates on the supply

[9] Unless there is a barrier to arbitrage, the low tax rate seller will not be able to force the high tax rate sellers to go for a lower cash price. Put differently, so long as the cash sales market is not segmented from the market for credit sales, competition, either from existing sellers or intermediaries entering into the resale market, must drive the equilibrium terms (cash or credit) to a point where no further tax advantages can be exploited.

side will be arbitraged to the same level. What will be observed in equilibrium under such a scenario is that the implied interest charge (and therefore cash discounts) will be set *as if* the effective tax rates were homogeneous among sellers.

In such an equilibrium, a form of consumer surplus exists on both the supply and demand side. It exists on the demand side via the tax clientele effect where low effective tax rate buyers will be able to enjoy the interest tax shield through the credit terms offered by the higher tax rate sellers. On the supply side, sellers with low effective tax rates will be setting cash prices higher than that suggested in Equation (2), for the tax rate $\bar{t}_s$. Therefore, all sellers with effective tax rate $\bar{t}_s < t_s$ will not offer credit terms but would prefer to transact in cash only. Thus, a corner solution exists as their optimal trade credit policy. Note further that in an equilibrium where there is no barrier to entry to both the demand and the supply side, our model implies that the highest effective tax rate must be identical for both sides.

To what extent this represents a stable equilibrium must depend on the ability of market agents to undertake this indirect form of tax arbitrage in practice. The emergence of intermediaries and the possible crossover between the supply and demand side in our model is a more plausible proposition than tax arbitrages involving pure securities which are stringently monitored by the IRS. Furthermore, unlimited costless tax arbitrage in a pure exchange model such as that in the theory on capital structure could also lead to a degenerate solution theoretically (see Black [1]). However in our analysis with a fixed quantity supply of physical goods and a fixed quantity of demand, this arbitrage process has a natural finite limit.

Recall that the above discussion regarding trade credit choice abstracts from other underlying motivation outside taxes. This does not deny the importance of the other motives, namely transaction and price motives. The corner solution obtained above would have to be modified, if considered jointly with other trading frictions. The model argues that, all things being equal, buyers with low effective tax rates would prefer trade credit and therefore are more likely to have higher levels of accounts payable relative to similar buyers with a higher effective tax rate. Similarly, sellers with high effective tax rates will supply trade credit and therefore are more likely to have a larger investment in accounts receivable.

II. Equity Financed Trade Credit

In the Miller [12] world, all firms are assumed to have the same marginal tax rate. Therefore, the equilibrium discount rate for all firms assumes the form $r_T(1 - t^*)$ where r_T represents the corresponding term rate of interest and t^* denotes the equilibrium marginal tax rate.[10] Hence, if all suppliers of trade credit have identical effective tax rates, then the same conclusion as in our previous homogeneous tax case holds. However, if suppliers of trade credit have heterogeneous effective tax rates then the possibility of equity financing must be considered.

[10] Strictly speaking, the Miller [12] model is stated in a single-period framework. Therefore r_T should really be the interest cost of perpetual debt which also satisfies the relationship $r_T(1 - t^*) = r_E$, the cost of equity. In order to make our analysis tractable, we are implicitly assuming that the Miller [12] analysis holds on a period-by-period basis and also for any finite horizon.

In order to accommodate an equilibrium structure where equity financing plays a role, we reexamine the preference structure for cash versus credit. In this case, equilibrium return on equity r_E equals $r_D(1 - t^*)$ where r_D is the interest cost on perpetual debt.[11] In such an equilibrium, firms with marginal tax rates $t_c < t^*$ will find equity financing more attractive or $r_E = r_D(1 - t^*) < r_D(1 - t_c)$. Conversely, firms with marginal tax rates $t_c = t^*$ will be indifferent or $r_E = r_D(1 - t^*) = r_D(1 - t_c)$.[12]

We begin by establishing the choice for cash versus credit as a mode of transaction as in Table I. Clearly whenever $t_b = t_s = t^*$ complete indifference between cash versus credit holds. This conclusion extends to the case when t_b and $t_s \leq t^*$ as both buyer and seller are faced with the same cost of financing. Finally, with $t_b = t^* > t_s$ or $t_b < t^* = t_s$ the same preferences as shown in Table I again hold. Note that in this case the only difference from the earlier derivations is that the comparison between cash cost versus credit cost now involves the term t^*. The presence of the term t^* in the comparisons indicates that different methods of financing are called for, which in turn imply different costs of funds. It is important to note that the main motivation underlying our equilibrium analysis is that the discount rates vary among the market agents. Hence, as long as there is no impediment to arbitrage, the introduction of equity financing does not materially affect our earlier conclusions.

[11] Note that r_E may not be equal to $r_D(1 - t^*)$ in a world of risk-aversion. However, it is clear that the two will be the same under risk-neutrality as implied in the DeAngelo and Masulis [5, 6] framework.

[12] It has been argued that in an equilibrium where leverage-related costs exist, see for example DeAngelo and Masulis [6] and Kim [8], it may be possible for the corporate tax rate $t_c > t^*$. The analysis in this section extends easily to this case.

REFERENCES

1. F. Black. "Taxes and Capital Market Equilibrium." Working paper no. 21A, Sloan School of Management, MIT, 1971.
2. R. A. Brealey and C. M. Young. "Debt, Taxes and Leasing—A Note." *Journal of Finance* 35 (December 1980).
3. F. Brechling and R. Lipsey. "Trade Credit and Monetary Policy." *Economic Journal* (December 1963).
4. I. Cooper and J. Franks. "The Interaction of Financial Investment Decisions When the Firm Has Unused Tax Credits." *Journal of Finance* 38 (May 1983), 571–83.
5. H. DeAngelo and R. Masulis. "Leverage and Dividend Irrelevancy under Corporate and Personal Taxation." *Journal of Finance* 35 (May 1980).
6. ———. "Optimal Capital Structure under Corporate and Personal Taxation." *Journal of Financial Economics* (May 1980).
7. D. Jaffee and F. Modigliani. "A Theory and Test of Capital Rationing." *American Economic Review* (December 1969).
8. E. H. Kim. "Miller's Equilibrium, Shareholder Leverage Clienteles, and Optimal Capital Structure." *Journal of Finance* 37 (May 1982), 301–19.
9. ———, W. Lewellen, and J. McConnell. "Financial Leverage Clienteles: Theory and Evidence." *Journal of Financial Economics* (March 1979).
10. A. Laffer. "Trade Credit and the Money Market." *Journal of Political Economy* (March/April 1970).
11. W. Lewellen, J. McConnell, and J. Scott. "Capital Market Influences on Trade Credit Policies." *Journal of Financial Research* (Summer 1980).

12. M. H. Miller. "Debt and Taxes." *Journal of Finance* 32 (May 1977), 261–75.
13. F. F. Modigliani and M. H. Miller. "Corporate Income Taxes and Cost of Capital: A Correction." *American Economic Review* (June 1963).
14. J. J. Pringle and R. A. Cohn. "Steps Toward an Integration of Corporate Financial Planning." In K. V. Smith (ed.), *Management of Working Capital.* St. Paul: West, 1974.
15. R. A. Schwartz. "An Economic Model of Trade Credit." *Journal of Financial and Quantitative Analysis* (September 1974).
16. ——— and D. K. Whitcomb. "Implicit Transfers in the Extension of Trade Credit." In K. Boulding and T. Wilson (eds.), *The Channels of Redistribution Through the Financial System: The Grants Economics Money and Credit.* New York: Praeger, 1978.
17. ——— and ———. "The Trade Credit Decision." In J. Bicksler (ed.), *Handbook of Financial Economics.* Amsterdam: North-Holland Pub. Co., 1980.
18. K. V. Smith. *Management of Working Capital.* St. Paul: West, 1974.