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THEMED PAPER

Dividend taxation and the pricing of UK equities

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Abstract

Purpose – The purpose of this paper is to investigate the extent to which UK equity prices reflect shareholder level taxation on dividends (dividend tax capitalisation). Despite an extensive theoretical and empirical literature controversy exists.

Design/methodology/approach – Using a sample of UK firm year ends from 1991 to 2007 archival accounting and share price data are used to test for the presence or otherwise of dividend tax capitalisation.

Findings – The paper finds evidence of equity values reflecting shareholder level dividend taxation. In particular, a significant reduction in the valuation of retained earnings, a measure of dividend paying potential, is observed around the July 1997 abolition of the repayment of dividend tax credits to tax exempt shareholders. This suggests a link between shareholder level taxation of dividends and firms' cost of capital.

Research limitations/implications – The analysis focuses on share prices and is therefore subject to an underlying assumption of shareholders' understanding tax and other potential relevant information.

Practical implications – The taxation of dividends is an important issue because of the potential for it to influence firms' cost of capital and therefore investment decisions. Further, non-tax costs may be incurred to the extent that attempts are made to mitigate any "adverse" tax effects.

Social implications – The results indicate that taxation of dividends and share prices are associated and therefore also indirectly firms' cost of capital. This linkage has implications for investment appraisal and the allocation of capital between competing demands.

Originality/value – In using an asset valuation approach the limitations of alternate methods of examining shareholder level taxation of dividends are avoided, e.g. analysis of dividend drop of ratios.

Keywords Taxation, Dividends, Accounting valuation model, Tax capitalization

Paper type Research paper

1. Introduction

Despite extensive study controversy remains as to the nature of the influence of dividend taxation on share prices (Shackelford and Shevlin, 2001). The topic is important because of the potential for dividend tax policy to directly influence firms' cost of capital and in turn investment decisions (Zodrow, 1991). If dividends are effectively taxed at a higher rate relative to capital gains as is most commonly the case, then shareholders' required rate of return could increase with dividend yield. The extent to which dividend taxation is reflected in share prices can act as a constraint on tax policy or rate changes because they could give rise to windfall gains

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and losses (Poterba and Summers, 1985). Further, non-tax costs may be incurred to the extent that firms' and/or shareholders attempt to mitigate any "adverse" tax effects.

There are three competing theoretical views as to the nature of the relation between levels of dividend tax and share prices: the "traditional view", the "irrelevancy view" and the "new view", also referred to as "tax capitalisation" or "trapped equity" (Shackelford and Shevlin, 2001). Under the "traditional view", firms pay dividends despite the tax penalty incurred when the taxation of dividends is higher than the taxation of capital gains because of non-tax benefits of paying dividends. Such benefits derive from agency and signalling considerations (Poterba and Summers, 1985). Agency costs are expected to fall with the payment of dividends because they reduce the amount of assets under managers' control. Managers can signal their superior information about future expected cashflows to investors via the level of dividend payments. Under the traditional view, changes in the level of dividend taxation would give rise to an adjustment to the level of dividends paid as their cost relative to their benefits alters.

The traditional view assumes that a firm's marginal investment is financed by a combination of new equity issues and retained earnings (RE). Through changes in the level of dividend taxation, a firm's tax adjusted user cost of capital would vary thereby influencing its investment levels (Poterba and Summers, 1985). Under the traditional view dividend taxes are capitalised into equity prices. However, prices would only respond to changes in dividend taxation if compensating changes in the level of dividends did not restore the tradeoff between tax costs of dividends and their non-tax benefits, i.e. agency and signalling, to a new equilibrium.

Under the "tax irrelevance" view, the price setting or marginal investor is tax exempt, or a taxable investor who can offset incremental taxes and would therefore be immune to dividend tax considerations. A change to dividend taxation would have no effect on share prices, dividend policy or firm investment levels.

The "new view" assumes firms fund their marginal investment through RE which are "trapped" in the firm because of the tax penalty of distributions over retentions. Therefore to the extent a firm delays distributing profits in the form of dividends, the associated dividend taxation is also deferred. The expected value of this future tax liability is reflected in the value of the share, i.e., as the firm is valued on an after tax basis the deferred liability is capitalised in the share price. As a consequence, changes in dividend taxation would affect the expected value of the future liability arising on eventual distribution and therefore lead to a change in the value of the firm. In contrast to the traditional view there is not the potential for an offsetting agency or signalling adjustment.

The "new view" can be challenged on its assumption that firms' earnings can only be distributed to investors in the form of dividends thereby dividend taxation cannot be avoided (Zodrow, 1991). However, although in practice firms can avoid paying dividends by the use of share repurchases, in the UK repurchases were treated as equivalent to dividends in giving rise to a potentially repayable tax credit[1]. Though it was possible to structure repurchases to avoid being treated as a dividend, with the aim of avoiding a liability to Advance Corporation Tax, Oswald and Young (2004) and Ferris *et al.* (2006) conclude that share repurchase activity in the UK is not dominated by tax considerations. Therefore although the distinction between dividend and repurchases is unlikely to be relevant with respect to the valuation of the repayable tax credit, in subsequent empirical analysis we control for repurchases to capture any significant non-tax valuation effects, e.g. signaling.

As agency costs, signalling effects and the identity and tax status of price setting investors are all unobservable, the question of the relation between dividend taxation and share prices is an empirical one. This paper uses the 1 July 1997 abolition of the repayment of dividend tax credits to UK pension funds and UK insurance company tax exempt pension businesses (hereafter collectively referred to as "pension funds") to empirically test the relation. Prior to the abolition these shareholders were subject to a negative tax on the receipt of dividends. If dividend taxes are capitalised into share prices, dividends paid after 1 July 1997 would be worth less to the pension fund shareholders because of the absence of the tax credit or negative tax rate and therefore the value of equity should fall if these funds are the marginal or price setting shareholders (Bell and Jenkinson, 2002).

This paper uses an accounting valuation model approach to test a hypothesis derived from the "new" or tax capitalisation view of dividend taxation. The advantage of this approach is that it circumvents some of the limitations associated with earlier methods, e.g. the effect of short-term dividend capture trading on the interpretation of dividend drop off ratios (DORs) (Kalay, 1982, 1984) and the potential for any capitalisation of dividend tax to affect the relation between share prices and dividend yields (Gentry *et al.*, 2003).

Using a sample of UK firm year ends over the period 1991-2007 this paper reports evidence of equity values reflecting dividend taxation or dividend tax capitalisation. Specifically, RE, which represent the ability of a firm to legally pay dividends, are valued more highly prior to repayment abolition than afterwards in a manner which suggests equity value is influenced by the ability of pension fund shareholders to obtain repayment of the tax credit. This finding is consistent with the "new" or tax capitalisation view of dividend taxation. This result is consistent with Bell and Jenkinson (2002) and Hodgkinson *et al.* (2006), though, in the interpretation of the results, conflicts with Bond *et al.* (2007). However, the paper's results are partially sensitive to research design which is a common feature with the use of financial statement data in this area (Dhaliwal *et al.*, 2003a; Rees and Valentincic, 2013) and more widely in market-based accounting research.

The remainder of the paper consists of seven further sections as follows: Section 2, relevant UK tax considerations; Section 3, previous literature; Section 4, hypothesis development; Section 5, research method; Section 6, data; Section 7, results; and Section 8, conclusion.

2. Relevant UK tax considerations

Following the introduction of an imputation system in 1973 UK shareholders receiving a dividend were entitled to an associated tax credit calculated by reference to the basic rate of income tax. For example, if a shareholder received a cash (net) dividend of £1, a tax credit of 20 per cent of the gross dividend (net dividend plus tax credit) was paid to the shareholder. For individual shareholders the credit satisfied or partially satisfied their income tax liability. Tax exempt shareholders, e.g. pension funds and insurance companies with respect to their pension business were entitled to a refund of the tax credit.

After 1 July 1997 the repayment of the credits to UK pension funds was abolished. Based on the then current income tax rates a net £1 dividend paid prior to 2 July 1997 would be worth £1.25 compared to only £1 for post 1 July paid dividends. Non-UK resident taxpayers were not normally entitled to the credit repayment. However under the terms of the appropriate Double Tax Treaty (DTT), repayment could have only

occurred when the non-UK resident investor held at least 10 per cent of the voting control of the UK resident dividend paying company. Hence repayment was restricted to a relatively small, in terms of capital available for investment, investor group. Bond *et al.* (2007) argue that this group relative to non-UK investors would be too small for their preferences to influence share prices. Hence the value of the repayment should not be reflected in share prices, though Bond *et al.* (2007) admit they cannot offer an alternative explanation for the results they observe, which are consistent with tax capitalisation driven by the repayment of dividend tax credits.

3. Previous literature

The lack of consensus on the relation between dividend taxation and share prices on a theoretical level is mirrored by a variety of research methods being adopted. These include ex-dividend price changes, i.e. DORs. Recent examples in the UK of DOR studies include Bell and Jenkinson (2002), Hodgkinson *et al.* (2006) and Bond *et al.* (2007). Other methods include analysis of dividend yields (Morgan and Thomas, 1998) and more recently in the US literature, accounting-based valuation models have been used directly to examine the influence of taxation on equity valuation, e.g. Harris and Kemsley (1999) and Harris *et al.* (2001). Another stream of literature involves direct tests of the implications of the "traditional view" and the "new view" by examining dividend payouts and the level of investment in response to changes (Poterba and Summers, 1985).

The majority of studies have attempted to isolate dividend tax effects by investigating ex-dividend day price reactions. Such studies rely on the administrative arrangement whereby immediately after a share is priced on an ex-dividend basis purchasers are not entitled to the forthcoming dividend they would have received had they earlier purchased the share on a cum-dividend basis. Thus the price of a share should drop when its basis of pricing changes from cum-dividend to ex-dividend. Elton and Gruber (1970) showed that if shareholder level taxes are capitalised then the fall in share price should reflect the after tax value of the dividend and if dividends are taxed more heavily than capital gains, the fall in share price should be less than the dividend. Poterba and Summers (1984) in a study of three different dividend tax regimes in the UK during the period 1955-1981 report evidence consistent with investor level taxation influencing the relative valuation by investors of dividends and thereby the level of ex-ante returns demanded by investors.

In response to the abolition of the repayment of the tax credit in 1997 Bell and Jenkinson (2002) examined DORs around July 1997. They concluded that prior to 2 July 1997 tax exempt investors were the price setting or marginal investor. In an extension, Hodgkinson *et al.* (2006) studied a provision of the UK – Republic of Ireland (ROI) DTT which allowed tax credit repayment post-July 1997 for a narrowly defined group of ROI resident companies which were listed on the London stock exchange. Both these studies support the new view that dividend tax, in this case the repayable credit, is reflected in share prices. Hodgkinson *et al.* (2006) also demonstrate that the extent, to which tax-exempt shareholders would alter their portfolio decisions by, for example, forming dividend clienteles, was dependent on the relative magnitude of the dividend to the share price. Hence they related the potential tax credit against the associated non-tax costs.

Bond *et al.* (2007) challenged the conclusion of Bell and Jenkinson (2002) of there being a single investor class whose tax status would determine the extent of any tax capitalisation. Using a tax-adjusted CAPM in which different investors may face

different tax rates on dividend income, Bond *et al.* (2007) showed that any effect of dividend taxation on share prices would depend on a weighted average of tax rates across all investor groups. Although different investor groups may have varying tax rates, non-tax costs, e.g. reduced liquidity and diversification would result in an equalisation of after tax rates of return. With respect to repayment abolition Bond *et al.* (2007) conclude that because of the small size of the UK pension fund investors relative to all potential investors in UK equities, the change would be too small to influence the determination of the average tax rate. By implication, if the UK tax-exempt sector was a significant investor group with respect to UK equities, the price of such equities would fall only if the effect of the resulting increase in the average investor tax rate was greater than any reduction in non-tax costs following a portfolio rebalancing.

Bond *et al.* (2007) replicate Bell and Jenkinson (2002) by comparing a 30-month-period before and after repayment abolition with similar results; they find a significant fall in the mean DOR after abolition (particularly for larger firms). Bond *et al.* (2007) also replicate the sub-samples divided by dividend yields produced by Bell and Jenkinson (2002) and again confirm Bell and Jenkinson's (2002) findings that the mean DOR fell significantly after abolition when comparing observations with high dividend yields (although those in the top quintile did not have the largest or most significant drop). Bond *et al.* (2007) extend this analysis by studying sub-samples based on average dividend yields in the pre-abolition period only. The results from these sub-samples show that their results in the initial dividend yield tests and the ones put forward by Bell and Jenkinson (2002) are sensitive to the sub-samples chosen. Bond *et al.* (2007) extend the DOR analysis to examine the timing of the apparent fall in share prices by making annual estimates. These estimates suggest that the mean DOR did not fall significantly until 1999. Overall Bond *et al.* (2007) note that there were substantial fluctuations in the mean DORs, which they suggest may be more to do with stock market dynamics rather than specific tax changes.

The presence of non-tax factors has led to questioning of tax-based explanations of DORs. Kalay (1982, 1984) argued that predictable clientele trading behaviour surrounding ex-dividend days could eliminate these observable tax effects as short-term arbitrageurs engage in transactions around the ex-dividend day. Bali and Hite (1998), Eades *et al.* (1984) and Frank and Jagannathan (1998) provide evidence that the magnitude of DORs are influenced by other microstructure effects, such as discreteness of changes in trading prices or bid-ask spreads. However, as subsequent work by Jakob and Ma (2004) and Graham *et al.* (2003) has challenged Bali and Hite (1998) the significance of the tick size effect is therefore debatable. It seems though unlikely that the tick size effect is important in the UK, since tick sizes are generally smaller (Armitage *et al.*, 2006). To circumvent some of these difficulties, Armitage *et al.* (2006) adopted an alternative approach to examining DORs by estimating the value of dividends from the prices of shares that are identical except for their dividend entitlements. They conclude that comparing the traditional DOR method and their method give different results. The overall evidence indicates that market structure factors can influence DORs thereby reducing their effectiveness in examining tax effects.

An alternative to examining DORs is the examination of dividend yields. If after tax risk-adjusted rates of return are to be constant across shares then by implication pre-tax risk-adjusted rates of return should be increasing in dividend yield as marginal rates of dividend taxation are generally higher than marginal rates on capital gains (Brennan, 1970). Though some empirical studies find supporting evidence of a relation

between ex post-returns and dividend yield (Litzenberger and Ramaswamy, 1979; Rosenberg and Marathe, 1975) other studies find no relation or one that can be explained by other factors such as risk, e.g. Black and Scholes (1974), Gordon and Bradford (1980), Keim (1982), Miller and Scholes (1982), Chen *et al.* (1990)[2]. In the UK Morgan and Thomas (1998) find that although a positive relation holds between returns and dividends, it is present irrespective of whether dividends are taxed at a higher or lower rate relative to capital gains. However, if dividend level taxation is capitalised in equity prices then no relation should exist between dividend yield and returns as there is no incremental tax penalty (Gentry *et al.*, 2003).

A recent approach designed to overcome the limitations of extant methods is the use of accounting-based valuation models. Their use in this setting was introduced by Harris and Kemsley (1999). The valuation approach does not require observation of a dividend, nor assumptions regarding clientele-based trading patterns around ex-dividend days and it is not materially influenced by discreteness in trading prices (Harris and Kemsley, 1999). Harris and Kemsley (1999) motivate the development of their model by reference to Ohlson (1995). Ohlson demonstrates that given certain assumptions, firm value can be modelled by the book value (BV) of equity and expected future abnormal earnings[3]. The contribution of Harris and Kemsley (1999) is to recognise that shareholder equity or net BV, is funded by two sources of capital, "contributed capital" (CC) and RE each with potentially different tax treatments in the event of repayment to shareholders. RE would potentially be subject to income tax when paid out as dividends whereas the repayment of issued share capital, a major component of CC would be tax-free to the extent that no capital gain arises. The presence of a dividend tax effect can be examined by regressing firm equity market value on CC and RE and testing for predicted differences in the relative magnitudes of the CC and RE regression coefficients. If the coefficients on CC and RE are identical then that suggests no dividend tax effects in the pricing of the firms' equity[4].

Harris and Kemsley (1999) concluded that investors reduce their valuations of RE for dividend taxes. While the presence of dividend tax capitalisation was accepted, a "controversial" finding was that the extent of the capitalisation was independent of the expected timing of the dividend payments, i.e. "timing irrelevancy" (Shackelford and Shevlin, 2001). A number of papers have refined the empirical model used by Harris and Kemsley (1999) to test this specific finding, i.e. the level of tax capitalisation is independent of expectations of the timing of future dividends. Dhaliwal *et al.* (2003a) argued for the need to include control variables for agency costs, information asymmetries and share repurchases. Because the Ohlson (1995) model relies on the perfect market conditions of Modigliani and Miller (1961) and the assumption that earnings will eventually be distributed as dividends[5]' [6]. Dhaliwal *et al.* (2003a) argue that they demonstrate that the initial model by Harris and Kemsley (1999) is flawed because the timing irrelevancy finding does not hold across tax regimes or in response to minor changes in empirical specification. Hanlon *et al.* (2003) replicate Harris and Kemsley's (1999) study and obtained inconsistent results with respect to the timing irrelevancy finding which they attributed to omitted variables in a similar manner to Dhaliwal *et al.* (2003a).

A series of further papers were published including Harris *et al.* (2001), Gentry *et al.* (2003) and Kemsley (2001a, b) which included control variables for the omitted variables disused above. Harris *et al.* (2001) based a second study on the model established in Harris and Kemsley (1999) to directly test the relationship between

dividend taxes and the valuation of CC and RE, repeating the basic test in several different tax regimes to strengthen their research design. Control variables were used to capture the possibility that dividend payments were a signal of future economic profits or were correlated in any other ways with risk or expected future growth in profitability and the and control for size of a firm. The principal finding was that accumulated RE are valued less per unit than CC, consistent with capitalisation of future "dividend taxes" in RE and this result was robust to the inclusion of a variety of control variables and tests for possible alternative explanations. The results supported the hypothesis that at least a substantial portion of the dividend taxation is capitalised in equity values though the conclusion that its magnitude is independent of dividend policy, i.e. timing of dividend payments is still disputed[7]. The overall conclusion is although there is agreement that dividend tax is capitalised into share prices, the extent is questioned.

Two UK-based accounting valuation model papers by Rees (1997) and Rees and Valentincic (2013) focused on equity valuation with respect to dividends but did consider taxation and current year RE. Rees (1997) found that earnings distributed as dividends had a greater impact on firm value than current year earnings retained within the firm. Although the paper focused on the signalling effect of dividends, an alternative, tax-based explanation of this finding was offered in the form of a tax advantage of dividends relative to current year RE[8]. More recently Rees and Valentincic (2013) again examined the valuation role of dividends but were unable to confirm any influence for taxation as their results were not robust to alternative methods of analysis.

In order to distinguish between the "traditional" and "new view", Poterba and Summers (1985) examined the potential consequences of the views in terms of dividend taxation, dividend payout and levels of investment. Their conclusion in support of the "traditional view" at the expense of the "new view" has been challenged by Sinn (1991) on the basis that the sample composition favoured immature firms which would have favoured new issues to finance investment because of insufficient RE given their relative immaturity.

4. Hypothesis development

An accounting valuation model is used to test for potential tax capitalisation by examining whether equity values reflect the credit repayable to pension fund shareholders if RE are paid out as dividends. Specifically, we test for taxation effects of dividend taxation on equity value with the following hypothesis, stated in its alternate form. If the repayment of the dividend tax credit was capitalised in share prices prior to 2 July 1997, then prior to abolition of the repayment a unit of RE would be valued more highly than subsequently. More formally the hypothesis stated in its alternate form is as follows:

H1. Ceteris paribus, the valuation of a unit of RE prior to 2 July 1997 is higher than its subsequent value.

A rejection of the hypothesis would be consistent either with the absence of tax capitalisation as under the irrelevancy view, a compensating adjustment to signalling and agency costs as predicted by the "traditional view" or the marginal or price setting investors not being UK pension funds[9].

5. Research method

A standard accounting valuation model where equity value is a function of income available to equity holders (NI) and BV is adapted by the inclusion of various control variables as discussed below (O'Hanlon and Taylor, 2007). Crucially, because the repayment of the tax credit occurred only on the payment of dividends out of RE, following Harris and Kemsley (1999) BV of equity is disaggregated into RE[10] and CC. To mitigate potential scale effects the non-ratio variables are deflated by opening BV (O'Hanlon and Taylor, 2007)[11].

The model is formally defined as follows for company i at balance sheet t:

$$\frac{MVE_{i,t+6m}}{BV_{i,t-1}} = \alpha + \beta_1 \frac{NI_{i,t}}{BV_{i,t-1}} + \beta_2 \frac{CC_{i,t}}{BV_{i,t-1}} + \beta_3 \frac{RE_{i,t}}{BV_{i,t-1}} + \beta_4 \frac{RE \times POST97_{i,t}}{BV_{i,t-1}} + \beta_5 \frac{SCF_{i,t}}{BV_{i,t-1}} + \beta_6 \frac{INV_{i,t}}{BV_{i,t-1}} + \beta_7 DE_{i,t} + \beta_8 INDEX_{i,t} + \varepsilon_{i,t}$$

Variable definitions and data sources are summarised in Table I.

The slope dummy variable RE × POST97 captures any change in the valuation of RE following repayment abolition post 1 July 1997. Prior to 2 July 1997 it takes a value of zero and subsequently it measures firms' level of RE. Consistent with *H1* we expect the variable's coefficient: $\beta_4 < 0$[12].

A number of control variables are necessary to overcome omitted variable bias (Dhaliwal *et al.*, 2003a; Hanlon *et al.*, 2003)[13]. The variable measuring shareholder cash flows (SCF) controls for two factors in a setting characterised by information asymmetry between managers and shareholders. First, it controls for signalling and agency cost concerns. The level of dividend can be used by managers to signal underlying equity value (Lintner, 1956; John and Williams, 1985 and Miller and Rock, 1985). Dividends can also be used as a means of reducing agency costs (Rozeff, 1982; Easterbrook, 1984; DeAngelo *et al.*, 2004). Second, it is argued that there are cheaper mechanisms, in terms of taxation, than dividends to distribute RE to shareholders. The inclusion of share repurchases in the variable SCF controls for this option (Dhaliwal *et al.*, 2003a)[14].

McConnell and Muscarella (1985) and Rees (1997) argue that there is a potential signalling effect for capital expenditure (INV) disclosures. Higher levels of expenditure can be interpreted as managers' indicating more favourable information in terms of firms' future prospects.

The debt-equity (DE) ratio controls for capital structure related signalling and agency cost influences (Rees, 1997). Jensen (1986) proposes that managers with free cash flow may waste it by investing in negative NPV projects or spending on themselves rather than distributing to shareholders. Debt can reduce these potential costs, because the higher the level of debt within a firm and therefore, higher interest and capital repayments, the less free cash flow available. This suggests that there is an inverse association between the amount of a firm's debt and its agency costs. The relative level of debt capital in a firm's capital structure can also act as a signal to equity investors (Leland and Pyle, 1977; Ross, 1977). Managers may use debt to signal their private information by taking on increasing levels of debt. Higher future interest payments will be interpreted by outsiders as signalling managers' optimism on the

Variable	Description
MVE	Market value of equity measured six months after year end (MV)
BV	Book value of equity (WC03501 "represents common shareholders' investment in a company. It includes but is not restricted to: Common stock value, Retained earnings, Capital surplus")
NI	Net income after tax attributable to ordinary shareholders (WC01706 "represents the net income after preferred dividends")
RE	Retained earnings (WC03495 "represents the accumulated after tax earnings of the company which have not been distributed as dividends to shareholders or allocated to a reserve account") + (WC03492 "represents a reserve created by the revaluation of assets")
CC	Contributed capital = BV less RE
RE × POST97	Where POST97 = coded 1(0) if MVE falls after (before) 1 July 1997
SCF	Shareholder cash flows = proceeds from issue of shares (WC04251 "represents the amount a company received from the sale of common and/or preferred stock. It includes amounts received from the conversion of debentures or preferred stock into common stock, exchange of common stock for debentures, sale of treasury shares, shares issued for acquisitions and proceeds from stock options") – payments on repurchased shares (WC04751 "represents funds used to decrease the outstanding shares of common and/or preferred stock") – payment of dividends (WC05376 "represents the total cash common dividends paid on the company's common stock during the fiscal year, including extra and special dividends")
INV	Cash flow on capital expenditure = additions to fixed assets (WC04601 "represents the funds used to acquire fixed assets other than those associated with acquisitions") + additions to other assets (WC04651 "represents the amount used to increase all other assets except fixed assets and net assets from acquisitions")
DE	Debt/equity = the sum of long-term debt (WC03251 "represents all interest bearing financial obligations, excluding amounts due within one year") and preferred stock (WC03451 "represents a claim prior to the common shareholders on the earnings of a company and on the assets in the event of liquidation") divided by book value of equity (WC03501) as described above
INDEX	FT-SE All Share Index (FTALLSH)

Notes: Bracketed codes and definitions refer to Thomson Reuters Worldscope data items. With the exception of the scaled variables (DE and INDEX) in the empirical estimations all of the above variables are scaled in turn by book value, sales and number of shares

Table I.
Variable definitions

level of future expected cash flows. Though debt signalling theory is well developed, it is not as well supported by empirical evidence as the signalling role for dividends or capital expenditure (Rees, 1997). This could follow from a counter argument, where high levels of debt could result in a reduction of equity firm value if it results in increased earnings variability and increased risk of bankruptcy (Baxter, 1967).

To control for temporal valuation effects, valuation models are usually estimated with the inclusion of time dummies (O'Hanlon and Taylor, 2007). Although such a control is necessary in this setting to avoid potentially observing a non-tax induced post-1997 effect, the use of time dummies is inappropriate because of the inclusion of the time related slope dummy variable RE × POST97. Instead, to control for potential temporal effects, the FT-SE All Share Index (INDEX) is used to capture market wide valuation effects as a proxy of wider macro-related changes.

Though a range of control variables are included in the model on the basis of previous literature, it is possible that uncontrolled firm specific differences exist. To control for this possibility the model is estimated employing fixed effects panel estimation (Brooks, 2002). This assumes that the effect of any firm specific factors is constant over the whole sample period.

5.1 Estimation

In determining the appropriate estimator a series of diagnostic tests were performed on a standard OLS estimation of the model. These indicated the presence of significant autocorrelation and heteroscedasticity[15][16]. Further tests showed significant within panel autocorrelation and rendered the use of remedies such as Huber (2004) or Newey and West (1987) "robust" standard errors for autocorrelation and heteroscedasticity as inappropriate (Pesaran, 2004; Baum, 2006). Under these circumstances Driscoll and Kraay (1998) "robust" standard errors were employed which control for autocorrelation and heteroscedasticity in the presence of within panel autocorrelation (Baum, 2006; Hoechle, 2007). This estimator was used on the full sample and in subsequent discussion it is referred to as OLS(Full)

To assess the potential impact of outliers and influential observations two further sets of estimations were performed in conjunction with each other. First, a robust (Huber, 2004) iteratively reweighted least squares was performed[17]. In subsequent discussion this estimator is referred to as (Robust). Although these coefficient estimates are robust to influential and outlier observations, the standard errors are not immune from the detected autocorrelation and heteroscedasticity, hence care must be exercised in their interpretation (Baum, 2006). To overcome this limitation a second set of Driscoll and Kraay (1998) robust standard error were estimated after excluding the most influential observations identified by the reported Huber (2004) estimation[18]. In subsequent discussion this estimator is referred to as OLS(Reduced).

6. Data

The sample comprises all non-financial firms included in the *Financial Times* All Share Index throughout the period 1 January 1991 – to 31 December 2007. This period is chosen to include the Finance Act 1997 abolition of repayment of dividend credits to UK pension funds and allow sufficient periods both before and after the change. In subsequently reported sensitivity tests the sample period is reduced to mitigate the potential influence of conflating events.

A survivorship requirement is imposed to avoid variations in earnings persistence from changes in the sample's industry composition and growth through the entering and leaving of new and dead firms (Hanlon *et al.*, 2003). A series of filters are employed. Firms reporting negative BVs are excluded as they are incompatible with the valuation model adopted (Harris and Kemsley, 1999) which uses BV as one of the sources of earnings. Further, firms with negative RE, despite an overall positive BV, are also excluded as the relationship between negative RE and firm market value is likely to be non-linear[19]. Firms with negative net income are also excluded as they are incompatible with the valuation model adopted where expected future income is proxied by the level of current after tax net income.

Summary descriptive statistics are displayed in Table II[20]. The number of firm year-end observations range from 176 (1992) to 206 (2006) with a mean of 194.

The sample includes a wide range of firms in terms of size. Market value of equity in 1991 ranges from: £2.13 million to £20.9 billion and in 2006 ranges from £67.57 million

Variable	*n*	Median	Mean	SD	Minimum	Maximum
MVE 1991	184	185,005.00	1,098,086.00	2,683,883.00	2,130.00	20,900,000.00
MVE 1996	197	376,160.00	1,818,240.00	4,666,390.00	3,050.00	39,600,000.00
MVE 2000	205	378,710.00	4,131,462.00	18,300,000.00	8,400.00	205,000,000.00
MVE 2006	206	697,355.00	3,930,937.00	11,200,000.00	67,570.00	112,000,000.00
RE 1991	184	56,902.00	332,486.4	800,531.80	0.00	8,047,000.00
RE 1996	197	67,400.00	407,363.3	997,990.40	0.00	9,797,000.00
RE 2000	205	110,000.00	1,210,802	7,409,070.00	0.00	96,300,000.00
RE 2006	206	120,000.00	1,393,089	6,083,569.00	0.00	52,700,000.00
CC 1991	184	26,553.50	317,160.60	1,568,983.00	−108,576.00	17,700,000.00
CC 1996	197	44,136.00	447,658.80	2,811,497.00	−155,300.00	37,200,000.00
CC 2000	205	64,500.00	710,649.8	4,123,665.00	−298,896.00	44,500,000.00
CC 2006	206	69,054.50	273,304.1	774,157.30	−3,842,400.00	4,377,000.00
NI 1991	184	13,385.50	80,977.06	217,815.20	109.00	2,080,000.00
NI 1996	197	19,707.00	146,135.10	499,596.50	51.00	5,691,000.00
NI 2000	205	27,797.00	217,568.30	871,628.20	71.00	8,409,930.00
NI 2006	206	37,400.00	391,629.80	1,636,928.00	351.00	13,700,000.00
SCF 1991	184	−3,332.50	−23,141.29	124,633.20	−837,000.00	616,700.00
SCF 1996	197	−5,669.00	−55,082.44	271,389.30	−3,204,000.00	287,000.00
SCF 2000	205	−9,394.00	−77,673.58	425,611.60	−4,073,463.00	1,816,000.00
SCF 2006	206	−14,000.00	−279,450.40	1,260,136.00	−12,300,000.00	183,600.00
INV 1991	184	14,179.00	125,788.50	402,952.20	0.00	3,793,000
INV 1996	197	17,900.00	151,908.30	595,672.20	100.00	7,039,000
INV 2000	205	22,682.00	196,394.30	665,690.80	111.00	6,636,565
INV 2006	206	23,301.00	304,349.40	1,371,430.00	0.00	12,300,000
DE 1991	184	0.18	0.28	0.32	0.00	1.70
DE 1996	197	0.21	0.28	0.33	0.00	1.99
DE 2000	205	0.30	0.42	0.56	0.00	6.05
DE 2006	206	0.37	0.69	2.08	0.00	28.67
INDEX 1991	184	1,187.7	1,208.23	57.28	1,151.28	1,307.28
INDEX 1996	197	2,107.27	2,116.66	158.54	1,848.04	2,291.97
INDEX 2000	205	2,853.56	2,858.21	181.44	2,674.89	3,261.57
INDEX 2006	206	3,235.13	3,189.46	99.56	2,983.52	3,466.52

Notes: MVE, RE, CC, NI, SCF and INV variables are displayed in £000s. The DE variable is a ratio

Table II.
Sample descriptive statistics

to £112 billion. Similarly net income in 1991 has a broad range from £109,000 to £2.08 billion and in 2006 ranges from £351,000 to £13.7 billion.

7. Results

Three sets of results based on the full sample period of 1991-2007 are reported in Table III. Based on the full sample of observations the first two sets of results represent OLS Driscoll and Kraay "robust" standard errors and Huber robust coefficient estimations, abbreviated to OLS(Full) and Robust, respectively. The third set are OLS Driscoll and Kraay "robust" standard errors estimated on a reduced sample formed by excluding the most influential observations as defined above, subsequently referred to as OLS(Reduced). The three sets of results are reported in Table III.

All three models show a reasonable fit with significant *F*-statistics. The control variables are of the predicted sign and statistically significant. The two components of BV, RE and CC are, as predicted, positive and highly significant in all three cases. *H1* is rejected with respect to the OLS(Full) though accepted in both Robust and

	OLS[a] Full sample	Robust[b] Full sample	OLS[a] Reduced sample
NI (+)	9.1652	8.7604	8.8455
	*12.03****	*63.88****	*25.37****
CC (+)	1.6775	0.6022	0.7051
	*6.98****	*8.72****	*9.01****
RE (+)	1.4412	0.6225	0.8191
	*3.77****	*7.09****	*4.34****
RE × POST97 (−)	−0.2226	−0.4474	−0.5295
	−1.21	*−7.53****	*−4.63****
SCF (+)	0.5722	0.9178	0.8563
	*1.99***	*10.93****	*5.32****
INV (+)	2.2370	0.5315	0.6390
	*4.64****	*4.23****	*2.62****
DE (±)	0.3747	0.2933	0.2652
	*4.08****	*6.70****	*6.13****
INDEX (+)	0.0003	0.0002	0.0003
	*2.78****	*7.40****	*3.03****
CON	−1.5221	−0.1261	−0.3621
	*−3.54****	*−0.58*	*−1.39*
Adjusted R^2	56.54%		65.94
F-statistic	364.70***	108.45***	741.03***
	(9, 261)	(269, 3,029)	(9, 261)
n	3,299	3,299	3,125

$$MVE_{it+6} = \beta_0 + \beta_1 NI_{it} + \beta_2 CC_{it} + \beta_3 RE_{it} + \beta_4 RE_{it} \times POST97_{it} + \beta_5 SCF_{it} + \beta_6 INV_{it} + \beta_7 DE_{it} + \beta_8 INDEX + \varepsilon_{it}$$

Table III.
Estimations based on period 1991-2007 using all sample observations and book value deflator

Notes: (±) indicate expected direction. [a]Driscoll and Kraay OLS "Robust" standard errors; [b]Huber "Robust" coefficients. *t*-statistics are reported in italics with **,*** indicating single or two-tailed significance as predicted at 2.5 and 1 per cent level, respectively

OLS(Reduced). In these latter two cases the RE × POST97 coefficient is negative and significant at the 1 per cent level, this finding is consistent with the value of the repayment being capitalised in equity prices.

In defining the initial sample period as 1991-2007 it is possible the above results arise not because of the repayment abolition but by another event(s) occurring post-1997 (Bond *et al.*, 2007). To reduce the potential of such an effect, the sample period post abolition is reduced to a single year, i.e. a reduced sample period of 1991-1998 is used. Revised summary results based on this period are reported in Table IV.

Under all three estimators OLS(Full), Robust and OLS(Reduced) the coefficient RE × POST97 is negative and statistically significant at the 1 per cent level. The conclusion drawn from this set of results on a shorter sample period is that if the negative sign of the RE × POST97 coefficient is not as a result of the repayment abolition, then it must be some other equity value-reducing event within the same period of the abolition, i.e. 1997[21].

The above estimations assume a linear relation between equity value and RE with respect to taxation. In reality, the relation may be non-linear because the repayment is conditional upon the payment of a dividend and not simply by the generation of distributable earnings. The present value of the expected credit repayment is therefore a function of the level of distributable earnings and the time scale over which they may

	OLS[a] Full sample	Robust[b] Full sample	OLS[a] Reduced sample
CC (+)	1.1688	0.7989	0.8728
	*2.99***	*6.87***	*12.10***
RE (+)	0.6849	0.5003	0.5797
	*1.68**	*4.08***	*5.44***
RE × POST97 (−)	−0.5965	−0.4189	−0.4282
	*−5.01***	*−4.73***	*−2.72***
Adjusted R^2	50.53%		71.07%
F-statistic	1,275.64***	117.81***	8,368.76***
	(9, 240)	(248, 1,087)	(9, 239)
n	1,336	1,336	1,250

$$MVE_{it+6} = \beta_0 + \beta_1 NI_{it} + \beta_2 CC_{it} + \beta_3 RE_{it} + \beta_4 RE_{it} \times \text{POST97}_{it} + \beta_5 SCF_{it} + \beta_6 INV_{it} + \beta_7 DE_{it} + \beta_8 INDEX + \varepsilon_{it}$$

Notes: (±) indicate expected direction. [a]Driscoll and Kraay OLS "Robust" standard errors; [b]Huber "Robust" coefficients. *t*-statistics are reported in italics with *,*** indicating single or two-tailed significance as predicted at 5 and 1 per cent level, respectively

Table IV. Estimations based on period 1991-1998 using all sample observations and book value deflator

be paid out as dividends (Harris and Kemsley, 1999; Bond *et al.*, 2007). Although the fixed effects specification controls *inter alia* for variation in dividend policy between firms, it assumes that such differences are constant over the sample period. In the absence of knowledge of intended dividend payout plans by firms and any variation in them over time, the sample is partitioned into dividend payout quintiles. As a proxy for dividend payout expectations these are formed with respect to the ex post-dividend payout ratio in the previous year, i.e. on an annual basis (Bond *et al.*, 2007). The results of the three estimators based on the quintiles are reported in Table V for quintiles 1 and 5 referred to as the Low and High payout firms, respectively[22].

The results in Table V are consistent with those in Table III with respect to the method of estimation. RE × POST97 is not significant for either quintile in OLS(Full) and in the case of Robust and OLS(Reduced) it is negative in all four cases though only statistically significant at the 1 per cent level for the High payout firms. A lack of significance associated with Low is consistent with the credit repayment not being reflected in the value of low payout firms in contrast with the position with the High quintiles under both Robust and OLS(Reduced)[23]. When the sample period is reduced to 1991-1998, there remains evidence of tax capitalisation with a statistically significant (1 per cent) negative RE × POST97 coefficient occurring in five of the six estimations, the one exception being the case of the High quintile under OLS(Full) where a statistically insignificant positive coefficient arises. Over this shorter period the distinction between High and Low firms is less marked with both samples reporting statistically significant RE × POST97 coefficients[24]. However, the difference between the RE × POST97 coefficients of the High and Low samples is statistically significant under both Robust and OLS(Reduced) estimators consistent with the degree of tax capitalisation being positively related to dividend payout[25]. This is consistent with the "new view" assumption that RE can only be paid out as dividends.

7.1 Sensitivity tests

The above results are based on controlling for size using BV deflated variables. A consistent finding of research in this field and in market-based research in general is

	OLS[a] Full sample		Robust[b] Full sample		OLS[a] Reduced sample	
	High	Low	High	Low	High	Low
NI (+)	7.9683	7.1570	5.3878	8.4056	5.5515	8.2138
	*12.89****	*7.79****	*17.80****	*25.80****	*12.72****	*16.81****
CC (+)	1.5395	2.1068	1.3989	1.1569	1.3911	1.0555
	*2.90****	*4.83****	*9.58****	7.55***	*6.02****	7.89***
RE (+)	1.9937	1.3090	1.3143	0.9511	1.4741	0.8655
	*3.82****	*1.75**	*6.62****	*4.20****	*6.61****	*2.88***
RE × POST97 (−)	−0.3267	0.3581	−0.8879	−0.1128	−0.9017	−0.0699
	−0.99	*1.06*	*−7.28****	*−0.66*	*−6.46****	*−0.68*
SCF (+)	0.7721	0.8355	0.2780	0.6683	0.1592	1.1127
	1.43	*2.96****	*1.41**	*3.49****	*1.25*	*4.77****
INV (+)	2.9717	2.3079	0.0943	0.6774	0.2671	0.8476
	*2.03***	*3.93****	*0.35*	*2.20***	*0.65*	*2.23****
DE (±)	0.7529	−0.0304	0.3125	0.0241	0.2991	−0.3990
	*3.56****	*−0.18*	*3.98****	*0.20*	*6.07****	*−0.29*
INDEX (+)	0.00027	0.0004	0.0003	*0.0003*	0.0003	*0.0003*
	*1.96**	2.04**	*4.96****	*2.81****	*4.60****	*4.57****
CON (±)	−1.6577	−1.6054	−0.6458	0.4141	−0.4982	−63,454
	*−2.51***	−2.21**	*−1.05*	*0.45*'	*−1.72*	−2.54**
Adjusted R^2	58.43%	56.83%			58.26%	75.48%
F-statistic	277.99***	50.36***	5,674***	40.39***	243.99***	270.49***
	(9, 175)	(9, 210)	(183, 470)	(214, 446)	(9, 175)	(9, 210)
n	654	665	654	661	600	615

$$MVE_{it+6} = \beta_0 + \beta_1 NI_{it} + \beta_2 CC_{it} + \beta_3 RE_{it} + \beta_4 RE_{it} \times \text{POST97}_{it} + \beta_5 \text{SCF}_{it} + \beta_6 INV_{it} + \beta_7 DE_{it} + \beta_8 INDEX + \varepsilon_{it}$$

Table V.
Estimations based on period 1991-2007 using High and Low quintile observations and book value deflator

Notes: (±) indicate expected direction. [a]Driscoll and Kraay OLS "robust" standard errors; [b]Huber "robust" coefficients. *t*-statistics are reported in italics with *,**,*** indicating single or two-tailed significance as predicted at 5, 2.5 and 1 per cent level, respectively

the sensitivity of results to the choice of deflator (Stark and Thomas, 1998; Akbar and Stark, 2001; Dhaliwal *et al.*, 2003a; Easton and Sommers, 2003). Therefore alternate deflators; sales and number of shares (NOSH) are used to replicate the estimations reported in Table III and IV, i.e. based on the sample periods 1991-2007 and 1991-1998, respectively.

When using the sales and NOSH deflators, the results in using the longer 1991-2007 sample period show no evidence of tax capitalisation as neither under OLS(Full), Robust nor OLS(Reduced) is a negative statistically significant RE × POST97 coefficient detected[26]. However, when estimated over the shorter period 1991-1998 results consistent with the finding in Table III occur. These are reported in summary form in Table VI. When deflated by sales, the RE × POST97 coefficient is statistically significant and negative in each of OLS(Full), Robust and OLS(Reduced) estimations (Panel A). When deflating by the NOSH (Panel B), the RE × POST97 is negative and statistically significant under the Robust and OLS(Reduced) estimations only, it is positive and insignificant under OLS(Full). In summary, the initial finding of a reduction in the valuation of RE following the credit repayment abolition is generally supported in this additional analysis although there is some sensitivity to the choice of length of sample frame when alternate deflators are used.

	OLS[a] Full sample	Robust[b] Full sample	OLS[a] Reduced sample
Panel A: sales			
CC (+)	0.6040	0.4126	0.3991
	*5.01***	*5.70***	*3.87***
RE (+)	0.1940	−0.0836	−0.0692
	*2.00***	*−1.40*	*−1.05*
RE × POST97 (−)	−0.2153	−0.2188	−0.2083
	*−4.81***	*−5.68***	*−6.25***
Adjusted R^2	30.42%		39.45%
F-statistic	11,106.19***	110.20***	204,206***
	(9, 240)	(248, 1,087)	(9, 239)
n	1,336	1,336	1,259
Panel B: number of shares			
CC (+)	1.3536	0.9050	0.9266
	*7.29***	*11.18***	*6.92***
RE (+)	0.5104	0.7928	0.7127
	*2.13***	*16.30***	*11.13***
RE × POST97 (−)	0.0504	−0.1884	−0.1645
	1.36	*7.72***	*−4.75***
Adjusted R^2	53.88%		65.10%
F-statistic	1,807.03***	130.33***	3,247.65***
	(9, 240)	(248, 1,087)	(9, 240)
n	1,336	1,336	1,244

$$MVE_{it+6} = \beta_0 + \beta_1 NI_{it} + \beta_2 CC_{it} + \beta_3 RE_{it} + \beta_4 RE_{it} \times \text{POST97}_{it} + \beta_5 SCF_{it} + \beta_6 INV_{it} + \beta_7 DE_{it} + \beta_8 INDEX + \varepsilon_{it}$$

Notes: (±) indicate expected direction. [a]Driscoll and Kraay OLS "robust" standard errors; [b]Huber "robust" coefficients. *t*-statistics are reported in italics with **,*** indicating single or two-tailed significance as predicted at 2.5 and 1 per cent level, respectively

Table VI. Estimations based on period 1991-1998 using all sample observations and sales and; number of shares deflators

8. Conclusion

This paper addresses the issue of whether dividend taxation is reflected in share prices of a sample of UK firms. The abolition of the repayment of the dividend tax credit to tax exempt pension funds in 1997 provides a natural setting given the relative size of the credit and the specific targeted nature of the change. The use of an alternate research method in the form of applying an accounting-based valuation model is this setting contributes to the extant UK literature employing DORs and dividend yields.

We find evidence of dividend tax capitalisation with a lower valuation of RE post 1 July 1997 than immediately prior, consistent with the availability of the tax credit being associated with the pricing of equity. This finding is consistent with pension fund shareholders exercising a significant influence over the setting of share prices although not necessarily as the marginal investor. Further, the degree of tax capitalisation is associated with dividend payout levels which suggests that pension funds assessed the likelihood of earnings being paid as dividends in pricing the availability of the tax credit. This is compatible with the "new", or "trapped equity" view of dividend taxation. Some caution is necessary in interpreting these results because although the BV, sales and NOSH deflated results suggest tax capitalisation, this consistency holds only over the shorter estimation period of 1991-1998. Over the longer sample period of

1991-2007 there is no evidence of the capitalisation of the repayable tax credit under the sales and NOSH deflated models, though the affect remains under the BV deflated model. In the absence of theory to justify the basis of controlling for size using a process of deflation it is prudent to use a range of possible factors.

While these results could be interpreted as supporting the "new view" over the traditional view this would imply a strict interpretation of the "traditional view". It would assume changes in signalling and agency affects can be made in the short term to offset perfectly the dividend tax changes.

Whether the "traditional" or "new views" hold or hold simultaneously for different sets of firms depending on their maturity and therefore likely sources of capital, the results can be interpreted as supporting Bell and Jenkinson (2002) attributing observed change in DORs to the abolition of the tax credit. From a tax policy perspective it follows that changes in the relative levels or method of dividend taxation can lead to changes in share prices and therefore give rise to winners and losers through wealth effects.

Notes

1. We thank a referee for drawing our attention to this point.
2. More recently US studies have examined ex ante equity returns in the context of taxation pricing effects, for example, see Dhaliwal *et al.* (2003b). However, their estimation requires the availability of analyst forecasts which given their unsystematic availability in the UK can induce sample bias (Collett, 2004).
3. In empirical applications of accounting based valuation models it is standard practice to relax Ohlson's assumption of information symmetry between managers and shareholders, for example, Rees (1997), Dhaliwal *et al.* (2003a) and O'Hanlon and Taylor (2007). A subsequent section discusses control variables in respect of potential signalling and agency-related factors arising from relaxing this assumption.
4. Alternatively, that a tax effect(s) is exactly offset by a non-tax induced wealth effect.
5. If capital can be returned to investors in a more tax efficient manner than dividends then the tax penalty may be less than anticipated.
6. This is a standard assumption underlying the "new view" and not specific to Harris and Kemsley (1999).
7. In the subsequent empirical testing we examine whether the level of observed capitalisation of dividend taxation is associated with dividend payout.
8. The exact nature of the tax advantage was not specified.
9. The relative valuation of contributed capital (CC) and retained earnings (RE) is not examined as in Harris and Kemsley (1999). Because of the composite nature of CC it is difficult to form expectations about its relative valuation.
10. RE are adjusted to include any revaluation reserve, see Table I for variable definitions. We thank a referee for this suggestion.
11. As prior results has been sensitive to the choice of deflator (Dhaliwal *et al.*, 2003a; Rees and Valentincic, 2008), sales (WC01001) and number of shares (NOSH) are used as alternative deflators in subsequently reported sensitivity tests. The process of deflating can induce spurious correlations between variables (Barraclough *et al.*, 2009). However, in this data set under all three deflators, a comparison of the correlation coefficients pre and post deflating show a general reduction in the size of the coefficients. See also footnote 15 concerning multicollinearity.

12. The use of a slope dummy is equivalent to estimating two separate regressions for the pre- and post-July 1997 periods and comparing the statistical significance of the difference between the two RE coefficients assuming that the errors have an identical solution (Maddala, 1988).

13. As discussed in the subsequent data section a survivorship requirement is designed to ensure the sample consists of mature firms to overcome Sinn's (1991) observation that sample composition can influence the interpretation of observed tax capitalisation.

14. Harris and Kemsley (1999) implicitly assume that RE will eventually be distributed as dividends (Dhaliwal *et al.*, 2003a).

15. As indicated by significant Wooldridge and Breusch-Pagan statistics, respectively, of: 61.141 (significant at 1 per cent – df 1, 240) and 2,778.00 (significant at 1 per cent – df 1) for the book value deflated model; 55.137 (significant at 1 per cent – df 1,240) and 2,540.09 (significant at 1 per cent – df 1) for the NOSH deflated model; and 73.353 significant at 1 per cent – df 1,240) and 1,841.38 (significant at 1 per cent – df 1), respectively, for the sales deflated model.

16. The data set does not exhibit serious levels of multicollinearity. A correlation matrix is available from the authors upon request and is not included in the interest of economy of space. Estimated on the full sample of 3,299 observations an analysis of variance inflation factors (VIF) and condition indices indicates that the maximum values, respectively, are of: 3.67 and 22.67 (book value deflated); 5.14 and 15.74 (sales deflated); and 3. 53 and 16.28 (NOSH deflated). All VIF and condition indices values are below their respective critical "high" values of 10 (Hair *et al.*, 2010) and 30 (Belsey *et al.*, 1980).

17. Estimated using the rreg option in Stata. This method eliminates gross outliers defined as observations with a Cook's distance measure greater than one and then using a combination of Huber and Biweight functions reduces the effect of any remaining influential observations.

18. The most influential observations are defined as all those given a zero weighting in the Huber estimation. Although the definition of "most influential" is arbitrary, using a zero weighting is the most conservative in terms of the number of observations excluded.

19. The length of time before a company with negative RE can pay a dividend will depend on the extent of the negative earnings and the level of profitability.

20. In the interest of economy, statistics for only four years are given, 1991, 1996, 2000 and 2006. A set for all years is available from the authors upon request.

21. Alternatively, that a change in the relationship between market value and RE occurred.

22. Results for quintiles 2, 3 and 4 are available from the authors upon request.

23. In Table V the RE_POST97 coefficients are significantly different from each other in both the Robust and OLS(Reduced) estimations. *H1*: -0.8879 ($\text{RE\_POST97}_{\text{High\_Robust}}$) $= -0.1128$ ($\text{RE\_POST97}_{\text{Low\_Robust}}$) $Z = -3.77$***. *H1*: -0.9017 ($\text{RE\_POST97}_{\text{High\_OLS(Reduced)}}$) $= -0.0699$ ($\text{RE\_POST97}_{\text{Low\_OLS(Reduced)}}$) $Z = -5.257$***.

24. In the interests of economy these results are not reported but are available from the authors upon request.

25. For the period 1991-1998 the RE_POST97 coefficients are significantly different from each other in both the Robust and OLS(Reduced) estimations. *H1*: -0.0005 ($\text{RE\_POST97}_{\text{High\_Robust}}$) $= 0.0002$ ($\text{RE\_POST97}_{\text{Low\_Robust)}}$) $Z = -4.48$***. *H1*: -0.0004 ($\text{RE\_POST97}_{\text{High\_OLS(Reduced)}}$) $= 0.0002$ ($\text{RE\_POST97}_{\text{Low\_OLS(Reduced)}}$) $Z = -2.213$***.

26. In the interests of economy these results are not reported but are available from the authors upon request.

References

Akbar, S. and Stark, A.W. (2001), "The value relevance of cash flow, current accruals and non-current accruals components of earnings", unpublished working paper, Manchester Business School, Manchester.

Armitage, S., Hodgkinson, L. and Partington, G. (2006), "The market value of UK dividends from shares with differing entitlements", *Journal of Business Finance and Accounting*, Vol. 33 Nos 1-2, pp. 220-244.

Bali, R. and Hite, G. (1998), "Ex-dividend day stock price behaviour: discreteness or tax-induced clienteles?", *Journal of Financial Economics*, Vol. 47 No. 2, pp. 127-159.

Barraclough, K., Foster, D., Smith, T. and Whaley, R. (2009), "Scaling regression equations solution or problem", working paper, Vanderbilt University, Nashville, TN.

Baum, C. (2006), *An Introduction to Modern Econometrics Using Stata*, Stata Pres, Boston, MA.

Baxter, N.D. (1967), "Leverage, risk of ruin and the cost of capital", *Journal of Finance*, Vol. 22 No. 3, pp. 395-403.

Bell, L. and Jenkinson, T. (2002), "New evidence of the impact of dividend taxation and on the identity of the marginal investor", *Journal of Finance*, Vol. 57 No. 3, pp. 1321-1346.

Belsey, D.A., Kuh, E. and Welsch, R.E. (1980), *Regression Diagnostics*, John Wiley & Sons, New York, NY.

Black, F. and Scholes, M. (1974), "The effects of dividend yield and dividend policy on common stock prices and returns", *Journal of Financial Economics*, Vol. 1 No. 1, pp. 1-22.

Bond, S., Devereux, M. and Klemm, A. (2007), "The effects of dividend taxes on equity prices: a re-examination of the 1997 UK tax reform", IMF working paper, pp. 1-30, available at: www.imf.org/external/pubs/ft/wp/2007/wp07204.pdf

Brennan, M.J. (1970), "Taxes, market valuation and corporate financial policy", *National Tax Journal*, Vol. 23 No. 4, pp. 417-427.

Brooks, C. (2002), *Introductory Econometrics for Finance*, Cambridge University Press, Cambridge.

Chen, N.F., Grundy, B. and Stambaugh, R.F. (1990), "Changing risk, changing risk premiums and the dividend yield effect", *Journal of Business*, Vol. 63 No. 1, pp. 178-206.

Collett, N. (2004), "Reactions of the London stock exchange to company trading statement announcements", *Journal of Business Finance & Accounting*, Vol. 31 Nos 1 & 2, pp. 3-35.

DeAngelo, H., DeAngelo, L. and Stulz, R. (2004), "Dividend policy, agency costs and earned equity", NBER Working Paper No. w10599, NEBR Cambridge, MA.

Dhaliwal, D.S., Zhen Li, O. and Trezevant, R. (2003b), "Is a dividend tax penalty incorporated into the return on a firm's common stock?", *Journal of Accounting and Economics*, Vol. 35 No. 2, pp. 155-178.

Dhaliwal, D.S., Erickson, M., Frank, M.M. and Banyi, M. (2003a), "Are shareholder dividend taxes on corporate retained earnings impounded in equity prices? Additional evidence and analysis", *Journal of Accounting and Economics*, Vol. 35 No. 2, pp. 179-200.

Driscoll, J.C. and Kraay, A.C. (1998), "Consistent covariance matrix estimation with spatially dependent panel data", *Review of Economics and Statistics*, Vol. 80 No. 4, pp. 549-560.

Eades, K.M., Hess, P.J. and Kim, E.H. (1984), "Interpreting security returns during the ex-dividend period", *Journal of Financial Economics*, Vol. 13 No. 1, pp. 3-34.

Easterbrook, F.H. (1984), "Two agency-cost explanations of dividends", *American Economic Review*, Vol. 74 No. 4, pp. 650-659.

Easton, P.D. and Sommers, G.A. (2003), "Scale and the scale effect in market-based accounting research", *Journal of Business Finance and Accounting*, Vol. 30 Nos 1-2, pp. 25-55.

Elton, E. and Gruber, M. (1970), "Marginal stockholder tax rates and the clientele effect", *Review of Economics and Statistics*, Vol. 52 No. 1, pp. 68-74.

Ferris, S.P., Sen, N. and Yui, H.P. (2006), "God save the queen and her dividends: corporate payouts in the United Kingdom", *The Journal of Business*, Vol. 79 No. 3, pp. 1149-1173.

Frank, M. and Jagannathan, R. (1998), "Why do stock prices drop by less than the value of the dividend? Evidence from a country without taxes", *Journal of Financial Economics*, Vol. 47 No. 2, pp. 161-188.

Gentry, W.D., Kemsley, D. and Mayer, C. (2003), "Dividend taxes and share prices: evidence from real estate investment trusts", *Journal of Finance*, Vol. 58 No. 1, pp. 261-282.

Gordon, R. and Bradford, D. (1980), "Taxation and the stock market valuation of capital gains and dividends: theory and empirical results", *Journal of Public Economics*, Vol. 14 No. 2, pp. 109-136.

Graham, J.R., Michaely, R. and Roberts, M.R. (2003), "Do price discreteness and transaction costs affect stock returns? Comparing ex-dividend pricing before and after decimalization", *Journal of Finance*, Vol. 58 No. 6, pp. 2611-2636.

Hair, J.F., Anderson, R.E., Tatham, R.L. and Black, W.C. (2010), *Multivariate Data Analysis*, 7th ed., Prentice Hall, Upper Saddle River, NJ.

Hanlon, M., Myers, J.N. and Shevlin, T. (2003), "Dividend taxes and firm valuation: a re-examination", *Journal of Accounting and Economics*, Vol. 35 No. 2, pp. 119-153.

Harris, T.S. and Kemsley, D. (1999), "Dividend taxation in firm valuation: new evidence", *Journal of Accounting Research*, Vol. 37 No. 2, pp. 275-291.

Harris, T.S., Hubbard, R.G. and Kemsley, D. (2001), "The share price effects of dividend taxes and tax imputation credits", *Journal of Public Economics*, Vol. 79 No. 3, pp. 569-596.

Hodgkinson, L., Holland, K.M. and Jackson, R.H.G. (2006), "Dividend valuation, trading and transaction costs: the 1997 partial abolition of dividend tax credit repayments", *Accounting and Business Research*, Vol. 36 No. 4, pp. 253-270.

Hoechle, D. (2007), "Robust standard errors for panel regressions with cross-sectional independence", *Stata Journal*, Vol. 7 No. 3, pp. 281-312.

Huber, P.J. (2004), *Robust Statistics*, John Wiley and Sons, New York, NY.

Jakob, K. and Ma, T. (2004), "Tick size, NYSE rule 118, and ex-dividend day stock price behaviour", *Journal of Financial Economics*, Vol. 72 No. 3, pp. 605-625.

Jensen, M.C. (1986), "Agency cost of free cash flow, corporate finance, and takeovers", *American Economic Review*, Vol. 76 No. 2, pp. 323-329.

John, K. and Williams, J. (1985), "Dividends, dilution and taxes: a signalling equilibrium", *Journal of Finance*, Vol. 40 No. 4, pp. 1053-1070.

Kalay, A. (1982), "The ex-dividend day behaviour of stock prices: a re-examination of the clientele effect", *Journal of Finance*, Vol. 37 No. 4, pp. 1059-1070.

Kalay, A. (1984), "The ex-dividend day behaviour of stock prices: a re-examination of the clientele effect: a reply", *Journal of Finance*, Vol. 39 No. 2, pp. 557-561.

Keim, D.B. (1982), "Size-related anomalies and stock return seasonality: further empirical evidence", *Journal of Financial Economics*, Vol. 12 No. 1, pp. 13-32.

Kemsley, D. (2001a), "Dividend tax capitalization: clarifications and responses to recent challenges [online]", Working Paper No. 10, Yale School of Management, New Haven, CT, available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=279199 (accessed 8 January 2013).

Kemsley, D. (2001b), "Dividend tax capitalization: further thoughts, comments, and response to Michelle Hanlon, James Myers and Terry Shevlin", Working Paper No. 11, Yale School of Management, New Haven, CT, available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=283997 (accessed 8 January 2013).

Leland, H. and Pyle, D. (1977), "Information asymmetries, financial structure, and financial intermediation", *Journal of Finance*, Vol. 32 No. 2, pp. 371-387.

Lintner, J. (1956), "Distribution of incomes of corporations among dividends, retained earnings and taxes", *American Economic Review*, Vol. 46 No. 2, pp. 97-113.

Litzenberger, R.H. and Ramaswamy, K. (1979), "The effect of personal taxes and dividends on capital asset prices: theory and empirical evidence", *Journal of Financial Economics*, Vol. 7 No. 2, pp. 163-195.

McConnell, J. and Muscarella, C. (1985), "Corporate capital expenditure decisions and the market value of the firm", *Journal of Financial Economics*, Vol. 14 No. 3, pp. 399-422.

Maddala, G.S. (1988), *Introduction to Econometrics*, Prentice Hall, Englewood Cliffs, NJ.

Miller, M.H. and Rock, K. (1985), "Dividend policy under asymmetric information", *Journal of Finance*, Vol. 40 No. 4, pp. 1031-1105.

Miller, M.H. and Scholes, M.S. (1982), "Dividends and taxes: some empirical evidence", *Journal of Political Economy*, Vol. 90 No. 6, pp. 1118-1141.

Modigliani, F. and Miller, M. (1961), "Dividend policy, growth and the valuation of shares", *Journal of Business*, Vol. 34 No. 4, pp. 411-433.

Morgan, G. and Thomas, S.H. (1998), "Taxes, dividend yields and returns in the UK equity market", *Journal of Banking and Finance*, Vol. 22 No. 4, pp. 405-423.

Newey, W.K. and West, K.D. (1987), "A simple, positive semi-definite, heteroscedasticity and autocorrelation consistent covariance matrix", *Econometrica*, Vol. 55 No. 3, pp. 703-708.

O'Hanlon, J. and Taylor, P. (2007), "The value relevance of disclosures of liabilities of equity accounted investees: UK evidence", *Accounting and Business Research*, Vol. 37 No. 4, pp. 267-284.

Ohlson, J. (1995), "Earnings, book values and dividends in equity valuation", *Contemporary Accounting Research*, Vol. 11 No. 2, pp. 661-687.

Oswald, D. and Young, S. (2004), "What role taxes and regulation? A second look at open market share buyback activity in the UK", *Journal of Business Finance & Accounting*, Vol. 31 Nos 1-2, pp. 257-292.

Pesaran, M.H. (2004), "General diagnostic tests for cross section dependence in panels", Working Papers in Economics No. 0435, Faculty of Economics, University of Cambridge, Cambridge.

Poterba, J. and Summers, L. (1984), "New evidence that taxes affect the valuation of dividends", *Journal of Finance*, Vol. 39 No. 5, pp. 1397-1415.

Poterba, J.M. and Summers, L.H. (1985), "The economic effects of dividend taxation", in Edward, A. and Marti, S. (Eds), *Recent Advances in Corporate Finance*, Richard D. Irwin Publishers, Homewood, IL, pp. 227-284.

Rees, W.P. (1997), "The impact of dividends, debt and investment on valuation models", *Journal of Business Finance and Accounting*, Vol. 24 Nos 7-8, pp. 1111-1140.

Rees, W. and Valentincic, A. (2013), "Dividend irrelevance and accounting models of value", *Journal of Business Finance & Accounting*, Vol. 40 Nos 5-6, pp. 646-672.

Rosenberg, B. and Marathe, V. (1975), "Tests of capital pricing hypotheses", Research Program in Finance Working Papers No. 32, University of California, Berkeley, CA.

Ross, S. (1977), "The determination of financial structure: the incentive signalling approach", *Bell Journal of Economics*, Vol. 8 No. 1, pp. 23-40.

Rozeff, M. (1982), "Growth, beta and agency costs as determinants of dividend payout ratios", *Journal of Financial Research*, Vol. 5 No. 3, pp. 249-259.

Shackelford, D.A. and Shevlin, T. (2001), "Empirical tax research in accounting", *Journal of Accounting and Economics*, Vol. 31 No. 1, pp. 321-387.

Sinn, H.-W. (1991), "Taxation and the cost of capital: the 'old' view, the 'new' view and another view", in Bradford, D. (Ed.), *Tax Policy and the Economy*, Vol. 5 The MIT Press, Cambridge, MA, pp. 25-54.

Stark, A.W. and Thomas, H.M. (1998), "The empirical relationship between excess market value and residual income: some UK evidence", *Management Accounting Research*, Vol. 9 No. 4, pp. 445-460.

Zodrow, G.R. (1991), "On the traditional and 'new' views of dividend taxation", *National Tax Journal*, Vol. 44 No. 4, pp. 497-509.

Further reading

Acker, D., Ashton, D.J. and Green, S. (1997), "Tax, corporate behaviour and the foreign income dividend scheme", *Journal of Business Finance & Accounting*, Vol. 24 No. 1, pp. 125-143.

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