Efficiency Costs of Dividend Taxation with Managerial Firms *

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Abstract
The paper analyzes the efficiency costs of dividend taxation in an effort-based corpo-
rate agency model in which non-verifiable managerial effort enhances taxable profits.
We show that, unlike in traditional efficiency analysis in which agency issues are ab-
sent, the source of investment finance and the sensitivity of investment to dividend
taxes are not uniquely linked. Investment might be downward distorted when re-
tained earnings or new equity issue finance investments at the margin. We provide
a testable implication to infer the mode of investment finance from the investment
sensitivity to dividend taxes. Further, we show that the efficiency effects depend on
the investment and effort responses in general. In the case of an ACE system or
R-based cash flow system dividend, however, taxes do not impair efficiency based on
the tax-induced investment response. Finally, we show that imposing an income tax
on managerial incentive pay is equivalent to a general dividend tax, both in terms
of induced firm responses and their efficiency implications.

JEL-Classification: H25, D21

Keywords: dividend taxation, managerial effort, corporate governance, tax on incentive
pay, managerial firms

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1 Introduction

The issue of how dividend taxes affect firm behavior has generated a lot of interest in public economics and among policy makers alike. The central issue is how dividend taxes influence dividend pay-outs and investments of firms and how these responses shape the efficiency effects that follow from the taxation of dividend income (Auerbach, 2002). Recent empirical evidence points to role of corporate agency conflicts for the way dividend taxes influence firm behavior. For instance, following the 2003 US dividend tax cut firms with more powerful principals, as indicated by the extent of taxable institutional ownership or the representation of independent shareholders on the board of directors, increased dividend payments more strongly (Chetty and Saez, 2005).\(^1\) Also, executives with higher managerial stock ownership were more likely to increase dividend distributions, consistent with managers acting in their own interests (Brown et al., 2007; Blonin et al., 2011). The empirical findings suggest that agency-related dividend responses influence investment behavior through their impact on corporate cash flow, thereby inducing investment responses that are unique to agency models (Becker et al., 2013; Chetty and Saez, 2010).

The results point to the useful role of linking traditional efficiency analysis of dividend taxation with corporate agency models to provide a more coherent understanding of firm responses to dividend taxation and the efficiency effects that are associated with them. In this paper, we set up an effort-based corporate agency model in which managerial effort influences production (Tirole, 2006). The assumed link between effort and output might be multi-facetted. Illustratively, managerial effort might directly increase output through e.g. the screening of ex-ante imperfectly known investment projects or indirectly through organizational changes whose implementation requires managerial effort and allows lower-level employees to be more productive.\(^2\)

Managerial effort is non-verifiable. Since the return to managerial effort provision accrues to shareholders through higher firm valuations, shareholders link the managerial wage to firm performance and use an equity-based incentive contract to align interests between the manager and shareholders. In this setting, dividend taxes influence investment behavior depending on how effort interacts with investments in production. For instance, complementarity of the two inputs

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\(^1\) Relatedly, Jacob et al. (2015) show that the sensitivity of dividend policy to owners’ tax preferences phases out as the number of owners increases, suggesting that managers pursue private agendas different to satisfying shareholder interests as ownership becomes more dispersed.

\(^2\) See e.g. Bloom and Van Reenen (2010) for a literature overview of the relation between management practices (such as human resource management and information technology management) and firm performance.
implies a negative investment response to dividend taxes. The finding holds independently of whether marginal investments are financed by retained earnings or external equity.

This contrasts with the traditional tax efficiency analysis which builds on the new view and old view of dividend taxation. Their predictions are that dividend taxes are neutral for investment behavior in firms which use retained earnings as the marginal source of funds (new view) and will distort investments in firms which rely on equity injections at the margin to finance investments (old view). This has implications for linking investment responses to economic efficiency. The investment response in the effort-based corporate agency model might be observationally equivalent to the investment response that is consistent with the old view although retained earnings is the marginal source of funds. The finding impairs the role of the two well established views to deduce the financing behavior of firms based on the empirically observed sensitivity of investment to dividend taxes and to infer the efficiency effects of dividend taxation based on this information. The paper proposes testable implications which allow to infer the financing behavior based on the investment sensitivity to dividend taxes in corporate agency models. Dividend taxes and the sharing parameter in the equity-based incentive contract influence investment in the same way when retained earnings are the marginal source of funds, while dividend taxes affect investment incentives more strongly compared to the sensitivity of managerial pay to performance when the firm uses equity injections at the margin. Interestingly, the proposed testable implications are robust to a wide range of corporate agency model, including effort-based agency models and models of free cash flow (Jensen, 1986).

In the agency model, dividend taxation incurs efficiency costs with both sources of investment finance. Efficiency costs generally depend on the responses of effort and investment to dividend taxes. We show that the general insight depends on the type of corporate tax system that is implemented. In an Allowance for Corporate Equity (ACE) system and a R-based cash flow system, two corporate tax systems that are frequently discussed in tax policy and implemented in some countries\(^3\), the efficiency effects solely deduce from effort responses, although investments change with dividend taxes.

The framework which we set up in the paper also allows us to address a frequently voiced policy measure, namely to impose a separate tax on equity-based incentive pay. In some countries, equity-based incentive pay receives a differential tax treatment compared to general income (Hall and Liebman, 2000). Theoretically, a differential tax treatment might correct for a tendency to

\(^3\)See Auerbach et al. (2010) for a discussion, among others.
under- or overincentivize managers (Benabou and Tirole, 2015) or might limit socially wasteful bargaining effort by managers (Piketty et al., 2014). As it turns out, the separate income tax and a dividend tax imposed on all shareholders are equivalent in their effects on firm behavior and on efficiency. The result might be surprising given that the two taxes are imposed on a different set of individuals with potentially different impacts on their decisions. The reason for the equivalence result is that shareholders, who set the managerial wage, become residual claimants and view the two instruments as perfect substitutes. For instance, the incentive contract they offer to managers changes with the two instruments in the same way. As a consequence, the induced managerial effort and investment choices coincide with the two tax instruments. Compared to a special tax on manager equity-based income, a general dividend tax has the potential to achieve the same efficiency effects.

1.1 Literature review

The literature on the effects of dividend taxation largely centers on the old view and new view of dividend taxation (Sinn, 1987; Auerbach, 2002). The alternative views of the impact of dividend taxes rely on different assumptions about the source of funds. Under the old view developed in Poterba and Summers (1985), the source of funds is new equity issue. Dividend distributions are taxed while capital injections do not receive a subsidy.\footnote{See Lindhe and Södersten (2014) for a refined treatment of the imperfect tax deductibility of the costs of investment finance that underlies the old view of dividend taxation.} The asymmetric tax treatment introduces tax distortions and reduces firm investments. Under the new view developed in Auerbach (1979), Bradford (1981) and King (1977), the source of funds are retained earnings. Retaining profits to finance investments only leads to a retiming of dividend taxes which renders dividend taxes neutral for investment behavior.\footnote{More precisely, the tax neutrality under the new view applies more broadly provided the source of funds and use of funds are the same. Thereby, the tax treatment is also the same and neutral for investment decisions.} Empirical analysis of the relevance of the two views include Poterba and Summers (1985), Poterba (2000), and Auerbach and Hassett (2002), among others. The literature derives the two views from a theoretical framework in which corporate agency issue are not considered.

Unlike traditional efficiency analysis in public finance, Kanniainen (1999) sets up a free cash flow model of firm behavior, in which managers try to build an empire and invest resources differently to what shareholders prefer, and analyzes the role of dividend taxes for resource allocation. More recently, Chetty and Saez (2010) resort to a free-cash flow model to explain observed

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firm responses after the 2003 US dividend tax cut and relate them to efficiency effects. In this setting, dividend taxes do not change incentives to invest productively, provided retained earnings finance marginal investments. This is consistent with the new view of dividend taxation. However, they increase total investment outlays since dividend taxes incentivize managers to expand the empire and invest resources unproductively instead of making distributions to shareholders. Such a positive investment response is consistent with recent findings in Becker et al. (2013). In the effort-based agency model analyzed in this paper, all investments are productive and managers are not empire builders. Still, the model equally predicts a positive investment response to dividend taxes, provided effort and investment are substitutes in production. This corroborates the finding that positive investment responses to dividend taxes are consistent with optimal corporate behavior, once frictions within the firm are accounted for.

The corporate agency model we set up in the paper is a second class of widely-used agency models; see Tirole (2006), for instance. It emphasizes the role of managerial effort in production and its impact on productive investments. Unlike the free-cash flow model, the investment response is not limited in sign to explain anomalies (based on traditional analysis) in investment responses to dividend taxation. It it also capable of explaininig the negative investment responses which is frequently documented in empirical analyses. However, it provides a nuanced perspective on this response and on the possibility to infer the financing behavior of firms. Following the two alternative views on dividend taxation, empirical papers sometimes use dividend-tax induced investment changes to infer the financing regime. The effort-based managerial model, however, suggests that there is no clear association between empirically observed negative investment responses to dividend taxation and the underlying financing regime of firms. Dividend taxes might downward investments when retained earnings or new equity issues are used at the margin to finance investments. As explained above, it provides an alternative test for the financing regime that underlies the marginal investment response and this test relies on a comparison of the effect of incentive wages and dividend taxes on investments.

The paper proceeds as follows. In Section 2 we set up an effort-based corporate agency model with endogenous incentive pay. In Section 3 we characterize the shareholders’ choice of incentive pay, the managerial effort and investment behavior and the welfare implications of...
dividend taxation. In Section 4 we turn to varous extensions of the basic model. In Section 5 we relate the findings of the previous section to empirical analyses of the effects of dividend taxation. Finally, we provide a summary of the results and offer some concluding remarks in Section 6.

2 Model

Consider a managerial firm that exists for two periods. In period 1, the firm has initial cash holdings $X$ and might issue new shares at an amount $V_1^N$. Cash holdings and new share issues are used to finance investments $I$ and are residually distributed to shareholders as dividends, $D_1 = X - I + V_1^N \geq 0$. In period 2, the firm produces output. The production function is stochastic $F(I, e) = f(I, e) + \varepsilon$ with $\varepsilon \sim \mathcal{N}(0, \sigma^2)$. Production depends on investment $I$ and on managerial effort choices $e$ and satisfies $f_I, f_e > 0$, $f_{II}, f_{ee} < 0$ and $f_{Ie} \leq 0$.8 The cross effect between investment and effort might capture different ways how managerial effort interacts with physical investments. The two production factors might be substitutes, reflecting a situation in which managerial effort increases the quality of the investment input, but not of other production factors.9 For instance, more managerial supervision of the selection of investment projects and the implementation of them increases the quality of the investment choice. See Tirole (2006) for moral hazard models that are consistent with the notion of substitututability. Such a situation might be reflected by a production function $f(I, e) = \tilde{f}(h(e, I))$ with $\tilde{f}'' > 0 > \tilde{f}''$ and $h_i > 0 > h_{ii}$, $i = e, I$. $h(I, e)$ might be interpreted as the quality of the capital input which can be enhanced by managerial effort provision. Provided $h_{Ie}$ is not too positive the two inputs are substitutes, $f_{Ie} < 0$.10 For instance, when $h(e, I)$ is additive the production function is $f(I + e)$ which implies $f_{Ie} < 0$.11 Alternatively, the productivity-enhancing effect of effort might not

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8Throughtout the paper, subscripts denote partial derivatives where the order in which derivates are taken is indicated by the sequence of subscripted variables.

9Other factors might include a fixed factor such as land. For simplicity, it is omitted from notation.

10More precisely, the cross derivative is $f_{Ie} = \tilde{f}'' h_e h_I + \tilde{f}' h_{Ie}$. Given the assumptions stated above, the sign of $f_{Ie}$ is negative when $h_{Ie}$ is not too positive. Effort and investments might thus be complements in forming the quality of the capital input $h(I, e)$ and substitutes in overall production.

11A microfoundation for $h(e, I)$ might be as follows. Assume a manager has a portfolio of projects under his control and influences the success of each project through his effort provision. There are two quality levels $I^h > I^l > 0$. The two quality levels are increasing in physical investments $I$, i.e. $I^i_1 > 0$, $i = h, l$. By exerting effort the manager makes some of the projects more successful, as measured by the differential $I^h - I^l$. The manager thereby decides on the relative importance of the two quality levels in the total capital stock where the aggregate quality level is $h(I, e) = e I^h + (1 - e) I^l$. The way effort and investments interact in production follows from $f_{Ie} = \tilde{f}'' (I^h - I^l) (e I^h + (1 - e) I^l) + \tilde{f}' (I^h - I^l)$. For instance, when physical investments symmetrically change the two quality levels, $I^h_1 = I^l_2$, effort and investments turn out to be substitutes in production, $f_{Ie} < 0$. 


only be directed towards investments, but towards all production factors, as described by the production function $f(I, e) = eg(I)$, with $g' > 0 > g''$. This implies $f_{Ie} > 0$.

Investments depreciate at a rate $\delta > 0$. Profits are taxed at rate $\tau > 0$ where economic depreciation and the fixed wage salary of the manager $a$ is deductible from the corporate tax base. At the end of period 2, the firm is liquidated. The liquidation proceeds and net of tax profits are distributed to shareholders:

$$D_2 = (1 - \tau)(F(I, e) - a) + \tau \delta I + (1 - \delta)I. \quad (1)$$

Dividend distributions are taxed at rate $\tau^D$ at the shareholder level. Thus, firm value is

$$V = (1 - \tau^D) \left( D_1 + \frac{D_2}{1 + r} \right) - V_1^N. \quad (2)$$

Shareholders offer the manager a share $\alpha$ of the firm and a fixed wage $a$, i.e. $w = \alpha V + \frac{a}{1 + r}$. The manager derives utility from income net of the costs of effort provision $E(U) = E(u(w)) - \phi(e)\frac{1}{1 + r}$ with $u' > 0 > u''$ and $\phi', \phi'' > 0$. Assuming utility over income to be CARA, we can simplify manager utility to $E(u(w)) = E(w) - \rho \text{Var}(w)$, $\rho > 0$. Using (1), (2) and $w = \alpha V + \frac{a}{1 + r}$, the mean and the variance of wage income is

$$E(w) = \alpha E(V) + \frac{a}{1 + r} \quad \text{and} \quad \text{Var}(w) = \rho \left( \alpha \frac{(1 - \tau^D)(1 - \tau)}{1 + r} \right)^2 \sigma^2. \quad (3)$$

Thus, manager utility is

$$E(U) = \alpha E(V) + \frac{a}{1 + r} - \rho \left( \alpha \frac{(1 - \tau^D)(1 - \tau)}{1 + r} \right)^2 \sigma^2 - \phi(e)\frac{1}{1 + r}. \quad (4)$$

The manager’s reservation utility is normalized at zero which yields the participation constraint $E(U) \geq 0$. Since manager remuneration is costly to shareholders, the manager’s participation constraint will choose a wage schedule so that the participation constraint holds as an equality. Inserting $E(U) = 0$ into external shareholder wealth $(1 - \alpha)V$, while noting (4) and $w = \alpha V + \frac{a}{1 + r}$, yields

$$(1 - \alpha)E(V) = E(V) + \frac{a}{1 + r} - \rho \left( \alpha \frac{(1 - \tau^D)(1 - \tau)}{1 + r} \right)^2 \sigma^2 - \phi(e)\frac{1}{1 + r}. \quad (5)$$

The sharing parameter $\alpha$ does not explicitly enter the right-hand side of (5). Intuitively, shareholders become residual claimants which effectively induces them to maximize the sum of their wealth and manager utility when choosing manager remuneration. In this environment, the

\[\text{Note, besides investments } I, \text{ the production function } g(I) \text{ also captures the use of a fixed factor which gives rise to } g'' < 0.\]
shareholders’ choice of \( \alpha \) follows from the well-known incentive-insurance trade-off (e.g., Holmstrom, 1979). A higher \( \alpha \) tends to align incentives between shareholders and the manager, but at the same time exposes the risk-averse manager to more risk. The latter effect is costly to shareholders since it requires a higher compensatory fixed wage payment \( a \) to satisfy \( U = 0 \). The fiscal resource of the public sector, \( T \), comprise dividend and corporate tax revenues

\[
T = \tau^D \left( D_1 + \frac{D_2}{1 + r} \right) + \tau \frac{f(I, e) - a - \delta I}{1 + r}
\]

In the model, shareholders and the manager move sequentially. At the beginning of period 1, shareholders decide on the parameters of the incentive contract \((\alpha, a)\) and choose the level of equity injections \( V_1^{N} \), anticipating how the manager chooses effort \( e \) and investment outlays \( I \) at the end of period 1. In period 2, production occurs, taxes are paid and, at the end of period 2, the firm is liquidated.

3 Retained earnings as the marginal source of funds

We start out by assuming the investments are financed through retained earnings. Retained earnings are a major source of investment finance in practice and this source of finance might be particularly relevant for mature firms. In the model, this implies that new share issues are optimally set to zero, \( V_1^{N} = 0 \), and first-period dividend distributions \( D_1 \) are positive in general. The flow of first-period dividends is

\[
D_1 = X - I \geq 0
\]

where \( X \) reflects the accumulated retained earnings that are available to finance either investments or distributions to shareholders.

3.1 Firm behavior

Solving backwards, the manager chooses investments and effort for given \( \alpha \) and \( a \). Inserting (2) into (4) while noting (1), \( w = \alpha V + \frac{a}{1 + r} \) and \( D_1 = X - I \geq 0 \), the manager’s choice of investment satisfies

\[
I : \quad \alpha(1 - \tau^D) \left( -1 + \frac{(1 - \tau)f + \tau \delta + 1 - \delta}{1 + r} \right) = 0
\]

The increase in second period dividend distributions due to higher investment equals the costs of reduced distributions in the first period. The manager fully shares in the benefits and costs of investments. The incentive contract hence aligns the interests of the manager and of shareholders. The managerial effort choice follows from

\[
e : \quad \alpha(1 - \tau^D) \left( \frac{(1 - \tau)f}{1 + r} - \frac{\phi'(e)}{1 + r} \right) = 0.
\]
The marginal increase in net-of-tax profits that accrues to the manager through the incentive contract is equated to marginal effort costs. Since the manager privately bears the full effort costs, but receives only a fraction of the total return to effort, the effort level is below the level that shareholders prefer.\footnote{Shareholders prefer a level of effort that satisfies (8) with } \[ \alpha = 1. \] The intuition is that shareholders are residual claimants which entails that they are interested in aligning the total marginal increase in net-of-tax profit to the marginal costs of effort provision.

From (7) and (8), we obtain

\[ \frac{dI}{d\alpha} = \frac{1}{|\Delta|} \alpha((1 - \tau D)(1 - \tau))^2 f_e f_{Ie} \quad \text{and} \quad \frac{de}{d\alpha} = -\frac{1}{|\Delta|} \frac{\alpha((1 - \tau D)(1 - \tau))^2}{1 + r} f_e f_{II} > 0, \]

where \(|\Delta| > 0\) is the determinant of the Hessian matrix that follows from the manager’s decision problem. A higher sharing parameter strengthens managerial incentives to exert effort. This changes the marginal productivity of investment depending on how effort and investment interact in production, i.e. \( f_{Ie} \geq 0 \). The investment response shows that \( \text{sign}\{dI/d\alpha\} = \text{sign}\{f_{Ie}\} \). For instance, if effort and investments are complements in production, \( f_{Ie} > 0 \), higher effort provision also strengthens incentives to invest.

At stage 1, shareholders choose the incentive contract so as to maximize shareholder wealth (5), noting (1), (2), \( w = \alpha V + \frac{a}{1 + r} \) and \( D_1 = X - I \). Applying the envelope theorem, the associated first-order condition is

\[ (1 - \alpha) \left( 1 - \tau D \right) \left( 1 - \tau \right) f_e \frac{de}{d\alpha} = 2 \alpha \rho \left( \frac{(1 - \tau D)(1 - \tau)}{1 + r} \right)^2 \sigma^2. \]

The choice of \( \alpha \) follows from the well-known incentive-insurance trade-off (e.g., Holmstrom, 1979). A higher sharing parameter induces more effort provision which increases shareholder wealth. The effect is captured by the left-hand side of (10). A higher sharing parameter exposes the risk-averse manager to more risk which needs to be compensated by a higher flat wage \( a \). The associated costs to shareholders are captured by the right-hand side of (10). Differentiating (10) with respect to \( \alpha \) and \( \tau D \) yields

\[ \frac{d\alpha}{d\tau D} = \left\{ (1 - \alpha) \frac{\partial f_e}{\partial \tau D} \alpha \frac{de}{d\alpha} + 4 \alpha \rho \frac{(1 - \tau D)(1 - \tau)^2}{1 + r} \sigma^2 \right\} \delta^{-1}. \]

Given the second-order condition for \( \alpha, \delta < 0 \). Changes in tax policy have different effects on the shareholders’ optimal choice of \( \alpha \). A higher tax rate affects the incentive effect on effort provision that is associated with a higher \( \alpha \). As depicted by the first term in curly brackets, the impact on the sharing parameter depends on how the incentive effect, as measured in output
units $f_e \frac{de}{da}$, varies with the tax rate. In general, this effect is ambiguous in sign and it vanishes provided effort provision does not change with the tax rate $\tau^i$, i.e. $\partial e / \partial \tau^i = 0$.\(^{14}\) As captured by the second term in curly brackets in (11), a higher tax exposes the managers to less income risk which induces shareholders to expose the manager to more risk through a higher sharing parameter.

Differentiating investment and effort with respect to $\tau^D$ yields

$$\frac{de}{d\tau^D} = \frac{\partial e}{\partial \tau^D} + \frac{\partial e}{\partial \alpha} \frac{da}{d\tau^D} \quad \text{and} \quad \frac{dI}{d\tau^D} = \frac{\partial I}{\partial \tau^D} + \frac{\partial I}{\partial \alpha} \frac{da}{d\tau^D}$$ \hspace{1cm} (12)

The first term in the two expressions capture the direct tax effect while the second term summarize the influence through changes in the sharing parameter. As discussed above, part of the response in the sharing rate is a second-order effect of the direct effect $\partial e / \partial \tau^D$, leaving the risk-sharing adjustment as a potential effect which might overturn the direct effect. Given these insights and to save on notation, we assume that the direct effect dominates in what follows. From (7) and (8), which predicts $\partial \iota / \partial \alpha = -\partial \iota / \partial \tau^D$ ($\iota = e, I$) , this assumption reduces to the condition $da / d\tau^D < 1$.\(^{15}\) The sharing rate is required to rise less than proportionally with the tax rate, a condition which does not appear to be too implausible. Multiple implications of the analysis are worthwhile discussing at this point. The above finding is different to the standard notion how dividend taxes affect investments with retained earnings as the marginal source of finance. A higher dividend tax is predicted to leave investments and thereby distributions unchanged, c.f. Auerbach and Hines (2002). A higher dividend tax influences managerial effort choices and investment behavior of firms. It raises investments and lowers distributions when effort and investments are substitutes in production, $f_{Ie} < 0$. The positive investment response is consistent with empirical evidence presented in Becker et al. (2010). Corporate distributions have also increased in response to the US dividend tax cut in 2003, c.f. Chetty and Saez (2005). The finding has been observed for mature firms for which retained earnings are frequently argued to be a major source of investment finance.\(^{16}\) A second interesting observation is that the

\(^{14}\)To see this, note that

$$\frac{\partial (f_e \frac{de}{d\tau^D})}{d\tau^D} = \left( f_{ee} \frac{\partial e}{\partial \tau^D} + f_{el} \frac{\partial I}{\partial \tau^D} \right) \frac{de}{da} + f_{e} \frac{\partial}{\partial \alpha} \frac{de}{d\alpha}.$$

From (7) and Young’s Theorem, $\partial I / \partial \tau^D = 0$ and $\partial (de / da) / \partial \tau^D = 0$ if $\partial e / \partial \tau^D = 0$.

\(^{15}\)More precisely, inserting the response $\partial \iota / \partial \alpha = -\partial \iota / \partial \tau^D$ ($\iota = e, I$) into (12), the total derivative of investment and effort w.r.t. the dividend tax becomes $d\iota / d\tau^D = (1 - da / d\tau^D) \partial \iota / \partial \tau^D$. Hence, sign{$d\iota / d\tau^D$} = sign{$\partial e / \partial \tau^D$} if $da / d\tau^D < 1$.

\(^{16}\)Corporate agency models of free cash flow equally predict that investment rises with dividend taxes with retained earnings as the marginal source of investment funds. See Kanninen (1999), Chetty and Saez (2010) and Koethenbuerger and Stimmelmayr (2014).
predictions of the model are observationally equivalent to the old view of dividend taxation when
effort and investments are complements in production, \( f_{Ie} > 0 \). In this case, higher dividend
taxes lower investments and this observation is consistent with the managerial model presented
here, where retained earnings are the marginal source of funds, and a neoclassical model of firm
behavior in which new share issues are used to finance investments at the margin. Empirical pa-
pers sometimes use dividend-tax induced investment changes to infer the financing regime. The
managerial model, however, suggests that there is no clear association between empirically ob-
served negative investment responses to dividend taxation and the underlying financing regime
of firms.

3.2 Welfare

The welfare measure includes shareholder wealth (5), which already accounts for the participa-
tion constraints of the manager, and tax revenues:

\[
W = E(V) + \frac{a}{1 + r} - \rho \left( \alpha \frac{(1 - \tau_D)(1 - \tau)}{1 + r} \right)^2 \sigma^2 - \frac{\phi(e)}{1 + r} + \frac{T}{1 + r}.
\]  

(13)

Tax revenues comprises dividend and corporate tax revenues and are given by (6). Differentiating
welfare with respect to \( \tau_D \), while invoking the envelope theorem, yields

\[
\frac{dW}{d\tau_D} = (1 - \alpha) \frac{(1 - \tau_D)(1 - \tau)}{1 + r} f_e \frac{\partial e}{\partial \tau_D} + \tau_D \frac{1 - \tau}{1 + r} f_e \frac{de}{d\tau_D} + \tau \left( (f_I - \delta) \frac{dI}{d\tau_D} + f_e \frac{de}{d\tau_D} \right).
\]  

(14)

To explain the welfare effects of dividend taxation, it might be instructive to first assume that
effort is exogenous. In the absence of effort changes, investment levels are unaffected by dividend
taxation, c.f. (7), (9), and (12).\(^{17}\) Consistent with the New View of dividend taxation, dividend
taxation exerts no efficiency effects. Dividend taxes fully capitalize in firm value and are neutral
for aggregate welfare, \( dW/d\tau_D = 0 \). Managerial effort changes introduce two sources of welfare
variation. Effort drops in response to a higher tax rate which lowers shareholder wealth and tax
revenues, c.f. the first and second term in (17). The shareholder wealth effect describes a nega-
tive externality managers exert on shareholders, given that managers only account for a fraction
\( \alpha \) of the effect of their effort choices on dividend payments, and the tax revenue term captures a
fiscal externality shareholders and managers exert on the public budget. Both externalities are
strengthened through dividend taxation. Differently to the tax revenue change, the shareholder

\(^{17}\) More precisely, with \( f_{Ie} \equiv 0 \) (7) and (9) imply \( \partial I/\partial \alpha = 0 \) and \( \partial I/\partial \tau_D = 0 \). From (12), it then follows that \( dI/d\tau_D = 0 \).
wealth effect is only influenced by the direct tax effect on effort provision because shareholders choose the managerial incentive contract optimally. These effects in isolation indicate that dividend taxation incurs an inefficiency when retained earnings are the marginal source of funds. Depending on sign \( \{f_{Ie}\} \), effort changes translate into investment changes. For instance, when investments and effort are substitutes, \( f_{Ie} > 0 \), a higher dividend tax also reduces investments which adds to the inefficiency associated with dividend taxation through its effect on corporate tax revenues. Note, dividend taxes are chosen to maximize firm value. Hence, the effect of investment changes on dividend tax revenue vanishes which is an application of the envelope theorem. A reversed type of reasoning applies when \( f_{Ie} > 0 \). In this case, higher dividend taxes spur investments which generates a positive effect on corporate tax revenues. Since the investment response is of second order compared to the effort response, the positive fiscal externality will most likely not compensate for the negative fiscal externality on corporate tax revenues that are due to effort changes.

4 Extensions

4.1 ACE tax system/Cash-flow taxation

Corporate taxation generally discourages investments. This follows from the asymmetric tax treatment of the costs and return to investment where the corporate tax fully taxes the return, while generally offering only an imperfect tax deductibility for the costs of investment. The issue is central to tax reform discussions in many countries. See Auerbach et al. (2010), for instance. Two frequently discussed tax systems, which offer a symmetric tax treatment, are the R-based cash-flow tax and an allowance for corporate equity (ACE) system. The two tax systems differ with respect to the timing of the reimbursement of the full costs of investment. The R-based cash-flow tax offers an immediate write-off of the investment, coupled with the taxation of liquidation proceeds, while an ACE system offers a tax deductibility of the costs of investment finance in the second period, combined with a depreciation allowance (Boadway and Bruce, 1984; Devereux and Freeman, 1991). The two tax systems are equivalent in the current setting. As a matter of choice, we consider a R-based cash-flow system in what follows. Such a system alters aggregate tax revenues to

\[
T = \tau^D \left( D_1 + \frac{D_2}{1+r} \right) + \tau \left( -I + \frac{f(I, e) - a}{1+r} + \frac{(1-\delta)I}{1+r} \right)
\]  

(15)
The first and third term in the second bracket are new. They represent the tax deductibility of the costs of investment and the inclusion of liquidation proceeds in the corporate tax base. Noting that first-period dividends now become \( D_1 = X - (1 - \tau)I \geq 0 \), the manager’s choice of investment satisfies

\[
I : \quad \alpha(1 - \tau^D)(1 - \tau) \left( -1 + \frac{f_I + 1 - \delta}{1 + r} \right) = 0 \quad \Leftrightarrow \quad f_I = r + \delta. \tag{16}
\]

Effort choices still follow from (8). The tax system treats the investment costs and benefits symmetrically, leaving the investment choice undistorted. Conditional on effort choices, investment levels are insulated from corporate taxation as well as dividend taxation. However, from (8) and (16), dividend taxation undermines managerial effort provision and, depending on \( \text{sign}\{f_{Ie}\} \), this ‘spills over’ to the investment choice, as before. As such, effort levels are negatively related to dividend taxes and investment responses to dividend taxation depend on \( \text{sign}\{f_{Ie}\} \). Using (13) and (15), we find

\[
\frac{dW}{d\tau^D} = (1 - \alpha) \left( 1 - \tau^D \right) \left( 1 - \tau \right) f_e \frac{\partial e}{\partial \tau^D} + \tau^D \left( 1 - \tau \right) f_e \frac{de}{d\tau^D} + \tau \left( \frac{f_I - r - \delta}{1 + r} \frac{dI}{d\tau^D} + f_e \frac{de}{d\tau^D} \right).
\]

From (16), \( f_I = r + \delta \), implying that the effect of investments on corporate tax revenues vanishes. The finding might be surprising, given that investments change with dividend taxation. However, the manager symmetrically participates in all benefits and costs of investments through the incentive contract which, at the margin, insulates tax revenues and thereby welfare from investment changes. Investments influence effort and the latter behavioral response is sufficient to calculate the efficiency costs of dividend taxation. We should note that the welfare neutrality of investment responses is different to the new view of dividend taxation where dividend taxation does not influence investment levels.

### 4.2 New share issues

Firms might not have sufficient internal funds to finance investments and, therefore, might resort to new share issues as the marginal source of funds. This might particularly apply to new firms which are still in the growth phase. They have not accumulated a sufficient amount of retained earnings and are particularly reliant on external equity financing. This mode of financing marginal investments is assumed in the old view of dividend taxation (Poterba and Summers,
With new share issues in the first period, we have \( V_1^N > 0 \) and \( D_1 = 0 \). The first-period resource constraint becomes \( D_1 = X - I + V_1^N = 0 \), the manager’s choice of investment satisfies

\[
I: \quad \alpha \left( -1 + \frac{(1 - \tau^D)((1 - \tau)f_I + \tau \delta + 1 - \delta)}{1 + r} \right) = 0.
\]

(17)

The first-order condition for investments continues to be given by (8). The first-order condition (17) differs from (7). Since the government shares in the return to investment, but provides no subsidy to the costs of equity investments, the dividend tax undermines investment incentives. The distortion arising from the asymmetric tax treatment is in line with the old view of dividend taxation (Poterba and Summers, 1985). Compared to the situation with retained earnings as the marginal source of funds, investment might still rise or decrease with dividend taxes, but the investment response \( dI/d\tau \) becomes smaller in magnitude. As such, the distortionary effects of dividend taxation become more pronounced. This shows that investment response does not allow to infer the financing regime of the firm, as it is possible with a neoclassical model of firm behavior. Recall, in such a model, a negative investment change in response to a dividend taxation is consistent with the use of new share issues as the marginal source of funds, while investments financed by retained earnings at the margin do not vary with dividend taxes. The agency model still offers some guidance to infer the mode of financing based on behavioral responses of the firm. Key to the identification is the observation that equity-based incentive pay \( \alpha \) and dividend tax factor \( 1 - \tau^D \) exert the same impact on investment financed out of retained earnings, while they differentially affect investments financed out of new share issues.

More precisely, from (7) and (8), it is the term \( \alpha(1 - \tau^D) \) which summarizes the effect of the sharing parameter and the dividend tax on investment and effort choices when retained earnings are sufficient to finance investment outlays. Intuitively, the incentive contract and the dividend tax depend on the same set of variables, which includes the equity costs of investment and the profit net of corporation tax. With new share issues, the equity costs of investment are excluded from the dividend tax base, but the incentive contract still depends on these costs, c.f. (7) and (17). It follows that investments respond more strongly to tax changes than to changes in the sharing parameter. Hence, using superscripts \( re \) and \( nsi \) for retained earnings and new share issues as the marginal source of finance, we find

\[
\frac{\partial I^{re}}{\partial \alpha} = \frac{\partial I^{re}}{\partial (1 - \tau^D)} \quad \text{and} \quad \frac{\partial I^{nsi}}{\partial \alpha} < \frac{\partial I^{nsi}}{\partial (1 - \tau^D)}.
\]

(18)

We should note that the suggested identification in (18) does not only apply to an effort-
based agency model, which is used here, but also to free cash flow models (Jensen, 1986).\textsuperscript{18} In free cash flow models, the sharing parameter applies to all corporate distributions. Differently, the dividend tax is based on all distributions when retained earnings are used at the margin, but excludes the costs of investment when new share issues are used, as in the effort-based model at hand.

4.3 Taxation of equity-based incentive wages

Tax policy discussions frequently center on the issue of whether equity-based managerial wages should be taxed differently than general wage income. The proposed rationale is that equity-based wages might well influence managerial behavior in socially (un)desirable ways and a special tax at least partially corrects for this (see Benabou and Tirole, 2014; Murphy, 1999, and Piketty et al, 2014, for instance). Equity-based incentive wage income of the manager is taxed at the personal income tax rate $\tau$. The net of tax income of the manager is

$$w = (1 - \tau)\alpha V + \frac{a}{1+r}.$$  

Expected utility of the manager is

$$E(U) = (1 - \tau)\alpha E(V) + \frac{a}{1+r} - \rho \left( \alpha \frac{(1 - \tau)(1 - \tau^D)(1 - \tau)}{1+r} \right)^2 \sigma^2 - \frac{\phi(e)}{1+r}, \quad \rho > 0. \quad (19)$$

From (19), we can conclude that the two taxes $\tau$ and $\tau^D$ are equivalent in terms of their impact on the manager’s choice of investment and effort, conditional on $\alpha$. At the beginning of the first period, shareholders choose the incentive contract and the manager accepts the incentive contract and works for the firm provided the participation constraint $E(U) = 0$ holds. Inserting $E(U) = 0$ into external shareholder wealth $(1 - \alpha)E(V)$, while noting (19), yields

$$(1 - \alpha)E(V) = E(V) + \frac{1}{1 - \tau} \left( \frac{a}{1+r} - \rho \left( \alpha \frac{(1 - \tau)(1 - \tau^D)(1 - \tau)}{1+r} \right)^2 \sigma^2 - \frac{\phi(e)}{1+r} \right). \quad (20)$$

Maximizing (20) w.r.t. the sharing parameter $\alpha$, while applying the envelope theorem, the first-order condition is

$$(1 - \alpha)(1 - \tau)\frac{d}{d\alpha}. \quad (21)$$

\textsuperscript{18}In these models, shareholders and managers disagree on the amount of cash flow that is distributed to shareholders. Empire-building managers have a preference for keeping cash flow in the firm which allows firms’ managers to finance projects earning low returns which therefore might not be funded by shareholders or equity markets. See Tirole (2006) for a formal treatment of free cash flow models and Kannaiainen (1999), Chetty and Saez (2010) and Koethenbuerger and Stimmelmayr (2014) for an analysis of tax policy in this type of corporate agency models.

\textsuperscript{19}We should note that $V$ now measures the net-of-tax value of dividend streams that accrue to shareholders before taxation at rate $\tau$ at the manager level.
where $1 - \tilde{\tau} = (1 - \tau^D)(1 - \tau^E)(1 - \tau)$. Shareholders perceive the dividend tax $\tau^D$ and personal income tax $\tau^E$ as equivalent tax instruments. This might be surprising since the personal income tax only applies to the manager. However, shareholders become residual claimants and residually receive all utility gains above the reservation utility. Effectively, the personal income tax effectively becomes a tax on shareholder wealth and is equivalent to the dividend tax $\tau^D$ in its effect on the sharing parameter in the incentive contract. Combining the insight with the previous conditional equivalence results, which applies to the tax effect on investments and effort for a given value of $\alpha$, the two taxes become equivalent in terms of their implications for manager and shareholder behavior and thus also in terms of their effects on welfare. The model thus predicts that a special tax on the equity-based wage of the manager is redundant and the same efficiency effects can be achieved through the general dividend tax $\tau^D$.

5 Discussion

A considerable body of literature has emerged over the years which attempts to evaluate the validity of the old view and new view of dividend taxation. Depending on data availability and methods used, the analyses either try to determine the marginal source of finance and then, using the diverging predictions of the two views, to infer the efficiency effects of dividend taxation, or to empirically test the implications of dividend taxes for corporate payout and investment behavior and to infer the marginal source of funds from there. See Auerbach (2002) for an overview. The two methods are differently informative as to the efficiency effects of dividend taxation for the agency model at hand. For instance, knowing the marginal source of funds is informative in itself, but is not sufficient to draw conclusions about dividend-tax neutrality. When investments are financed out of retained earnings, dividend taxation also changes investment incentives. In fact, investments might be unresponsive to dividend taxation with new share issues at the margin (provided $f_{Ie} > 0$), while they affect new investments that are financed by retained earnings. Conversely, empirical estimates of dividend tax effects

\footnote{Precisely, the private welfare term in (13) needs to be corrected for tax payments $\tau^E\alpha V$ which are now included in the tax revenue term. Given that the behavioral responses are the same, the two taxes exert the same efficiency effects.}

\footnote{For instance, Auerbach and Hasset (2002) look at the sensitivity of dividend payments to investments to identify the source of funds for investments. Poterba and Summers (1985) estimates investment equations based on Tobin’s q-theory of investment which includes the new and old view as special cases. Poterba (2004) looks at corporate payout policies to disentangle the empirical relevance of the two views and Chetty and Saez (2004) analyzes how dividend payments change with dividend taxes.}
on investments cannot be straightforwadly connected to a financing regime. However, as shown above, the agency model provides auxiliary predictions which allow to infer the financing regime based on empirically observed investment behavior. With retained earnings as the marignal source of funds, investment responses to dividend taxes and to the sensitivity of managerial wages to firm performance (α in our model) are identical, while the two responses differ with new share issues, c.f. (18). The suggested method for the identification of financing regimes is new and, by its very nature, is not available in neoclassical models of firm behavior. As explained above, it has broader appeal than suggested by the agency model in this paper. It also applies to free-cash flow models (Jensen, 1986) and to models of managerial overconfidence (Malmendier and Tate, 2005), two further leading classes of corporate agency models.

Interestingly, the agency model and the neoclassical model of firm behavior generate identical qualitative implications for the differential investment responses. In both models, the difference \( I^{re} - I^{nsi} \) is increasing in the dividend tax. Some empirical analyses use such relative responses as the outcome variable. For instance, Becker et al. (2010) divide the firm sample into firms that are likely to use new share issues or retained earnings to finance new investments (proxied by the access to equity markets) and relate the tax-related investment response of the two groups of firms to each other. They find that the empirically observed relative investment changes are consistent with the old and new view of dividend taxation. Against the background of this paper, their finding can be interpreted more broadly since it also carries over to agency models of firm behavior. Unfortunately, the differential response is generally not sufficient to calculate the efficiency costs of dividend taxation in agency models. It requires knowledge of investment responses under each of the two financing regimes. The information can be inferred from the relative investment response in the neoclassical model of firm behavior22, but less so in agency models. Finally, in an environment in which firms are pre-clustered in groups according to their presumed marginal source of funds (as in Becker et al., 2010, for instance), the auxiliary prediction suggested in this paper might be useful to verify consistency of the pre-assignment of firms with the essence of a large class of corporate agency models.

Using the 2003 US dividend tax cut as a policy experiment, Yagan (2014) finds no sginifcant tax effect on investment of firms that are subject to dividend taxation. As discussed in the paper, the finding might be related to different firm responses to the 2003 US dividend tax cut

22This follows from the dividend-tax neutrality under the new view of dividend taxation. Under this view, changes in the investment difference \( I^{re} - I^{nsi} \) are exclusively related to changes in \( I^{nsi} \).
which reflect inefficiencies due to corporate agency problems, but might have offset each other in aggregate. In particular, firms might use different sources of finance which give rise to counteracting investment responses to dividend taxes. This model provides a different mechanism which is consistent with the empirical finding. Heterogeneity of firm responses which is due to heterogeneity in the sign and magnitude of $f_{le}$ might generate investment response which are distributed with zero mean and thus might well neutralize in the aggregate. The heterogeneity in response might not only be related to firms which resort to different sources of finance at the margin but also to firms that use the same source of investment finance.

6 Conclusion

Traditional efficiency analysis of dividend taxes in public finance is not firmly connected to corporate agency theory. The paper analyzes the efficiency costs of dividend taxation in an effort-based corporate agency model in which non-verifiable managerial effort enhances taxable profits. We show that, unlike in traditional efficiency analysis, the source of investment finance and the sensitivity of investment to dividend taxes are not uniquely linked. Investment might be downward distorted when retained earnings or new equity issue finance investments at the margin. We provide a testable implication to infer the mode of investment finance from the investment sensitivity to dividend taxes. Also, we show that the efficiency effects depend on the investment and effort responses in general. However, in the case of an ACE system or R-based cash flow system dividend, however, taxes do not impair efficiency based on the tax-induced investment response. Finally, we show that imposing an income tax on managerial incentive pay is equivalent to a general dividend tax, both in terms of induced firm responses and their efficiency implications.
References


