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DIVIDEND POLICY AND VALUATION: THEORY AND TESTS

Presiding: SUDIPTO BATTACHARYA†

To Pay or Not to Pay Dividends*

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I. Introduction

OUR UNDERSTANDING of why corporations pay dividends is currently unsatisfactory. On the one hand, received theory tells us that dividends are irrelevant (in the sense that any two arbitrarily chosen dividend policies have equivalent consequences), both in the absence of taxes (Miller and Modigliani [13]) and in their presence (Miller and Scholes [14]). On the other hand, dividends continue to flood the empirical world with cash as regularly and as consistently as the sun scorches the desert, and one is hard put to characterize this pattern (currently at an annual rate of about $63 billion[1]) as being founded on irrelevance. Not surprisingly, the attendant anomaly has led some, notably Black [1], to suggest that we really don't know why companies pay dividends. Something is clearly amiss.

The present paper will look to the information content of dividends as a substantive (although not necessarily complete) explanation for the prevalence and persistence of positive dividend policies in market economies. The notion that dividends may constitute a source of information is, of course, not new (see e.g., Miller and Modigliani [13], Black [1], Stern [18]). The basic idea is that the raising and lowering of dividends communicates information *over and beyond* what is provided by (mandated and nonmandated historical cost-based) earnings reports, forecasts, and other announcements. By in effect merging extant dividend theory with the theory of public information, the present paper generates several noteworthy consequences. In particular, it extends substantially the current paradigm, bringing within its domain cases in which dividend payments are

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* This is an abridged version on [7], which is available upon request from the author (School of Business Administration, University of California, Berkeley 94720). Among other things, the comprehensive version examines the informativeness of dividends and the issue of cash dividends vs. share repurchases, and provides examples and more extensive references to the literature.

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[1] See Malabre [12].

beneficial to investor welfare, cases in which they are harmful, as well as *new* cases in which dividend policy is irrelevant. As a result, current theory becomes in effect a special case of dividend irrelevance, which itself is a special case of the aforementioned richer set of possibilities.

The conditions separating the three cases are somewhat intertwined and not readily communicated in nontechnical language. However, the thrust of the results may be stated as follows: whether informative or not, dividends serve no useful role when investors are substantially homogeneous, have additive utility, and markets are complete. When associated with positive costs, dividends are under these circumstances deleterious to efficiency. On the other hand, dividends are capable of improving welfare (efficiency) when they are informative provided investors have heterogeneous beliefs, utility is nonadditive, *or* markets are incomplete, even in the presence of deadweight costs. In this context, the power of informative dividends to serve as a substitute for financial markets is especially significant; *dividend announcements may under certain circumstances bring an incomplete market to or even beyond the level of efficiency that would be attained if the market were complete.*

The model is cast in a setting that does not compromise the portfolio problem, that treats information formally, and that is sensitive to possible deadweight costs. The perspective employed is that of general equilibrium. In addition, welfare is measured throughout by the ex ante expected utility that investors attain from any given dividend policy, where a policy is defined by the set of dividend levels that a given firm (or set of firms) may choose from in its announcements. This avoids reliance on firm values as a wlefare indicator with its attendant problems in less than complete markets, for example. These problems are particularly relevant in the present paper, in which informative dividends are found to play an important role in just such a context. At the technical level, the analysis extends the results in Hakansson, Kunkel, and Ohlson [8] by incorporating personal taxes; Proposition V, however, is a new result.

II. The Basic Model

Like its many predecessor studies, this paper posits a pure exchange economy with a single commodity (cash). For simplicity, the focal point will be a two-period time frame incorporating the usual assumptions. That is, at the end of period 1 the economy will be in some state s, where $s = 1, \cdots, n$. There are I consumer-investors indexed by i, whose probability beliefs over the states are given by the vectors $\pi_i = (\pi_{i1}, \cdots, \pi_{in})$, where $\pi_{is} \geq 0$ for all i and s, and there is agreement on the subset of states for which π_{is} is > 0. Preferences are represented by the functions $U_{is}(c_i, w_{is})$, where c_i is the consumption level in period 1 and w_{is} is the consumption level in period 2 if the economy is in state s at the beginning of that period. U_{is} is assumed to be monotone increasing in each argument and strictly concave. That is, consumer-investors prefer more to less and are risk-averse. At the beginning of period 1 (time 0), consumer-investors allocate their resources among current consumption and a portfolio chosen from J securities indexed by j. Security j pays $a^d_{js} \geq 0$ per share at the end of period 1 (time 1), of which \$$d$, in the case of common shares, is in the form of a dividend. For other types of securities, superscript d will be omitted. Payoffs on common shares paying zero dividends will be denoted a^0_{js}. In contrast to payments, *declarations* of dividends are assumed to take place at the *beginning* of period 1 (time 0). Once declared, dividends are assumed to be paid with certainty. Coupon payments on interest-bearing securities are also viewed as risk-free although the underlying securities themselves may of course be risky. The total number of outstanding shares of security j held by investors (other than passive financial intermediaries) is Z_j. Let z_{ij} denote the number of shares of seucrity j purchased by consumer-investor i at time 0; his portfolio $z_i = (z_{i1}, \cdots, z_{iJ})$ then yields the payoff

$$w_{is} = \sum_j z_{ij} a_{js},$$

available for consumption in period 2, if state s occurs at the end of period 1. Investor endowments are denoted $(\bar{c}_i, \bar{z}_i)$ and markets, as is usual, are assumed to be competitive and perfect.[2] If the rank of matrix $A = [a_{js}]$ is full (equals n), the financial market will be called complete; if not, it will be called incomplete. Aggregate wealth in state s is given by

$$W_s \equiv \sum_j Z_j a_{js}.$$

For simplicity, and without loss of generality in terms of the primary objectives of the paper, capital gains are assumed to be taxed at a flat rate $t_1 < t_2$, where $t_1 \geq 0$ and $t_2 < 1$ is the *flat* rate of tax that applies to dividends and interest. The tax law is assumed to be administered symmetrically in the sense that interest and dividend payments on short positions, as well as capital losses, give rise to tax refunds at the respective rates.[3] These assumptions imply that the after-tax payoff can be uniquely and independently determined for each security. Consequently, the numbers a_{js} will generally be assumed to represent the various security payoffs *after taxes* as well as *after* net flotation costs or on a *net cash flow basis*.[4] For comparability, we also require that the firm's net assets, disregarding flotation costs, be the same at the end of period 1 independently of the dividend policy. If we think of a given firm j as raising x_j of new equity capital at the end of period 1 in the absence of a dividend, then, having paid a dividend of d_j, it will need to raise $x_j + d_j Z_j$ on a gross basis. The incremental deadweight flotation cost associated with $d_j Z_j$ is then most easily thought of as a second subtraction from a^0_{js}, over and beyond the tax effect, in calculating the net per share payoffs a^d_{js}. Thus we obtain

$$W^d_s = W^0_s, \qquad \text{all} \quad s \tag{1a}$$

in the absence of deadweight costs and

$$W^d_s < W^0_s, \qquad \text{all} \quad s \tag{1b}$$

in the presence of deadweight costs from either differential taxes of incremental

[2] That is, consumer-investors perceive prices as beyond their influence, there are no transaction costs, securities are perfectly divisible, and the proceeds from short sales can be invested.

[3] Under current U.S. tax laws, investment interest is deductible to the extent of investment income + \$10,000 and capital losses are deductible up to a maximum of \$3,000 per year; any remainder can, in both cases, be offset against future years' income.

[4] See [7] for an alternative approach.

flotation costs or both. The aggregate deadweight costs associated with dividend payment d will be denoted by $C = (C_1, \cdots, C_n)$, where $C_s = W_s^0 - W_s^d$. Thus, the presence of deadweight costs implies a reduction in the aggregate resources W available for second-period consumption.

The set of feasible second-period consumption allocations among investors in market A is given by

$$F(A) \equiv \{w \mid w_i \geq 0, w_i = z_i A, \sum_i z_{ij} \leq Z_j\}.$$

Our concern will be with the relationship between $F(A^d)$ and $F(A^0)$, where the declared dividend d applies to some particular firm (or collection of firms). When

$$F(A^d) = F(A^0), \tag{2}$$

which can only occur in the absence of deadweight costs, dividend payment d will be said to be allocationally neutral (since every feasible payoff with dividends is also feasible without dividends). When deadweight costs are present and

$$F_C(A^d) \subset F(A^0), \tag{3}$$

we shall say that the deadweight costs C associated with dividend payment d are allocationally limiting.[5] That is, when (3) holds, certain allocations that were feasible in the absence of deadweight costs have been rendered infeasible through the appearance of deadweight costs without having added *any* offsetting possibilities.

Under our assumptions, each consumer-investor i maximizes

$$\sum_s \pi_{is} U_{is}(c_i, \sum_j z_{ij} a_{js}) \tag{4}$$

with respect to the decision vector (c_i, z_i), subject to his budget constraint

$$c_i P_0 + \sum_j z_{ij} P_j = \bar{c}_i P_0 + \sum_j \bar{z}_{ij} P_j$$

as a price-taker, where P_0 is the price of a unit of period 1 consumption and P_j is the price (at $t = 0$) of security j. Assuming interior solutions (with respect to the implicit non-negativity constraint on consumption $(c_i, w_i) \geq 0$), the equilibrium conditions may be written

$$\sum_s \pi_{is} \frac{\partial U_{is}(c_i, w_{is})}{\partial c_i} = \lambda_i \qquad \text{all} \quad i \tag{5}$$

$$\sum_s \pi_{is} \frac{\partial U_{is}(c_i, w_{is}) a_{js}}{\partial w_{is}} = \lambda_i P_j \qquad \text{all} \quad i, j \tag{6}$$

$$c_i + z_i P = \bar{c}_i + \bar{z}_i P \qquad \text{all } i \tag{7}$$

$$\sum_i c_i = \sum_i \bar{c}_i, \sum_i z_{ij} = Z_j, \qquad \text{all} \quad j, \tag{8}$$

where the λ_i are the Lagrange multipliers, (8) represents the market clearing equations, and $P_0 \equiv 1$ has been chosen as numeraire.

We note that an allocation (c^*, z^*) which constitutes a solution to system (5)-

[5] A sufficient condition for (2) and (3) to be valid, given a risk-free portfolio, is for each security's payoff in A^d to differ from the corresponding payoff in A^0 by at most a linear transformation.

(8) (along with a price vector P and a vector λ) is *allocationally efficient* with respect to market structure A; no other allocation (c, z) obtainable within market structure A can make some consumer-investors better off without making others worse off. However, there may exist trades *outside* the market (e.g., by the invention of new securities) which yield allocations that Pareto-dominate the market allocation (c^*, z^*). When this is not the case, i.e., when (c^*, z^*) is Pareto-efficient with respect to all conceivable allocations inside *and* outside the existing market, (c^*, z^*) will be said to be *fully allocationally efficient.*

To be more precise, let

$$P_{is} \equiv \frac{\pi_{is}}{\lambda_i} \frac{\partial U_{is}(c_i, w_{is})}{\partial w_{is}}.$$

By reference to (6), it can be seen that P_{is} denotes investor i's shadow price of wealth in state s; roughly, it represents the marginal value of receiving an additional unit of wealth in state s.

It is well known that (5)-(8) plus

$$P_{is} = P_{1s} \qquad \text{all} \quad i \geq 2, \qquad \text{all} \quad s \tag{9}$$

is a necessary and sufficient condition for the market allocation (c^*, z^*) to be fully allocationally efficient. This follows because (9) insures that the marginal rates of substitution of wealth (consumption) *between any two states* are the same for all investors i. Condition (9) plays an important role in what follows, a role which has previously not been well appreciated. A sufficient (but not necessary) condition for (9) to obtain is that the security market is complete, i.e. that the rank of A is n.[6]

III. Equilibria with Dividends

It is widely recognized that dividend declarations may convey information to investors concerning future payoff patterns (see e.g., [7]). In the present setting, this process may be pictured as follows.

Before trading at time 0 investors may obtain information bearing on the state that will occur at time 1 via a dividend declaration d from a set of possible signals $D = \{d_1, \cdots, d_m\}$. We shall refer to D and its associated probabilities as a *dividend* policy; it may be thought of as encompassing a single firm alone or a collection of firms.

Each possible dividend signal d causes consumer-investor i to update his prior beliefs π_i^0 to the posterior beliefs π_i^d via Bayes' rule. That is, if $p_i(d \mid s)$ denotes investor i's perceived probability that dividend d will be declared if s is about to occur, Bayes' Theorem gives

$$\pi_{is}^d = \frac{p_i(d \mid s)\pi_{is}^0}{\sum_s p_i(d \mid s)\, \pi_{is}^0} = \frac{p_i(d \mid s)\pi_{is}^0}{p_i(d)}.$$

When $\pi_i^d \neq \pi_i^0$ for some d, dividend policy D is said to be *informative* for investor i.

[6] For other sufficient conditions, see e.g. Hakansson [6].

The $n \times m$ matrix of conditional probability numbers $p_i(d \mid s)$ for investor i will be called his *information structure*. Whenever

$$p_i(d \mid s) = p_1(d \mid s) \quad \text{for all} \quad i \geq 2, d, \quad \text{and} \quad s, \tag{10a}$$

the information structures will be said to be *homogeneous*. If (10a) does not hold, they will be called nonhomogeneous. Finally, when there exist numbers $k_i(d)$ such that

$$p_i(d \mid s) = k_i(d) p_1(d \mid s) \quad \text{for all} \quad i \geq 2, \quad \text{all} \quad s \quad \text{and} \quad d, \tag{10b}$$

the information structures will be said to be *essentially homogeneous*. This is because, as a practical matter, (10b) is only slightly more general than (10a).

Denote the maximum of (4) in the no information case, i.e., the consumer-investor's equilibrium expected utility when (all) investors make decisions on the basis of their prior beliefs π_i^0, by V_i^0, and let (c_i^0, z_i^0) be the resulting equilibrium allocation to consumer-investor i. When dividend policy D is in use, there will be a different equilibrium for each signal d. Let V_i^d and (c_i^d, z_i^d) represent the consumer-investor i's expected utility and final allocation when equilibrium is based on revised beliefs π_i^d (signal d). The probability of receiving signal d is $p_i(d) = \sum_s p_i(d \mid s) \pi_{is}^0$. Thus the relevant expected utility of consumer-investor i in the dividend case, which we label $V_i(D)$, is

$$V_i(D) = \sum_d p_i(d) V_i^d = \sum_s \sum_d \pi_{is}^0 p_i(d \mid s) U_{is}(c_i^d, \sum_j z_{ij}^d a_{js}^d).$$

Following standard practice, dividends will consequently be said to have social value or yield a Pareto-improvement if

$$\begin{aligned} V_i(D) &\geq V_i^0 \quad \text{all} \quad i, \\ V_i(D) &> V_i^0 \quad \text{some} \quad i, \end{aligned} \tag{11}$$

but not otherwise.

A set of equilibrium allocations (c^d, z^d), one for each signal d, will be said to be *informationally efficient* with respect to market A and dividend policy D if there are no other allocations $(c^1, z^1), \cdots, (c^m, z^m)$ based on A and D which can make some consumer-investors better off without making others worse off. A necessary and sufficient condition for informational efficiency to be satisfied is that the endowments $(\bar{c}, \bar{z})$ are such that

$$\frac{p_i(d)\lambda_i^d}{p_i(d_1)\lambda_i^{d_1}} = \frac{p_1(d)\lambda_1^d}{p_1(d_1)\lambda_1^{d_1}}, \quad \text{all} \quad i, d \tag{12}$$

that is, that the marginal rates of substitutions of *endowments*, for any two signals d, are the same for all investors.

It should be noted that informational efficiency, as opposed to allocational efficiency, cannot be guaranteed. Endowments satisfying (12) may simply fail to exist. This would typically be the case, for example, if the number of signals m exceeds the number of securities J since (12), in essence, gives rise to m equations in J unknowns.[7]

[7] The simplest way to insure (12), assuming that is feasible, is to open the total existing market for a pre-signal round of trading in addition to the post-signal trading round already in use.

Finally, *full informational efficiency* with respect to D will be said to occur if (12) holds in conjunction with

$$P_{is}^{d} = P_{1s}^{d}, \qquad \text{all} \quad i \geq 2,\ s, \quad \text{and} \quad d. \tag{13}$$

This is because (13) insures full allocational efficiency for each dividend signal d.

In what follows, it will sometimes be assumed that endowments represent efficient allocations without dividends, which implies:

$$(c_i^0, w_i^0) = (\bar{c}_i, \bar{w}_i), \qquad \text{all} \quad i. \tag{14}$$

IV. Tax Neutrality

Miller and Scholes [14] observed that differential tax rates on dividends and interest on the one hand and capital gains on the other lead to the same result as if all income were taxed at (zero) capital gains rates under conditions with considerable similarity to U.S. tax laws. The ability to offset interest payments on margin purchases against dividends and the availability of tax-exempt or tax-deferred vehicles constitute the cornerstones of this phenomenon. In the context of the current paper, the preceding equivalence will be depicted as follows. Let the economy with differential taxes contain a (passive, non-taxable) financial intermediary (the MS Life Assurance Society, say)[8] which is permitted to own, prior to trading, all risk-free bonds in the economy *plus* a sufficient quantity of such bonds (held short by the various consumer-investors) for investors to achieve a perfect offset between the total interest payment on these *additional* bonds and the totality of taxable dividends plus the interest receipts on all risky debt securities.[9] Against its long position in coupon bonds, the intermediary is short an equal number of discount bonds,[10] on which holding gains are taxable to investors at rate t_1.[11] Assuming at the same time that each investor is permitted to exchange ordinary (risk-free) bonds for discount bonds, on a one for one basis, to the point where his income taxable at t_2 based on his endowment is zero, it is demonstrated in [7] that each consumer-investor faced with differential taxes will in fact, when trading opens, choose the same portfolio of risky assets in equilibrium as if all income had been taxed at (the lower) rate t_1. In addition each investor will go short in the risk-free bonds sufficiently to exactly offset all income taxed at rate t_2, placing the remainder of his funds in the discount securities. This causes his after-tax equilibrium payoff pattern to be identical to the one he would have achieved with all income taxed at the lower rate t_1. Note that total taxes paid would be the same in the two economies and that (2), which is valid in the

[8] The savings component of ordinary life insurance contracts is an example of financial intermediation of this genre for the case when $t_1 = 0$. Pension funds represent another example with similar features.

[9] This is equivalent to permitting investment interest deductions to equal investment income (interest plus dividends) in the *aggregate*.

[10] While viewing the discount bonds as pure discount bonds keeps the exposition uncluttered, the above scenario also applied if these bonds have a coupon as long as the coupon is *lower* than on the bonds on the other side of the balance sheet.

[11] For an example of the change in the market structure caused by the intermediary, see [7].

absence of deadweight costs and in the presence of risk-free *declared* dividends and coupon payments, is assumed to hold.

The intermediary and the accompanying endowment exchange we have posited give rise to a situation which we shall refer to as *tax neutrality* between the single tax rate and the dual tax rate economies. It is the two-period general equilibrium analogue, for the case in which capital gains are taxed at positive rates, to the Miller and Scholes [14] tax-neutrality dividend scenario.[12]

V. Dividend Irrelevance Under Uncertainty

It is natural to begin by asking under what conditions dividends are irrelevant. Adopting the assumptions of tax neutrality or the absence of taxes coupled with zero deadweight costs from Section IV, we first consider the case in which dividend declarations convey *no* information beyond what is already known, that is no *new* information. Since this implies that $\pi_{is}^{d} = \pi_{is}^{0}$ for all i, s, and d, we trivially obtain:

Proposition I. Dividend policy is a matter of irrelevance ($V_i(D) = V_i^0$, all i) in a world of no taxes or tax neutrality for all signals d whenever dividend declarations convey no information.

The above can be thought of as a restatement of the irrelevance propositions of Miller and Modigliani [13] and Miller and Scholes [14] although the key words "no information" have generally not been emphasized in these studies. Recall also that tax neutrality only holds in the absence of deadweight costs and in conjunction with (2) and tax-neutral endowments.

Let us now turn to the case in which dividend declarations do convey information to investors while retaining the other assumptions of Proposition I. As it happens, dividends will now be irrelevant only if each possible declaration causes no trading; that is, only if the change in beliefs is perfectly offset by the resulting changes in equilibrium prices in such a way that no trading becomes necessary. In the taxless case, no less than five conditions must simultaneously be present for this to hold true under arbitrary preferences and non-null information structures (see Hakansson, Kunkel, and Ohlson [8, Lemma 2]). It is readily shown that the same conditions extend to the tax neutrality case as well. Consequently, endowments must be efficient before the declaration, that is (14) must hold.[13] Second, (10b) must be valid, that is, the relevant information structures must be

[12] Whether the equilibrium prices in the two economies differ or not depends on how investors view tax payments. If taxes are looked on as separate and distinct outflows (the separable tax scenario), dividends and coupons would have had no effect on security prices. On the other hand, if investors price securities on the basis of after-tax cash flows, the *before-tax* return on a dividend-paying stock is an *increasing* function of the dividend under tax neutrality. This invitation to schizophrenia seems to show up in the empirical literature as well: the influence of yield on before-tax returns was found to be significant in studies by Rosenberg and Marathe [17], Litzenberger and Ramaswamy [9, 10], and Blume [4], but not in Black and Scholes [2], Gordon and Bradford, [5], and Miller and Scholes [15].

[13] While the necessity of (14) was not established in Hakansson, Kunkel, and Ohlson [8], this is readily done.

essentially homogeneous. Third, the market must exhibit full allocational efficiency in the absence of the declaration, that is, we must have:

$$P_{is}^0 = P_{1s}^0, \qquad \text{all} \quad i \geq 2, \quad \text{all} \quad s. \tag{15}$$

Fourth, signal beliefs, or equivalently prior beliefs given (10b), must be essentially homogeneous. That is, we require:

$$p_i(d) = k_i(d)p_1(d), \qquad \text{all} \quad i \geq 2, \quad \text{all} \quad d, \tag{16b}$$

where $k_i(d)$ is the same as in (10b). Finally, utility must be time-additive, which is equivalent to saying that we must be able to write

$$U_{is}(c_i, w_{is}) = f_i(c_i) + g_{is}(w_{is}), \qquad \text{all} \quad s \quad \text{and} \quad i. \tag{17}$$

Formally, the preceding may be stated as;

Proposition II. Dividend policy is a matter of irrelevance ($V_i(D) = V_i^0$, all i) in a world of no taxes or tax neutrality when dividend declarations convey information if and (for arbitrary preferences) only if *all* of the conditions (14), (10b), (15), (16b), and (17) hold.

While the last four of the above assumptions are somewhat strong, they have been commonly employed in financial modeling. Thus, dividend policy is indeed irrelevant in a number of popular models, both with and without taxes, in which no deadweight costs are present. Proposition II may therefore be viewed as a significant extension of the extant theory of dividend irrelevance.

VI. When to Scrap Dividends

In the previous section, the irrelevance of dividends depended crucially on the absence of deadweight costs, both in connection with the tax structure and with the incremental sale of new shares in the presence of dividend payments. Such a benign view of these two phenomena may, of course, not be justified. We shall therefore examine the implications of positive deadweight costs on dividends.

To begin the analysis, let $F^*(A^d)$ denote the set of efficient second-period allocations w in the *absence* of deadweight costs in the presence of dividend payment d. It then follows from Lemma 3 in Hakansson, Kunkel, and Ohlson [8] that the efficient allocations $F^*(A^d)$ are such that we obtain either

$$V_i(D) = V_i^0 \qquad \text{all} \quad i \tag{18}$$

or

$$V_i(D) < V_i^0 \qquad \text{some} \quad i \tag{19}$$

whenever each of the four conditions (10a), (15),

$$p_i(d) = p_1(d) \qquad \text{all} \quad i \geq 2, \quad \text{all} \quad d, \tag{16a}$$

and (17) hold. That is, an informative dividend policy has no social value, independently of (14), if both the information structures and the signal beliefs are homogeneous, the financial market is fully allocationally efficient, and utility is time-additive.

Let us now introduce deadweight costs, making no other changes. This causes (1b) and possibly (3) to become valid. Let $F_C^*(A^d)$ denote the set of efficient second-period allocations in the presence of dividend d and its accompanying deadweight costs C. Whenever (3) holds, every efficient second-period allocation $w^* \in F^*(A^d)$ now becomes infeasible. That is, $w^* \notin F_C^*(A^d)$. This implies immediately that at least some investors must be worse off with dividends than they are without dividends. That is, (19) or

$$V_i(D) < V_i^0, \qquad \text{all} \quad i \tag{20}$$

must hold whenever dividends are either 1) not informative or 2) informative in the presence of conditions (10a), (15), (16a) and (17). Formally this may be stated as

Proposition III. Suppose that dividends induce positive deadweight costs (via differential taxation rules and/or additional flotation costs) and that these deadweight costs are allocationally limiting, i.e., (3) is satisfied for all signals d. The declaration and payment of dividends will then cause at least some investors (and possibly all) to be worse off with dividends than without dividends whenever either (a) the dividend declaration conveys no information, or (b) the dividend declaration conveys information but (10a), (15), (16a), and (17) hold.

The preceding shows that informative dividends have nothing to contribute to the "level of efficiency" achieved by an economy with homogeneous beliefs and information structures, full allocational efficiency, and additive preferences. In fact, in such an economy the presence of deadweight costs reduces the level of efficiency by moving it to a lower Pareto surface than that which applies in the zero dividend case.[14]

VII. When to Pay Dividends

Just as there are clear-cut cases when dividends reduce efficiency, there are also clear-cut cases when positive dividends *guarantee* a Pareto-improvement, that is, (11) occurs. Three conditions are pivotal for this to be true: the absence of deadweight costs, the provision of non-null information by the dividend declaration, and endowments that are efficient without the information. If in addition at least *one* of conditions (10b), (15), (16b), or (17) does *not* hold, trading must occur when the dividend signal is released, and that trading can only lead to a Pareto-improvement in the taxless case (Hakansson, Kunkel, and Ohlson [8, Theorem 1]). The extension to the tax-neutrality case is again straight-forward. Thus we obtain

Proposition IV. Suppose that there are no taxes or that tax neutrality prevails (so that there are no deadweight costs), that a given dividend policy conveys information, and that endowments are efficient in the absence of dividend declarations, i.e., (14) holds. The declaration and payment of dividends then

[14] For an analysis of the relationship between the "efficiency levels" attained and the degree of "fineness" of public information structures in the absence of deadweight costs, see Ohlson [16].

yields a Pareto-improvement (except for singular preference structures) provided that at least one of conditions (10b), (15), (16b), or (17) is violated.

Since none of conditions (10b), (15), (16b), or (17) is in any sense farfetched, the case for the payment of informative dividends appears quite strong—provided there are no deadweight costs to worry about.

One question that suggests itself is whether a policy of informative dividends can bring a market that is less than fully allocationally efficient in the absence of dividends (say an incomplete market) to the equivalent of *full* allocational efficiency or better. The answer is in the affirmative because dividends may be able to bring an incomplete market to full informational efficiency, which implies a Pareto surface at least as high as that corresponding to full allocational efficiency without dividends in the tax neutral case.[15] By reference to Section III, two conditions are required. First, (12) must hold. That is, the marginal rates of substitution of *endowments*, for any two signals d, must be the same for all investors. Second, the market must be *conditionally* complete. That is, it must be complete *given* any dividend declaration d, which implies (13). In other words, when all the states which under the revised beliefs have zero probability have been eliminated to form matrix A^d, conditional completeness is satisfied if the rank of $A^d = S(d)$, where $S(d)$ is the number of states with *positive* probability given signal d. Formally, the preceding may be stated as:

Proposition V. Suppose that there are no taxes or that tax neutrality prevails (so that there are no deadweight costs), that a given dividend policy D conveys information, that endowments are such that

$$\frac{p_i(d)\lambda_i^d}{p_i(d_1)\lambda_i^{d_1}} = \frac{p_1(d)\lambda_1^d}{p_1(d_1)\lambda_1^{d_1}}, \qquad \text{all} \quad i, d, \tag{12}$$

and that markets are conditionally complete for each dividend signal d. The declaration and payment of dividends based on D then gives rise to full informational efficiency.

Note again that (12) is "likely" to hold if the number of dividend signals m is less than the number of securities J but not otherwise (since (12) essentially gives rise to m linear equation in J unknowns). Thus, if there are 1,000 securities and 10,000 states, we clearly have less than a complete market in the absence of information. But with 25 distinct dividend signals, for example, one can readily visualize the attainment of full allocational efficiency for each signal even in the presence of arbitrary preferences and beliefs as long as $S(d) \leq 1000$ for all d. Dividend signals, in other words, may serve as a direct substitute for markets. Note also that (12), if feasible, would automatically be attained if (pre-signal) trading were permitted.

VIII. The Critical Tradeoff

In view of the analysis of the two previous sections, it is apparent that the social value of an informative dividend policy is subject to two opposing forces: the

[15] Only in the case of homogeneous beliefs and additive utility do the two Pareto surfaces coincide (see Proposition VI).

conditions which promote social value in the absence of deadweight costs, and the deadweight costs themselves, which act in the opposite direction. The net result, therefore, depends on the particular tradeoffs that are attained in any particular circumstance.

Since the positive forces do not always overpower the negative ones, it will be helpful to identify the conditions which act in the positive direction. It was shown in Hakansson, Kunkel, and Ohlson [8, Theorem 2] that, in the absence of deadweight costs, it is necessary (but not sufficient) that either (10a), (15), (16a), or (17) be violated in order for a Pareto-improvement to occur. It follows from Propositions III and IV that these conditions remain necessary when deadweight costs are introduced as long as condition (3) applies. This gives our final result.

Proposition VI. Suppose that dividends induce positive deadweight costs (via differential taxation rules and/or additional flotation costs) and that these deadweight costs are allocationally limiting, i.e., (3) is satisfied for all signals d. A necessary (but not sufficient) condition for dividends to yield a Pareto-improvement is that the dividend declaration conveys information and that at least one of conditions (10a), (15), (16a), or (17) is violated.

Again, it is noteworthy that each of the above conditions is highly plausible so that the potential for informative dividend policies to lead to Pareto-improvements must be viewed as substantial. Since "more complete" markets also improve welfare under certain conditions (Hakansson [6]), we confirm once again, with reference to condition (15), that informative dividend policies can serve as a powerful substitute for a richer financial market.

For an example in which an informative dividend policy yields a Pareto-improvement even in the presence of a deadweight loss, the reader is referred to [7].

IX. Summary and Concluding Remarks

The well-known dividend-irrelevance propositions for the taxless case [Miller and Modigliani (13)] and the tax-neutrality case [Miller and Scholes (14)] have been recast in a general equilibrium framework, extended, and embedded in a larger paradigm in which the potential of dividends to provide information was explicitly recognized. This enlarged framework led to a rich set of propositions.

We have demonstrated that dividends, whether informative or not, serve no useful role when investors have homogeneous beliefs and time-additive utility and markets exhibit full allocational efficiency—when associated with positive costs, dividends are under these circumstances deleterious to efficiency. On the other hand, dividends are capable of improving welfare (efficiency) when they are informative provided investors have heterogeneous beliefs, utility is not additive, or markets are incomplete, even in the presence of deadweight costs. In this context, the power of informative dividends to serve as a substitute for additional financial markets is particularly notable. Moreover, this demonstration was cast in a setting that does not compromise the portfolio problem, that treats information formally, that is sensitive to possible deadweight costs, that employs a general equilibrium perspective, and that measures investor welfare in expected utility.

The limitations of the framework used should also be noted. First, the analysis was based on a two-period model; it is always possible that a multi-period framework would capture additional elements of the dividend decision. Second, the concept of (strict) tax neutrality, which played a crucial role in Propositions I, II, IV, and V and is useful in terms of the insights gained, is somewhat artificial.

Third, the paper considered only two alternatives, zero dividends and an informative policy of positive dividends. An ordering of all conceivable dividend policies would of course be desirable. Limited results in this area are actually readily obtained. Dividends policies which can be ranked by the informativeness criterion [Blackwell and Girshick], a criterion which produces a partial ordering, can be similarly ordered in terms of the level of economic efficiency achieved (but generally not in terms of welfare) in those cases in which deadweight costs are absent [see Ohlson, 16]. Beyond this, however, comparative statements appear somewhat elusive.

Fourth, the question of whether to pay or not to pay dividends has been addressed from the perspective of the welfare implications to the owners (the consumer-investors). While this is a natural first step, the problem of what kinds of incentive schemes would be required to induce managers to carry out the wishes of the owners is equally important and remains to be addressed.

Finally, it should be reiterated that the demand for cash dividends, insofar as it is not fully accounted for by the after-tax return itself, stems in the present paper solely from the information conveyed by the applicable dividend declaration. Thus, the present paper offers no explanation for the observed preference for cash dividends over stock dividends, other things, in particular the information conveyed by the dividend declaration, being equal, that was documented by Long [11]. An explanation for this preference must await another effort.

REFERENCES

1. Fischer Black. "The Dividend Puzzle," *Journal of Portfolio Management.* (Winter 1976), pp. 5–8.
2. Fischer Black and Myron Scholes. "The Effects of Dividend Yield and Dividend Policy on Common Stock Prices and Returns," *Journal of Financial Economics*, 1 (May 1974), pp. 1–22.
3. David Blackwell and M. A. Girshick, *Theory of Games ad Statistical Decisions*, New York, John Wiley, 1954, Ch. 12.
4. Marshall Blume. "Stock Returns and Dividend Yields: Some More Evidence," *Review of Economics and Statistics*, 52(November 1980), pp. 567–577.
5. Roger Gordon and David Bradford. "Taxation and the Stock Market Valuation of Capital Gains and Dividends: Theory and Empirical Results," *Journal of Public Economics*, (1980), pp. 109–136.
6. Nils Hakansson. "Changes in the Financial Market: Welfare and Price Effects and the Basic Theorems of Value Conservation," *The Journal of Finance*, (forthcoming).
7. Nils Hakansson. "To Pay or Not to Pay Dividends," Finance Working Paper No. 124, University of California, Berkeley, (November 1981).
8. Nils Hakansson, Gregory Kunkel, and James Ohlson. "Sufficient and Necessary Conditions for Information to Have Social Value in Pure Exchange," Finance Working Paper No. 122, University of California, Berkeley, (August 1981).

9. Robert Litzenberger and Krishna Ramaswamy. "The Effect of Personal Taxes and Dividends on Capital Asset Prices: Theory and Empirical Evidence," *Journal of Financial Economics*, 7 (June 1979), pp. 163–195.
10. Robert Litzenberger and Krishna Ramaswamy. "The Effects of Dividends on Common Stock Prices: Tax Effects or Information Effects?", *The Journal of Finance*, (this issue).
11. John Long, Jr., "The Market Valuation of Cash Dividends: A Case to Consider," *Journal of Financial Economics*, June/September 1978.
12. Alfred Malabre, Jr. "Corporate Dividends Climb to Record Level Despite Lag in Profits," *The Wall Street Journal*, (October 19, 1981), p. 1.
13. Merton Miller and Franco Modigliani. "Dividend Policy and the Valuation of Shares," *The Journal of Business*, 34 (October 1961), pp. 411–433.
14. Merton Miller and Myron Scholes. "Dividends and Taxes," *Journal of Financial Economics*, 6 (December 1978), pp. 333–364.
15. Merton Miller and Myron Scholes. "Dividends and Taxes: Some Empirical Evidence," Working Paper, University of Chicago, (January 1981).
16. James Ohlson. "Efficiency and the Social Value of Information in Exchange Economies," Working Paper, University of California, Berkeley, (April 1980).
17. Barr Rosenberg and Vinay Marathe. "Tests of Capital Asset Pricing Hypotheses," in Haim Levy, ed., *Research in Finance*, (New York: JAI Press, 1979).
18. Joel Stern. "The Dividend Question," *The Wall Street Journal*, (July 16, 1979).