ISSN 1471-0498

DEPARTMENT OF ECONOMICS

DISCUSSION PAPER SERIES

NEW EVIDENCE OF THE IMPACT OF DIVIDEND TAXATION AND ON THE IDENTITY OF THE MARGINAL INVESTOR

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Number 24

October 2000

Manor Road Building, Oxford OX1 3UQ

New evidence of the impact of dividend taxation and on the identity of the marginal investor

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ABSTRACT

This paper examines the impact of a major change in dividend taxation introduced in the UK in July 1997. The reform was structured in such a way that the immediate impact fell almost entirely on the largest investor class in the UK, namely pension funds. We analyse the behaviour of share prices around the ex-dividend day both before and after the reform to test clientele effects and the impact of taxation on the valuation of companies. We find strong clientele effects in the UK, which are consistent with the distortions introduced by the tax system (before the reform dividend income was *tax-advantaged* in the UK). We also find significant changes in the valuation of dividend income after the reform, in particular for high-yielding companies. These results provide strong support for the hypothesis that taxation affects the valuation of companies, and that pension funds were the effective marginal investors for high-yielding companies.

JEL classification: G12, G18

Key words: dividends, taxation, equity valuation

This draft: 12 June 2000

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It is very rare for governments to design their tax changes in a way that allows clean tests of important hypotheses. However, in July 1997 the incoming Labour government in the UK radically reformed the taxation of dividend income in such a way that the immediate impact fell almost entirely upon one important class of investors, namely pension funds. As is well known, pension funds are the single biggest class of investors in UK equities. In 1997 it was estimated that over one third of UK equities were held by pension funds, and the impact of the tax change was to increase the taxation of dividend income by £5bn per annum. We use this major tax change to examine two questions: is there evidence that pension funds are the "marginal" investors in the UK, and, if so, how do taxes affect the valuation of dividend income?

Given the nature of the tax change we examine, these questions are inevitably linked. We examine the valuation of dividends before and after the tax change, by considering the ex-dividend day behaviour of share prices. If pension funds were not the marginal investors, then we would anticipate no change in valuation, as all other classes of investors were unaffected by the tax change. However, if pension funds have a significant effect at the margin in setting share prices, then we can estimate how, if at all, taxation affects their valuation of dividend income. In practice the marginal investor may differ across companies (for example, depending on the dividend yield) and so we also test for tax-clientele effects. This ability to test both the identity of the marginal investor and the impact of dividend taxation is one of the unusual features of this tax reform.

Despite considerable research effort, the impact of taxation on the valuation of dividends remains the subject of dispute. In many countries, such as the US, profits distributed as dividend payments are taxed more heavily than profits retained within the firm. This should, if dividend taxes affect valuation at the margin, result in strong incentives for firms to reduce dividend distributions to zero. The fact that dividend payments still exist in such countries has led to a large literature on the possible reasons for paying dividends even when such distributions are tax-disadvantaged (see Poterba and Summers (1985) and Zodrow (1991) for a discussion).

However, an interesting feature of UK dividend taxation until July 1997 was that dividends were actually tax-preferred by certain investor classes. Between 1973 and July 1997 the UK operated an imputation tax system, whereby companies paid Advance Corporation Tax (ACT) on dividend distributions, and issued a tax credit to investors in respect of the dividend distribution (we give details of the tax system in the next section). Subject to certain rules, ACT paid could be offset against the Mainstream Corporation Tax liabilities of the company, and investors could use the tax credits to offset their personal tax liabilities. Importantly, in the case of tax-exempt

investors, these tax credits could be sent to the tax authorities and a full cash refund obtained. This feature, which is uncommon among countries operating imputation systems, resulted in tax-exempt investors having a strong preference for dividend distributions (with the associated tax credit) over retaining profits within the company (which generated no tax credit). The main effect of the reform introduced in July 1997 was to withdraw the ability of tax-exempt investors to reclaim dividend tax credits, thereby significantly reducing (by 20%) their valuation of dividend income. The overall result of the tax reform was to make tax-exempt investors indifferent, at least in tax terms, between dividends and retained earnings.

This paper analyses the impact of this major tax reform by estimating the extent of any change in the valuation of dividend income before and after the reform. We do this, following Elton and Gruber (1970) and others, by considering returns observed around ex-dividend days. We also test for the existence of tax-clientele effects. As noted by Kalay (1982), Lakonishok and Vermaelen (1983) and others, the interpretation of ex-dividend day behaviour can be problematic if the prices around ex-dividend days are influenced more by the behaviour of short-term traders than the longer-term investors in the company. However, tax-motivated short-term trading is seriously constrained in the UK by restrictions in the tax code as noted Lasfer (1995), who concludes, "unlike the US market, ex-day returns in the UK are not affected by short-term trading". This makes evidence from the UK particularly pertinent.

Previous studies of UK tax changes have generally found taxes to be an important determinant of equity returns. Poterba and Summers (1984) study two reforms: the introduction of capital gains tax in 1965, and the move to the imputation tax system in 1973. One aspect of the latter reform was the introduction of the dividend subsidy for tax-exempt investors, the removal of which we study in this paper. They conclude that the valuation of dividends changes significantly across tax regimes. Lasfer (1995) considers the impact of the 1988 tax changes, which reduced the higher rates of income tax, harmonised income and capital gains taxes, and reduced the tax credit associated with dividend payments. This was a complicated reform whose effects differed across investors. However, Lasfer finds a significant change in the valuation of dividends after the reform, in particular for those companies with high dividend yields.[1]

The results we find in respect of the 1997 tax reform are consistent with these previous studies. We find a significant reduction in the valuation of dividend income after 1997, in particular for high-yielding companies. The effects of the reform on lower-yielding companies are much less pronounced, a result that is consistent with tax-exempt investors not being the

[1] Tax effects on UK equity values are also reported in Kaplanis (1986), Ang et al (1991), Chui et al (1992) and Menyah (1993).

marginal investors in such companies. This, of course, would be consistent with the tax-clientele hypothesis as tax-exempt investors should, prior to the reform, have had a strict preference for dividend distributions over retained profits.

The remainder of the paper is organised as follows. In section I we describe the taxation of dividend income in the UK, and the effects of the July 1997 reform. We also explain the hypotheses to be tested. In section II we describe the data and methods we use to test these hypotheses. Section III presents the empirical results. Section IV contains the conclusions and a discussion of the wider implications of the results.

I. The 1997 UK tax reform

A. The UK imputation tax system before Finance Act 1997

Under the UK imputation system, resident companies were liable to account to the Inland Revenue for Advance Corporation Tax (ACT) upon dividend distributions to shareholders. The ACT was treated as a payment on account of the Mainstream Corporation Tax for the accounting period in which the dividends were paid.[2] The rate of ACT was 20% of the tax-inclusive dividend. Thus, on a dividend payment of 100, a company had to pay 25 in ACT.

Shareholders were issued with an imputation tax credit equal to the rate of ACT, which could be offset against income tax liabilities.[3] The final dividend tax burden depended on the status of the recipient shareholders. We summarise the position prior to Finance Act 1997 (FA97) in Table I below. It shows the after-tax receipts resulting from a dividend payment of 100 made by a UK resident company.

[2] The corporate tax rate was 33% until Finance Act 1997 and then cut to 31%. ACT offset against the Mainstream Corporation Tax was subject to the overriding limit that the dividend and the ACT could not exceed current taxable profits. ACT in excess of the amount was known as "surplus ACT" which could be carried backward or forward. For more details on UK corporate taxation, see Gammie (1997).

[3] ACT was effectively a withholding tax on dividends, although the British law did not recognize it as such.

Table I: The after-tax value of a dividend of 100 before Finance Act 1997

	Pre-FA 1997
Higher rate individuals	75
Lower and basic rate individuals	100
Corporate shareholders[4]	100
Pension funds[5]	***125***
PEPs	125
Charitable institutions	125
Non-UK investors (no special treaty)	100
Non-UK portfolio/direct investors (treaty)	106/107

The tax credit discharged the tax liability of individual investors subject to the lower (20%) and basic (24%)[6] rates of income tax. Individuals subject to the higher (40%) income tax rate had to pay further tax equal to the higher rate on the grossed-up dividend less the tax credit. UK resident companies did not count dividends as income and there was no liability to corporation tax. Rather, dividends were treated as franked investment income, and the attached tax credit eliminated companies' ACT liability when the dividends were paid on to the ultimate shareholders.

The peculiar feature that distinguished the UK from other imputation tax systems was that the *tax credit was fully refundable to tax-exempt shareholders*. The tax-exempt shareholder community predominantly consists of pension funds and insurance companies with respect to their pension business, but also of charitable bodies and individuals holding shares through Personal Equity Plans (PEPs). Although not shown in Table I, the credit repayment extended to non-tax paying individuals with incomes below their annual allowance as well as to companies that used franked investment income to offset trading losses.

[4] Unit trusts, investment trusts, and insurance companies with respect to their life insurance and general insurance business would value dividends like non-financial corporations. For all corporate shareholders, we assume that the companies did not require dividend income to offset trading losses or expenses.

[5] This category includes insurance companies with respect to their pension business.

[6] The basic rate was reduced from 25% in 1994/5 to 24% in 1996, but with no effect on the dividend tax burden.

A partial refund was also granted to non-resident investors qualifying for special tax treaty provisions.[7] Non-treaty qualifying investors received no refund but were not subject to further UK tax on the dividends. For all non-residents, the total dividend tax burden depended on how the dividends were taxed when declared in their country of residence.

The relative importance of these various shareholder groups, at least in terms of their ownership of UK listed companies, can be seen in Table II. As is well known, institutional share ownership has gone much further in the UK than in many other countries. In contrast to the US, where individuals still own more than half of quoted equity, more than 56% of UK equity in 1997 was directly owned by financial institutions, including pension funds, insurance companies, and unit and investment trusts. Of particular importance for this paper is the size of equity holdings within pension schemes, which enjoyed tax-exempt status. In addition to direct contributions to pension funds, 50-55% of company insurance premium income represents contributions to pension schemes.[8] Thus, tax-exempt pension fund investors, for whom Finance Act 1997 was of major impact, held over one third of the equity in UK listed companies.

Table II: UK ownership structures (31 Dec 1997)

	Total Equity Owned (%)
Pension funds	**22.1**
Insurance companies	**23.5**
Individuals	16.5
Unit trusts	6.7
Investment trusts	1.9
Other financial institutions	2.0
Charities	1.9
Private non-financial corporations	1.2
Banks	0.1
Public Sector	0.1
Rest of the World	24.0

Source: Central Statistical Office (1997).

[7] The standard treaty provided for the repayment of the full tax credit less a 15% withholding tax on the grossed-up dividend in the case of portfolio investors, and the repayment of half the credit less a 5% withholding tax in the case of direct investors.

[8] Source: Association of British Insurers (1998).

B. Finance Act 1997

On 2 July 1997 the incoming Labour government radically reformed the taxation of dividend income in the UK. The resolutions taken in Finance Act 1997 marked the beginning of the end of the imputation system that had been in existence in the UK since 1973.

The main effect of FA97 was to abolish the right of pension funds to be repaid the imputation tax credit on dividends paid on or after the day the Act was passed.[9] Thus, UK pension funds saw an immediate 20% drop in the value of their net dividend income on UK equities. FA97 contained dividend tax reforms that affected other investors, but these either had a significantly smaller, or a delayed, impact.[10] FA97 had no immediate dividend tax implications for other investor groups. There were no changes to the rates of imputation credit or income tax and thus no changes to the dividend tax burden of individual shareholders. Similarly, tax-exempt charities, tax-favoured PEPs, non-tax paying individuals, and treaty-protected investors continued to enjoy the pre-Budget regime of refundable tax credits.

Although not immediately effective, FA97 provided for two future changes to the taxation of dividend income. As of 6 April 1999, the rate of imputation credit was to be cut from 20% on the tax-inclusive dividend to 10%.[11] This however did not affect the dividend tax burden of individual investors because of a simultaneous cut in tax rates applicable to dividend income.[12] Shareholder relief, in the form of lower dividend tax rates, therefore offset the reduction in dividend imputation.

Whilst having no effect on shareholders subject to tax in the UK, the reduction in the rate of imputation effectively eliminated any credit repayments to non-resident investors benefiting from

[9] Finance Act 1997, S. 19.

[10] The one other change that took immediate effect was that UK companies were no longer able to offset any trading losses against franked investment income and claim repayment of the tax credit (Finance Act 1997, S. 20). In particular, for investment funds this meant that they could no longer offset their expenses against UK dividend income and obtain relief at the tax credit rate. For example, a UK equity fund with an annual management charge of 1.5% would see a drop in its income by 0.3% (i.e. 20% of 1.5%). However, this only affected companies with insufficient taxable income from non-UK-equity sources. Similarly, companies had been able to obtain immediate relief for trading losses at the 20% ACT rate, whereas relief at the full corporate tax rate would only have been obtained once the company had moved into profits. FA97 therefore removed a temporary cash flow benefit for some companies.

[11] Finance Act 1997, S. 30.

[12] As of April 1999, lower and basic rate tax-payers were subject to a tax rate of 10% on dividend income. The higher rate was cut from 40% to 32.5% for dividend income only.

special tax treaty provisions.[13] For such investors, the value of dividends after UK tax fell by 6%. However, the total effect depended on how the UK dividends were subsequently taxed when (and if) declared in the residence country.[14]

The second change that became effective as of April 1999 was that the remaining credit repayments to tax-exempt investors would cease.[15] However, charitable bodies were granted compensatory payments, which in 1999/2000 prevented the value of UK dividends from falling by more than 3%.[16] Similarly, shareholders in PEPs were offered the opportunity to switch into a new tax-privileged savings vehicle, the Individual Savings Account (ISA).[17]

In summary, although FA97 had wide-ranging implications for UK dividend taxation, the immediate and largest impact fell entirely on tax-exempt pension funds. As of Budget day, pension funds saw a drop in the value of their UK net dividend income of 20%. FA97 did not change the dividend tax burden of individual or corporate shareholders.[18] It affected some other investor groups such as charities, investors in tax-exempt savings accounts, and certain non-residents, but only with a time lag of 21 months and in no case was the dividend tax increase anywhere near as sharp as that for pension funds on 2 July 1997. The remainder of this paper is concerned with estimating the effect of this major change on the valuation of dividend income.

C. Tax hypotheses

We examine the valuation of dividends before and after FA97 by considering the ex-dividend day behaviour of share prices. Following Elton and Gruber (1970), market prices in equilibrium will be such that the marginal investor is indifferent between selling a share on the cum-dividend

[13] Direct investors would continue to receive a small repayment. On a dividend of 100 the credit would be 0.28 compared to 6.88 before 6 April 1999. No repayment would be available for portfolio investors.

[14] It is difficult to assess the importance of this effect in the absence of a by-country breakdown of the 24% foreign ownership share reported in Table II. Of the more than hundred double taxation agreements concluded by the UK, about half allowed for the partial refund of the imputation credit. For example, US and Japanese residents qualified for the special provision, whereas Germans did not. Even within the European Union, the UK treaty network was not harmonised.

[15] It would also cease for non-tax paying individuals with income below the threshold.

[16] Compensatory payments would increase the value of a dividend of 100 to 121 in 1999/2000 but by gradually less in subsequent years. Our period of study ends December 1999.

[17] Dividends received through ISAs qualified for the credit refund for the first 5 years of the scheme. During this period, a dividend of 100 had an ISA value of 111 under the new 10% rate of imputation credit.

[18] Except in the case of UK companies with insufficient income sources other than UK equities to offset their trading losses or expenses.

day at the price P_c or on the ex-dividend day at the price P_e. If the dividend per share is D, the price-drop-to-dividend ratio (DOR) is expected to equal the relative tax differential between dividends and capital gains, where t_d and t_g are the investor's effective tax rates on dividend income and on capital gains respectively:

$$DOR = \frac{P_c - P_e}{D} = \frac{1 - t_d}{1 - t_g}. \tag{1}$$

Alternatively, the rate of return on the ex-dividend day (R_e) is expected to be:

$$R_e = \frac{P_e + D - P_c}{P_c} = (1 - DOR)\frac{D}{P_c} = \left(\frac{t_d - t_g}{1 - t_g}\right)\frac{D}{P_c}. \tag{2}$$

In many countries, such as the US, profits distributed as dividend payments are tax-disadvantaged relative to capital gains for many investors ($t_d > t_g$). Dividends are taxed at ordinary rates without tax credits, whereas effective capital gains taxes are low. Under dividend tax discrimination, drop-off ratios are expected to be less than one or, alternatively, ex-day returns must be positive in order to compensate investors for the tax penalty.

The tax environment in the UK is very different. As explained above, under the UK imputation system, the total tax burden on dividend income (t_d) depends not only on the ordinary income tax rate (t_m) but also on the rate of imputation credit (s) such that:

$$DOR = \frac{(1 - t_m)}{(1 - s)(1 - t_g)}, \text{ and} \tag{3}$$

$$R_e = \left(\frac{t_m - s - t_g(1 - s)}{1 - t_g}\right)\frac{D}{P_c}. \tag{4}$$

The peculiar feature of UK dividend taxation before FA97 was that dividends were tax-preferred by many investor classes. In particular, tax-exempt investors such as pension funds were not liable to either income tax or capital gains tax ($t_m = t_g = 0$) but were allowed the repayment of the imputation credit (s = 0.20). As shown in Table III, if ex-day share price

movements were solely driven by the tax preferences of tax-exempt investors we would expect the DOR to be equal to 1.25.

Taxable UK resident investors are in general liable to capital gains taxes at the ordinary (corporate or personal) income tax rates.[19] However, effective capital gains tax rates are significantly lower than statutory rates because of deferral, generous allowances, and inflation indexation.[20] Under the assumption of an effective capital gains tax rate equal to zero, Table III shows that basic- and lower-rate individuals as well as corporate shareholders were tax-indifferent between dividends and capital gains both before and after FA97. For them, we would expect a drop-off ratio equal to one. Indeed, the only investor class for which the expected drop-off ratio might be less than one is individual shareholders subject to income tax at the higher rate, but able to shelter capital gains.

Table III also shows the upper bound for expected drop-off ratios, which would obtain if capital gains were effectively taxed at the statutory rates. In this extreme case, most investor classes,[21] whether tax-exempt or not, had a strong tax preference for cash distributions over capital gains. Thus, if ex-dividend behaviour of stock prices was driven by the taxation of dividends relative to capital gains, we would expect the behaviour of UK equities to be the reverse of that in the US. The price should fall by more than the distribution when a stock reaches the ex-dividend day, rather than by less than the distribution.

Table III demonstrates why an analysis of the level of drop-off ratios prior to FA97 is problematic as regards inferences on relative dividend valuation and the identity of the marginal investor. First, uncertainty about effective capital gains tax rates means that we cannot directly relate the ex-day price drop-off to the differential taxation of dividends and capital gains in order to determine the identity of the marginal investor.[22] Second, even if we were able to rule out high effective capital gains tax rates, the finding of drop-off ratios equal to 1.25 would not allow us to discriminate between different classes of tax-exempt investors. As Table III shows, prior to FA97

[19] Unit and investment trusts, unlike ordinary companies, were not liable to capital gains tax.

[20] Taxes were due on realised capital gains after indexation for inflation. Individuals benefited from an annual exemption of £6,300 in tax year 1996/7, were able to defer certain gains by reinvesting in other qualifying investments, or obtained relief upon retirement. Unrealised gains upon death were also exempted.

[21] Open-ended trust funds, investment trusts, and non-treaty qualifying foreigners, who were all exempted from UK capital gains tax, were indifferent between the two types of equity income.

[22] For example, the finding of a drop-off ratio equal to 1.25 prior to 1997 is consistent with a tax-exempt ($m = t_g = 0 \leq s = 0.20$) and a higher-rate individual ($m = t_g = 0.40 \geq s = 0.20$) marginal investor.

at least two investor classes other than pension funds had a marked tax preference for dividends. Finally, other non-tax factors might influence share price movements on the ex-day. For example, Frank and Jagannathan (1998) study ex-day price behaviour in Hong Kong where neither capital gains nor dividends are taxed. Prices are found to drop on average by less than the dividend due to market microstructure effects and transaction costs. Thus, in the UK tax environment a drop-off ratio of less than 1.25 could be wrongly interpreted as evidence against tax-exempt pension funds setting share prices.

Table III: Expected drop-off ratios before and after FA97

This table calculates expected drop-off ratios for different classes of investors. The drop-off ratio is defined as $DOR = \frac{(1-t_m)}{(1-s)(1-t_g)}$ and is calculated under two assumptions regarding the effective capital gains tax rate, t_g. The reforms introduced in FA97 had their main effect immediately, although the effect of some provisions was delayed until April 1999. Personal Equity Plans (PEPs) were withdrawn with effect from April 1999 and replaced by Individual Savings Accounts (ISAs), although the returns on existing sums invested within PEPs continued to be free of income and capital gains taxes.

	Effective capital gains tax = 0			**Effective capital gains tax = statutory rate**		
	Before FA97	After FA97	After April 1999	Before FA97	After FA97	After April 1999
Pension funds[23]	**1.25**	**1.00**	**1.00**	**1.25**	**1.00**	**1.00**
Higher-rate individuals	0.75	0.75	0.75	1.25	1.25	1.25
Basic-rate individuals	1.00	1.00	1.00	1.30	1.30	1.30
Lower-rate individuals	1.00	1.00	1.00	1.25	1.25	1.11
PEP (ISA) holders	1.25	1.25	(1.11)	1.25	1.25	(1.11)
Unit/investment trusts[24]	1.00	1.00	1.00	1.00	1.00	1.00
Corporations[25]	1.00	1.00	1.00	1.49	1.45	1.43
Charities	1.25	1.25	1.21	1.25	1.25	1.21
Non-UK (no treaty)	1.00	1.00	1.00	1.00	1.00	1.00
Non-UK (treaty)[26]	1.06/1.07	1.06/1.07	1.00/1.00	1.06/1.07	1.06/1.07	1.00/1.00

[23] This category includes insurance companies on their pension related business.

[24] Trusts are assumed to have sufficient non-UK equity income to offset their expenses.

[25] We do not consider companies with trading losses. Insurance companies with respect to their general business fall into the corporate shareholder category.

[26] Taxes on non-residents are UK taxes only. Non-residents were in general exempt from UK capital gains tax.

We overcome these ambiguities by analysing the *change* in ex-day price behaviour in response to FA97. As described above, FA97 was designed in a way that the immediate and only significant dividend tax impact fell entirely upon tax-exempt pension funds. The main effect of the reform was to withdraw the ability of pension funds to reclaim tax credits, thereby reducing their valuation of UK dividend income by 20%. Therefore, if DORs after FA97 were significantly lower than before we would argue in favour of the joint hypothesis that pension funds had a significant effect at the margin on UK equity prices and that taxes affected the valuation of dividend income. If taxes were fully reflected in the valuation of dividends, we would expect the drop-off ratio to fall by 20%.

The finding of a significant change in ex-day price behaviour around FA97 is not consistent with other types of investors being those that mattered at the margin. Since no changes were made to the taxation of capital gains[27] and dividends, taxable individual and corporate investors would not alter their relative valuation of dividend income.[28] For other tax-exempt investors and certain non-residents the dividend tax resolutions would become effective only after 6 April 1999 and had a much smaller impact.

Clearly, the finding of no significant change around the Budget day is consistent with a number of hypotheses. In particular, if pension funds were intra-marginal investors we would anticipate no significant impact of the reforms. However, equally, a finding that the reforms had no impact would not imply that taxes were in general irrelevant for the valuation of dividends. The nature of the tax change examined would not allow us to discriminate between the alternatives. These arguments lead to our first hypothesis:

Hypothesis 1: Pension funds were the marginal investors in UK equities and dividend taxes affected equity values. As a result, drop-off ratios declined significantly after the day FA97 was passed.

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[27] The 1997 resolutions and those taken in the following two Budgets contained no changes to the way in which corporate capital gains were computed. Corporate taxes were cut from 33% to 31% to 30%, which marginally changed the capital gains tax burden of corporate shareholders (see Table III). UK individuals benefited from a small increase in the annual tax-exempt amount as well as from a 1998 change to the indexation of capital gains. However, these changes were marginal. In April 1999, the lower rate of income tax was cut to 10% on all incomes, which explains the change in drop-off ratios in the case of statutory-rate capital gains taxes for lower-rate individuals (Table III).

[28] For companies with trading losses or insufficient non-equity income, the dividend tax burden was raised only marginally compared to the 20% drop in the after-tax value to pension funds.

In practice marginal investors may differ across companies. Prior to FA97 pension funds had a strong tax preference for dividend income. On the other hand, individual investors with high incomes and unexhausted capital gains allowances preferred companies to retain earnings for investment. Following Elton and Gruber (1970), we thus test for tax-clientele effects:

Hypothesis 2: Prior to FA 1997, pension funds predominantly invested in high-yielding stocks and shareholders subject to high relative dividend taxes in low-yielding stocks. As a result, drop-off ratios were increasing in dividend yield.

The existence of tax clienteles in the UK would imply low effective capital gains tax rates. At rates close to statutory rates, all investors would value dividends in a way similar to that of pension funds and no obvious clienteles could emerge. Tax clienteles would also imply that the impact of FA97 differed across companies depending on their dividend policy. We would expect the strongest effect on ex-day price behaviour for those stocks most likely to be held by pension funds. This leads to our third hypothesis:

Hypothesis 3: Prior to 2 July 1997, pension funds predominantly held stocks with high dividend yields. As a result, the decline in drop-off ratios in response to FA97 was strongest for highest-yielding stocks and weakest for lowest-yielding stocks.

The overall result of FA97 was to make pension funds indifferent, at least in tax terms, between dividends and profit retentions. Assuming that pension funds had a disproportionately high stake in high-yielding stocks purely to take advantage of the tax credit subsidy, we should observe, over time, a shift in their shareholdings away from high-yielding stocks towards other stocks. We therefore test:

Hypothesis 4: FA97 made pension funds indifferent between dividends and capital gains. As a result, any tax clientele effects and associated spreads in drop-off ratios across companies disappeared after 2 July 1997.

Portfolio reallocation of pension funds should also show in the relative performance of low-yielding versus high-yielding stocks. We therefore provide some additional evidence on

hypothesis 4 by assessing whether stocks with lower yields out-performed high-dividend stocks in the post-reform period.

Apart from the pension fund hypotheses, we also test for the impact of those tax measures that were enacted in FA97 but only took effect after 6 April 1999. If the tax preferences of PEP holders, charities, non-tax paying individuals, or non-residents mattered, we should observe a decline in drop-off ratios after that date.

II. Data and methodology

A. Data

The change we study became effective on 2 July 1997; we set our sample period to be 30 months before and after this date (1 January 1995 to 31 December 1999). Initially we included all companies quoted on the London Stock Exchange that paid at least one dividend during our sample period and for whom data was available on Datastream (all data in this paper was derived from Datastream). Foreign corporations and investment trusts were then eliminated. For the remaining 1,785 companies we gathered information on all dividend payments over the sample period. We deleted special dividends and screened the remaining observations for missing or contradictory data entries.[29] Minimum data requirements on historical prices, which we needed to estimate the risk characteristics of each stock, forced us to further delete ex-day events.[30]

The resulting sample contained 9,673 ex-dividend day events for 1,478 companies. As is well known, a feature of the UK equity market is the low level of liquidity amongst small companies. One manifestation of this in our sample is that on 1,291 (13.3%) of the occasions when stocks went ex-dividend, there was no share price movement, on the day, at all. This is not to say, of course, that the price did not change when the share was next traded. However, since we study the

[29] Starting off with 12,343 ex-day observations for the 1,785 companies we deleted 30 observations because of missing price data on either ex-day or cum-day. We also compared ex-day share price changes with changes in Datastream's total return index for the stock and deleted those observations where the implicit dividend was negative (63 observations) or deviated substantially from the actual dividend paid (370 observations). We then excluded 68 special dividends and 440 foreign income dividends.

[30] The risk adjustment is explained in the next section. Insufficient historical price data required us to delete 1,699 ex-day events. We ran the tests on unadjusted ex-day closing prices leaving in shares with insufficient observations to make the market-adjustment, which made for a larger sample but had no effect on the interpretation of the results.

behaviour of share prices on the ex-day we exclude such observations and focus on the remaining sample of 8,382 observations for 1,403 stocks. We take our concerns about thin-trading one step further. Since liquidity problems are most severe for small companies we generate our own synthetic *Largest 250* sample by ranking the market capitalisations of each stock at the start of each calendar year. Ex-day events of the largest 250 stocks in that year are included. This sample contains 2,289 ex-day events for 383 different companies.

B. Methodology

A number of different approaches have been employed to document the behaviour of ex-day share prices. Elton and Gruber (1970) base their analysis on the average drop-off ratio:

$$\hat{DOR} = \frac{1}{N}\sum_{i}^{N}\left(\frac{P_c - P_e}{D}\right)_i, \tag{5}$$

where N is the number of ex-day observations. The Elton and Gruber statistic can be estimated as the intercept of the regression:

$$DOR_i = \overline{DOR} + \varepsilon_i^*, \tag{6}$$

where ε_i* is an error term with an assumed mean of zero. Although an analysis of (unweighted) average ex-day drop-off ratios is intuitively appealing, there are several reasons that discourage the use of this particular statistic. First, the empirical distribution of drop-off ratios is far from being normally distributed. The second reason is that the error term ε_i* is heteroskedastic: drop-off ratios are scaled by dividends that vary widely for different firms. As Lakonishok and Vermaelen (1983) and Michaely (1991) point out, this would exacerbate the ex-day price change of small dividends relative to large dividends.

Assume that ex-dividend day returns R_e, as defined in (2), are generated by the following process:

$$R_{ei} = \left(\frac{P_e - P_c + D}{P_c}\right)_i = (1 - \overline{DOR})\left(\frac{D}{P_c}\right)_i + \varepsilon_i, \tag{7}$$

where ε_i is an error term with $E(\varepsilon_i) = 0$ and $Var(\varepsilon_i) = (\sigma^2)$.

Thus, applying OLS to (6) would result in a residual variance that is decreasing in the dividend yield:

$$DOR_i = \overline{DOR} - \varepsilon_i \left(\frac{P_c}{D} \right)_i . \qquad (6^*)$$

The OLS estimate is not efficient. Moreover, stocks with lower dividend yields are given a higher weight than those with higher yields, which is not very reasonable. Given the problems with the Elton and Gruber statistic, our interpretation is largely based on an alternative estimate of the drop-off ratio.[31] Rearrange (7) to give:

$$\left(\frac{P_c - P_e}{P_c} \right)_i = \overline{DOR} \left(\frac{D}{P_c} \right)_i - \varepsilon_i , \qquad (8)$$

and we can estimate the drop-off ratio as the slope coefficient in the OLS regression:[32]

$$\left(\frac{P_c - P_e}{P_c} \right)_i = \alpha \left(\frac{D}{P_c} \right)_i + \varepsilon_i . \qquad (9)$$

We thus relate the ex-day price change scaled by the cum-dividend price to the dividend amount, also scaled by the cum-dividend price. We refer to this statistic as the portfolio statistic.[33] Further

[31] An alternative approach could have been to use total ex-day returns rather than the percentage price drop as the dependent variable (e.g. Lasfer, 1995) and apply OLS to (7). However, the use of returns on the left-hand side may be inappropriate because dividends are a component of return, and also including the dividend yield on the right-hand side of the model may yield regression estimates with unpredictable behaviour. We present some summary statistics on ex-day returns but do not use them in our regressions.

[32] This is the method used in Boyd and Jagannathan (1994) and others. Michaely (1991) applies GLS regressions to (6*) with the weights being determined by the dividend yield, which produces identical results.

[33] Although our methods differ, we use the terminology proposed by Lakonishok and Vermaelen (1983). They calculate their portfolio statistic as the average percentage price drop divided by the average dividend yield and adjust the variance by making some simplifying assumptions. Their statistic implies a portfolio investment strategy in which each stock is weighted equally. Our reported OLS estimates imply portfolios in which higher-yielding stocks receive higher weights. In this sense, our weighting approach is at the opposite extreme to the Elton and Gruber statistic. We tested all three approaches, but the results

corrections for heteroskedasticity should lead to only minor improvements in efficiency in large samples, but we nevertheless base our inferences on robust standard errors using White's (1980) procedure.

We estimate all models on both an unadjusted and market-adjusted basis. In the latter case we adjust the ex-day closing price in the following way:

$$P_e^* = \frac{P_e}{1 + \beta R_e^m},$$

where P_e^* denotes the adjusted price on the ex-day, R_e^m is the return on the market (as measured by the *FT-Actuaries All Shares Index*) on the ex-day. To obtain beta we estimate the market model based on monthly return data and observations (-60, -1) relative to the ex-dividend month.[34] The reasons why we depart from other researchers and use monthly returns over a much longer time period are essentially twofold:[35] First, monthly data allows us to control for thin-trading problems, which would likely bias our beta-estimates downward.[36] Second, we expect to obtain more reliable estimates of a stock's risk characteristics over a three to five year estimation period.

To test the first tax hypothesis, we compare estimated drop-off ratios before and after FA97. We pick up the tax-induced change by including an interactive zero-one dummy (PostFA97) for whether or not the observation falls in the post-reform period:[37]

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were qualitatively the same. This is to be expected since the variability in dividend yields, D/P_c, is relatively low.

[34] The minimum requirement was 36 months of return data. Ex-day events with insufficient data were excluded.

[35] Most other papers rely on the event study methodology of Brown and Walters (1985). Michaely (1991) estimates the market model parameters using daily returns over the period (–25, –2) and (+2, + 25) relative to the ex-day. Lasfer (1995) uses returns on days (–200, –41). However, Poterba and Summers (1984) is the one paper that also obtains beta-estimates using monthly data over a longer time period (5 years).

[36] We experimented with daily data but obtained unreasonably low average beta estimates.

[37] Pooling generates unbiased standard errors if the disturbance variances across the two periods are equal. We report both pooled and disaggregated estimates.

$$\left(\frac{P_c - P_e}{P_c}\right)_i = \alpha\left(\frac{D}{P_c}\right)_i + \beta\left(PostFA97\frac{D}{P_c}\right)_i + \varepsilon_i . \qquad (10)$$

Support for our tax hypothesis of a significant decline in drop-off ratios would require the rejection of the null H_0: $\beta = 0$ in favour of the alternative H_A: $\beta < 0$.

Tests for tax clientele effects relate drop-off ratios to dividend yield. There are various ways to measure the dividend yield and hence various ways to categorise stocks into clientele groups. One approach that has been used in a number of papers[38] is to compute the instantaneous dividend yield (D/P_c). This approach will, therefore, classify according to dividend events and is likely to result in different dividend payments by the same company being classified into different groups.[39] An alternative approach is to use a smoothed measure of the dividend yield for each company by averaging the total dividend payments over a year. Such a measure could either be historical or prospective (using dividend forecasts). In principle, the latter is to be preferred, as clienteles should be based upon anticipated dividend yields.

Measuring the (smoothed) dividend yield of the company paying the dividend, rather than the instantaneous yield of a particular dividend event, is, we would argue, more in line with the spirit of the tax-clientele hypothesis, and is also more realistic given the far higher transaction costs that would be incurred in continuously changing portfolio composition in response to particular dividend events. We therefore focus our analysis on a smoothed measure of the dividend yield, although we present results for the instantaneous measure for comparison with existing papers.

For each period, we categorize ex-day observations into five equally-sized clientele groups on the basis of the forecasted (annual) dividend yield for the stock at the time of the dividend payment.[40] This allows us to test for clientele effects by comparing estimated drop-off ratios for each yield quintile before and after 2 July 1997. Using our regression approach (9), we first test whether drop-off ratios were increasing in dividend yield by comparing the slope coefficients (α) across different yield quintiles. Using (10), we then test whether higher-yielding quintiles experienced a sharper drop in response to FA97.

[38] See for example Lakonishok and Vermaelen (1983) or Lasfer (1995).

[39] For instance, some companies pay low interim dividends and a high final dividend. The instantaneous dividend yield approach would classify the interim dividend events in a lower yield category than the final dividend events.

[40] We use the yield forecast as available on Datastream.

Rather than splitting the sample into yield quintiles, we also test for continuous clientele effects and introduce the annualised dividend yield (D^Y) into our regressions:

$$\left(\frac{P_c - P_e}{P_c}\right)_i = \alpha\left(\frac{D}{P_c}\right)_i + \gamma\left(D^Y \frac{D}{P_c}\right)_i + \varepsilon_i \,. \tag{11}$$

If drop-off ratios were increasing in prospective dividend yields, the coefficient on the interactive term should be positive and significant. Thus, evidence of tax clienteles would require rejection of the null H_0: $\gamma = 0$ in favour of the alternative H_A: $\gamma > 0$. We also use this framework to test whether clientele effects were less prominent following FA97.

C. Short-term trading and clustering

Kalay (1982), Lakonishok and Vermaelen (1983) and others have noted that the tax interpretation of ex-dividend price behaviour is flawed if prices around ex-days are influenced more by the behaviour of short-term traders than the long-term investors in the company. The argument involves the implicit assumption of a change in the identity of the marginal investor around ex-dividend days. In the UK, pension funds were the class of investors that could potentially make the largest profits on dividend capture trading, at least prior to 1997. However, with an ownership share of over one third of UK equities pension funds were also the single biggest class of investors and thus the most likely "marginal" shareholders in the longer term. If the "trading" clientele corresponded to the "holding" clientele in the UK, the conflict between the short-term trading interpretation and the tax interpretation is less apparent. Moreover, tax-motivated short-term trading activities were seriously constrained by restrictions in the tax code as noted by Poterba and Summers (1984) and Lasfer (1995). The latter specifically investigates the relevance of short-term trading to the UK and concludes that ex-day returns in the UK are not affected by short-term trading. This makes ex-dividend evidence from the UK particularly useful in testing the impact of dividend taxation.

Another methodological issue that has to be addressed when dividend data is used is the possible clustering of dividend events on particular days. This is certainly a major feature of our sample: the 8,382 ex-day observations occurred on only 274 different calendar dates with the majority of payments being made on Mondays. This raises the possibility that the innovations might be correlated and OLS standard errors would then be biased.[41] However, there is no reason

[41] OLS standard errors would understate the true standard errors (Boyd and Jagannathan, 1994).

to suspect the error terms to be correlated when the corresponding ex-days occur on different dates. Neither are there reasons to suspect that the dividend yield (D/P_c) is correlated with the error term. For estimation purposes, we first ignore the possibility of contemporaneous correlation due to multiple observations on the same ex-dividend day. Indeed, the majority of papers treats each ex-day event as a separate observation. Following Boyd and Jagannathan (1994) and Green and Rydqvist (1999), we then check for the robustness of our results by forming portfolios across all stocks going ex-dividend on the same calendar date.[42]

III. Empirical results

We start by considering the evidence regarding the first hypothesis: that pension funds were the effective marginal UK investor group, and that dividend taxation affected their valuation of dividends. In Panel A of Table IV we present evidence on the average drop-off ratios and ex-day returns for our two samples. Before the 1997 reform the mean unadjusted DOR was 0.87 for the whole sample and 0.92 in the sample of the 250 largest companies. Market-adjusting results in a slight increase in these mean DORs (to 0.89 and 0.98 respectively), and in each case the median DOR lies somewhat above the mean DOR. As noted in section I, the expected DORs prior to the 1997 reforms were in the range 0.75 to 1.49 depending on who was the marginal investor and on the effective capital gains tax rate. Hence our results are consistent with this theoretical range, although are, on average, somewhat lower than might be expected if UK pension funds were the marginal shareholder group for *all* companies. However, given the tax incentives that existed before FA97, pension funds had a strong preference for high-yielding companies, and so we would expect their effect on price formation of low-yielding shares to be relatively limited. We investigate the impact of possible dividend yield clientele effects in detail below.

After the 1997 reforms we observe falls in the average DORs. All median DORs are significantly lower after FA97 than before. The observed impact is greatest in the case of the large company sample, where the average DOR falls by 0.13, and the number of companies with DORs above unity falls by around six percentage points. The mean DORs are also lower, although the differences are not generally statistically significant. This greater impact in the large company sample is likely to be explained in part by pension funds' preference for taking a stake in large and liquid stocks. Panel A also reports the returns on the ex-dividend day, and in all cases there is a significant increase in the observed returns after FA97.

[42] For each trading day, we compute the average percentage price drop and the average dividend yield for that day.

As noted in the previous section, the use of average DORs raises concerns regarding the implied portfolio composition (with low dividend companies being given higher weight than high dividend companies) and the reliability of statistical inference (given the non-normality and heteroskedasticity of the errors). Hence, in Panel B of Table IV we report portfolio statistics (that weight the observations by dividend yield) and consistent estimates of standard errors. Before FA97, the estimated DOR averaged 0.87 for the whole sample and 1.02 for the largest 250 companies using unadjusted data. After FA97 the estimated DOR falls to 0.77 for the whole sample and 0.76 for the large company sample. In each case the fall is statistically significant. Hence, the portfolio statistics suggest strongly that DORs have fallen post-FA97, and that the fall in the valuation of dividends has been greatest in the largest companies. Market-adjusting the ex-day returns results in slightly higher DORs in each case, but confirms these conclusions.

There is, therefore, strong initial evidence in favour of the hypothesis that pension funds are the marginal investor class, and that taxation affects the valuation of dividends. However, as noted above, given the tax treatment of dividends and capital gains for pension funds, we would expect such investors to have a strong preference, *ceteris paribus*, for high-yielding companies. The measures reported in Table IV take sample averages, and do not allow for these possible clientele effects.

Hence, in Table V we repeat the analysis reported in Panel B of Table IV, but split each sample into yield quintiles. Note, as discussed above, that we measure the dividend yield of each dividend event by the forecast *annualised* dividend yield for that company. Similar results are obtained if the dividend yield is measured as the *instantaneous* yield obtaining for a particular dividend event; we report later some results derived on this basis. Considering first the results for the whole sample of companies, although the estimated DORs are not monotonically increasing according to yield quintile, there is nonetheless evidence that high-yielding companies had higher DORs before FA97, and that the fall in DORs has been greatest for higher-yielding companies. The fall is most pronounced in the top-yielding quintile where the DOR fell significantly after FA97 by 15%, with a standard error of about 4%. Recall that the expected fall in the DOR, if pensions funds are the marginal investor class, is 20%.

In Panel B, we repeat the analysis for the largest 250 companies. The results are qualitatively similar. As noted previously, the DORs for this sample are somewhat higher; for instance, in the case of the highest yielding quintile the DORs average around 1.1. The fall in the DORs is also significantly greater. For the top-yielding quintile the DOR fell on average by 27% on a market-adjusted basis and 30% on an unadjusted basis. The falls in the DOR are statistically significant for the top four quintile groups using unadjusted ex-day prices. The results are somewhat less

significant when the ex-day prices are market-adjusted, but again for each of the top four quintiles the DORs fall after FA97.

As mentioned in section II.C, there is heavy clustering of dividend payments onto particular days of the week (especially Mondays), which introduces the possibility that the innovations in our models are correlated. In order to investigate this issue we repeat the analysis reported in Table V (for the adjusted prices) but instead of treating each dividend event as a separate observation we construct a portfolio for each day upon which a dividend event occurs. The number of dividend events within these portfolios varies between 1 and 74. We then calculate the weighted average price drop for each portfolio and perform a weighted least squares regression, where the weights reflect the number of dividend events in each portfolio. The results are presented in Table VI. As can be seen, they are similar to those reported earlier; in particular the effects of FA97 are generally strongest in the top dividend yield quintiles. Event clustering does not, therefore, seem to be affecting the estimates unduly, and so in the remainder of the paper we only report the results treating each dividend event as a separate observation.

One disadvantage of splitting the samples into yield quintiles is that the resulting sub-samples can become quite small. Therefore, in Table VII we estimate regressions with the dividend yield included as an explanatory variable (see equation 11). We expect the dividend yield to have a positive effect upon the level of the DOR. We also experiment with allowing the impact of the dividend yield on the DOR to change after FA97, as might be expected given that pension funds' tax preference for dividend income is likely to have fallen. This we do by interacting the FA97 dummy with the dividend yield, thereby investigating whether the sensitivity of the DOR to the dividend yield declined immediately after FA97 (as measured by δ_1 in the regressions). However, we would not necessarily expect a change in the distribution of the DORs straight after FA97, as pension funds are unlikely to have immediately re-balanced their portfolios. Therefore we investigate by interacting a time trend with the dividend yield (as measured by δ_2 in the regressions).

Panel A reports the results when the dividend yield is measured on an annualised basis. For the whole sample the first model confirms a significant fall in DORs after FA97, with significantly higher DORs for higher-yielding companies. In this sample the impact of FA97 on the sensitivity of DORs to the dividend yield is negative but not significant (models 2 and 3). For the sample including only the largest 250 companies the results again confirm a significant fall in DORs, and a significant clientele effect. There is also some evidence to suggest a fall in the sensitivity of DORs to dividend yields after FA97 (as measured by the estimate of δ_1 in model 2). When both interactive dummies are included together they are jointly significant (although the

estimated fall in the DORs, as measured by β, loses individual statistical significance). The results are qualitatively similar whether the ex-day price is adjusted or not.

In Panel B we report results using an instantaneous measure of the dividend yield (in line with some previous papers). We do not report the results for the interactive terms, which were statistically insignificant in both samples. The results confirm those in Panel A: there are strong clientele effects in both samples and significant falls in DORs after FA97.[43]

We also tested for a change in the valuation of dividends in response to the FA97 reforms that took effect as of April 1999. We included (in equations 10 and 11) a new interactive term obtained by pre-multiplying the dividend yield with a one/zero indicator for whether or not the event occurred after 6 April 1999. The coefficient on the interactive term turned out to be insignificant in all regressions, and its inclusion did not change any of the other coefficients. This suggests that dividends paid in the 9 months after 6 April 1999 were not differently valued from those paid in the 21 months since the day FA97 was passed. It also implies that non-resident investors, charitable bodies, or individuals investing through tax-privileged savings accounts had, in contrast to pension funds, no noticeable impact on the ex-day pricing of UK equities.

To summarize the results to date, there is strong evidence of clientele effects in the UK. We find drop-off ratios that are consistent with theoretical predictions and which increase, on average, with the observed dividend yield. We have also found reductions in DORs after FA97, with the greatest, and most significant, reductions being observed for those high-yielding companies likely (given the tax discrimination in favour of dividends) to have been particularly attractive to pension funds. These results suggest that pension funds were, for some companies, the effective marginal investor class, and that taxation significantly affects the valuation of dividend income.

We turn finally to possible implications of these findings. The changes introduced in FA97 would be expected to have important implications, over time, on pension funds' investment policies. In particular, the removal of tax discrimination in favour of dividend distributions should induce pension funds to rebalance their portfolios in favour of lower-yielding companies. The impact of such a reallocation should be observed in the relative valuation of high-yielding versus

[43] We also investigated whether company size, which might act as a proxy for liquidity, has an impact on DORs. We do find a small (significant) positive impact of size (as measured by the log of market capitalisation) in the regressions for the whole sample, but no effect in the sample of the largest 250 companies. This confirms our earlier findings that the largest companies have higher DORs, but also suggests that any additional size effects are limited to small and mid-sized companies, as might be expected. None of the conclusions are affected by the inclusion of size effects, however.

low-yielding companies. To investigate whether such an effect has occurred in the UK, we computed total return indices for various portfolios of high- and low-yielding companies.

We present in Figure 1 the results for the sample of the 250 largest companies (the results for the whole sample are even more pronounced). We grouped the companies according to their dividend yield in 1997.[44] We then computed the total returns on these portfolios over our sample period (from the start of 1995 until the end of 1999). As can be seen, low-yielding companies have massively out-performed high-yielding companies over the period. However, we do not observe a clear break in performance around July 1997; the low-yielding portfolios have out-performed the high-yielding portfolios over the whole period. It may be, of course, that the change of government and the tax change started to be anticipated (the Labour Government was elected, after 18 years of Conservative administration, on 1 May 1997) before it was announced on 2 July 1997. We would also expect the effect of FA97 on pension funds' portfolio decisions to occur over time rather than instantaneously. Both these factors make an event study around FA97 infeasible. All we can claim at this stage is that the results are striking, and are at least consistent with pension funds revising their relative valuations of high- and low-yielding stocks.[45]

The second implication we briefly consider is the impact of FA97 on the dividend decisions of firms. Most theories of dividend behaviour (including the traditional and tax-capitalisation theories[46]) predict that the removal of tax discrimination in favour of dividend distributions should reduce dividend payout ratios. Also, the main justification offered by the government for the policy change was that, by reducing pressure for high dividend payouts, financial constraints that might limit investment in some companies would be relaxed. In Table VIII we present some initial evidence on the dividend payouts of the non-financial companies in our samples for which accounting information is available for at least two years both before and after FA97.

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[44] We categorised companies into 1997 yield quartiles rather than quintiles to ensure a sufficiently large sample size since we deleted companies with incomplete daily return data during 1 January 1995 and 31 December 1999 as well as those which would not be classified as low- (or high-) yielding stocks in the other years.

[45] The relative under-performance of high-yielding stocks was also reported in the press: "Last year the FTSE All-Share Index rose 10.9% in capital terms, while the specialist higher yield indices, the FTSE 350 Higher Yield and the Dresdner Kleinwort Benson TOPSI-100, returned only 5.9% and 5.3% respectively. The Higher Yield Index yields about 130% of the All-Share and the TOPSI-100 almost 150%." (Investment Week, February 1999).

[46] See Poterba and Summers (1985) and Zodrow (1991) for a discussion of the theories.

Panel A reports average dividend payout ratios for the years 1994 to 1999. As can be seen, there is little evidence, as yet, of a general decline in dividend payouts. However, companies with the highest payout ratios prior to FA97 have on average markedly cut back dividend payments.[47] The downward adjustment is also noticeable, although somewhat less marked, for the sample of companies with the highest dividend yields prior to the reforms.

In panel B we compare, for all payout groups,[48] the company-specific average dividend payout ratios before and after FA97, which we calculated as the mean of each company's annual payout ratios in the respective (1994-96 and 1997-99) periods. Again, we find (generally significant) declines in dividend payouts of companies in the top-payout group. For example, median dividends as a proportion of after-tax profits significantly fell from 68% to 52% for the high-dividend companies in the whole sample and from 72% to 56% for those in the largest 250 sample. In contrast, companies with lower dividend payouts did not cut or, in some cases, increased dividend payments after FA97.

The initial evidence is therefore consistent with the notion that FA97 not only affected equity valuation but also payout behaviour of high-dividend companies, although the accounting data for 1999 is very limited. The impact of FA97 on dividend policy, and on investment, is clearly an interesting area for future research.

[47] We grouped companies into quartiles (not quintiles so as to maintain a sufficiently large sample size) according to their average pre-FA dividend payout (and dividend yield).

[48] The results for the yield groups are qualitatively the same.

IV. Conclusions

Major changes to the tax system are relatively rare and offer an excellent opportunity to test important hypotheses. The changes introduced in the UK system of dividend taxation in July 1997 were both wide-ranging and focused, initially at least, on the largest single shareholder group in the UK, namely pension funds. We have used an analysis of the valuation of dividends to investigate (i) the importance of pension funds in setting prices (as the "marginal" investor), (ii) clientele effects more generally, and (iii) the impact of taxation on the valuation of dividend income. The UK is a particularly good market to conduct such an analysis as problems associated with short-term trading, which potentially undermine research that considers returns around the ex-day, have been found to be minimal.

Before the FA97 reforms, the UK tax system was relatively unusual in discriminating in *favour* of dividend distributions compared with retention of profit within the company. Before FA97 we find share price movements around the ex-day that are consistent with the range of estimates (depending on the effective marginal investor) implied by theory. In particular we observe average DORs in the range 0.85 to 1.1 depending on the sample and measurement of ex-day returns. We also find strong clientele effects, with DORs being positively related to dividend yields. This finding is consistent with effective rates of capital gains tax being considerably below statutory rates for many investors, and also with pension funds being the effective marginal investors for high-yielding companies.

We test this latter hypothesis by considering the impact of FA97 on the valuation of dividend income. As the immediate impact of the tax reform fell almost entirely on pension funds, we analyse the behaviour of ex-day prices before and after the reform. We find significant changes in DORs, especially for high-yielding companies. Given the strong preference of pension funds for dividend income, prior to FA97, this provides strong evidence that pension funds were the effective marginal investors for high-yielding companies, and that taxation influences the valuation of companies. The reduction in DORs that we observe is also consistent with the range implied by theory. FA97 reduced the valuation of dividend income of pension funds by 20%; for the companies in the top quintile, as measured by dividend yield, we find reductions in the average DORs of 15% to 30% depending on company size and measurement.

The changes introduced in FA97 should result in significant changes in pension funds' asset allocation. In particular, the removal of tax credits on dividend payments should, *ceteris paribus*, reduce the attractiveness of high-yielding companies relative to lower-yielding companies. We

investigate this issue by constructing portfolios of companies according to their dividend yield, and comparing the total returns achieved by these portfolios in the five-year period around FA97. Although there are clearly many factors that could influence the relative performance of low and high-yielding companies, we find that high-yielding companies have under-performed the market since July 1997, and also that low-yielding companies have spectacularly out-performed during this period. We also briefly investigate the impact of the tax reform on the dividend policy of companies and find initial evidence of significant reductions in dividend payout ratios for high-dividend companies. We leave these issues for future research.

Table IV: Drop-off ratios and ex-day returns

In panel A we report for each period mean and median drop-off ratios (DOR) and rates of return (R) on the ex-day. The whole sample comprises 8,382 dividend events, with 4,327 occurring before FA97 and 4,055 after FA97. The sample of the largest 250 companies contains 2,289 dividend events, with 1,169 occurring before FA97 and 1,120 after FA97. Use of market-adjusted ex-day prices is denoted by an asterisk. "N>1 (< 0)" measures the percentage of observations for which DOR (R) is greater than 1 (less than 0). We test the significance of the fall in DORs (rise in returns) and employ a one-sided t-test for the difference in means (we report the standard error) and the Mann-Whitney rank-sum test for the difference in medians (we report the z-statistic). ** (*) denotes significance at 5% (10%). Panel B estimates the drop-off ratios using the portfolio statistics rather than the unweighted average reported in panel A. The drop-off ratios for each period are estimated as the slope coefficient in the regression $(P_c - P_e)/P_c = \alpha\ (D/P_c) + \varepsilon$. A 5% (10%) significant fall in drop-off ratios is denoted by ** (*). Robust standard errors are reported in brackets.

Panel A: Descriptive Statistics: Unadjusted and market-adjusted drop-off ratios and ex-day returns

		Pre-FA97			Post-FA97			Difference	
		Mean (s.e.)	Median	N>1(<0)	Mean (s.e.)	Median	N>1(<0)	Mean (s.e.)	Median (z-stat)
Whole sample	DOR	0.87	0.97	44%	0.78	0.88	38%	-0.09*	-0.09**
		(0.03)			(0.06)			(0.06)	(-7.15)
	DOR*	0.89	0.99	49%	0.89	0.93	45%	-0.00	-0.06**
		(0.04)			(0.06)			(0.07)	(-3.18)
	R	0.25	0.03	44%	0.48	0.22	38%	0.221**	0.19**
		(0.05)			(0.04)			(0.07)	(8.22)
	R*	0.23	0.02	49%	0.35	0.14	45%	0.12**	0.12**
		(0.05)			(0.04)			(0.07)	(4.36)
Largest 250	DOR	0.92	0.99	47%	0.71	0.85	40%	-0.21*	-0.13**
		(0.03)			(0.16)			(0.16)	(4.44)
	DOR*	0.98	1.06	54%	0.92	0.93	48%	-0.06	-0.13**
		(0.03)			(0.16)			(0.16)	(2.40)
	R	0.06	0.02	47%	0.39	0.22	40%	0.33**	0.20**
		(0.04)			(0.04)			(0.07)	(5.03)
	R*	-0.01	-0.10	54%	0.23	0.10	48%	0.24**	0.20**
		(0.04)			(0.06)			(0.07)	(3.42)

Panel B: Portfolio Statistics

	Unadjusted ex-day prices			Market-adjusted ex-day prices		
	Pre-FA97	Post-FA97	Difference	Pre-FA97	Post-FA97	Difference
Whole sample	0.873	0.771	-0.103**	0.885	0.807	-0.079**
	(0.03)	(0.02)	(0.04)	(0.03)	(0.02)	(0.04)
Largest 250	1.021	0.760	-0.261**	1.050	0.832	-0.218**
	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.04)

Table V: Clientele effects – drop-off ratios by yield quintiles

In panels A and B we group observations according to their annualised dividend yield (forecast) and estimate the portfolio statistic for each quintile and sub-period as the slope coefficient in the regression $(P_c - P_e)/P_c = \alpha\,(D/P_c) + \varepsilon$. The number of observations per sample and period is shown in Obs Pre/Post. "N>1" is the percentage of observations for which the drop-off ratio exceeds one. "Diff." measures the difference in portfolio statistics between the two periods. ** (*) denotes significance at 5% (10%). Robust standard errors are reported in brackets.

Panel A: Portfolio Statistics – Whole sample

		Unadjusted ex-day prices					Market-adjusted ex-day prices				
Yield Quintiles	Obs Pre/Post	Pre-FA97	N>1	Post-FA97	N>1	Diff.	Pre-FA97	N>1	Post-FA97	N>1	Diff.
1	866/811	0.619	44%	0.698	46%	0.079	0.615	49%	0.823	52%	0.208
		(0.11)		(0.11)		(0.16)	(0.11)		(0.11)		(0.15)
2	865/811	0.529	43%	0.527	36%	-0.002	0.544	47%	0.610	44%	0.066
		(0.25)		(0.08)		(0.26)	(0.25)		(0.08)		(0.26)
3	865/811	0.887	43%	0.734	39%	-0.153**	0.898	46%	0.766	46%	-0.133**
		(0.03)		(0.06)		(0.07)	(0.03)		(0.06)		(0.07)
4	865/811	0.853	45%	0.740	35%	-0.113*	0.861	51%	0.779	45%	-0.082
		(0.05)		(0.04)		(0.06)	(0.05)		(0.04)		(0.06)
5	866/811	0.967	44%	0.821	33%	-0.146**	0.982	52%	0.848	40%	-0.134**
		(0.02)		(0.03)		(0.04)	(0.02)		(0.03)		(0.04)

Panel B: Portfolio Statistics – Largest 250 companies

		Unadjusted ex-day prices					Market-adjusted ex-day prices				
Yield Quintiles	Obs Pre/Post	Pre-FA97	N>1	Post-FA97	N>1	Diff.	Pre-FA97	N>1	Post-FA97	N>1	Diff.
1	234/224	0.739	41%	0.777	46%	0.038	0.813	51%	0.818	52%	0.005
		(0.07)		(0.18)		(0.20)	(0.07)		(0.19)		(0.20)
2	234/224	0.906	44%	0.592	40%	-0.314**	0.959	50%	0.739	49%	-0.220*
		(0.06)		(0.12)		(0.13)	(0.05)		(0.11)		(0.12)
3	233/224	0.908	48%	0.668	39%	-0.241**	0.947	50%	0.848	49%	-0.099
		(0.05)		(0.09)		(0.10)	(0.05)		(0.08)		(0.10)
4	234/224	1.013	50%	0.841	44%	-0.172**	1.013	56%	0.869	46%	-0.144*
		(0.05)		(0.06)		(0.08)	(0.04)		(0.06)		(0.08)
5	234/224	1.100	53%	0.770	32%	-0.330**	1.132	63%	0.826	43%	-0.306**
		(0.04)		(0.04)		(0.06)	(0.03)		(0.04)		(0.05)

Table VI: Drop-off ratios for portfolios of same-day dividends

For each sample and quintile-specific subsample, same-day events are grouped into portfolios. Portfolio weights are positively related to dividend yield. The number of portfolios (calendar dates) per sample and period is shown in Obs Pre/Post. For each portfolio we calculate weighted average price drop (Pc – Pe)/Pc and weighted average dividend yield (D/Pc). We then estimate the slope coefficient in the regression $(Pc - Pe)/Pc = \alpha\,(D/Pc) + \varepsilon$. The regression is a weighted least squares regression with the weights given by the number of ex-day events per portfolio. "Diff." measures the difference in slope coefficients between the two periods. ** (*) denotes a 5% (10%) significant difference. Robust standard errors are reported in brackets.

Weighted Least Squares Estimates - Same-day events grouped into yield-weighted portfolios								
Yield Quintiles	Whole sample (adjusted prices)				Largest 250 companies (adjusted prices)			
	Obs Pre/Post	Pre-FA97	Post-FA97	Diff.	Obs Pre/Post	Pre-FA97	Post-FA97	Diff.
ALL	140/134	0.906	0.826	-0.080	134/129	1.065	0.826	-0.238**
		(0.04)	(0.03)	(0.05)		(0.03)	(0.04)	(0.05)
1	134/130	0.632	0.799	0.167	105/95	0.811	0.861	0.050
		(0.11)	(0.11)	(0.15)		(0.06)	(0.22)	(0.23)
2	133/128	0.532	0.595	0.063	103/101	0.958	0.726	-0.232*
		(0.32)	(0.09)	(0.33)		(0.05)	(0.12)	(0.13)
3	128/131	0.929	0.765	-0.165*	94/100	0.949	0.849	-0.101
		(0.05)	(0.07)	(0.09)		(0.06)	(0.08)	(0.11)
4	132/127	0.866	0.770	-0.096	100/96	1.009	0.868	-0.141*
		(0.05)	(0.05)	(0.07)		(0.05)	(0.07)	(0.08)
5	130/125	0.999	0.872	-0.127**	101/95	1.138	0.819	-0.319**
		(0.03)	(0.04)	(0.05)		(0.03)	(0.05)	(0.06)

Table VII: Clientele effects – drop-off ratio regressions

In Panel A we estimate the change in the drop-off ratios while allowing for a "continuous" clientele effect by estimating the regression:

$$(P_c - P_e)/P_c = \alpha\,(D/P_c) + \beta\,(\text{PostFA97} * D/P_c) + \gamma\,(D^Y * D/P_c) + \delta_1\,(\text{PostFA97} * D^Y * D/P_c) + \delta_2\,(\text{month} * D^Y * D/P_c) + \varepsilon.$$

D^Y is the annualised dividend yield, PostFA97 is a 0/1 dummy for whether or not the observation falls into the post-FA97 period, and month is a time trend taking the value 1 to 30 for each of the 30 months as of FA97 and zero before. The whole sample contains 8,382 dividend events, and the sample for the largest 250 companies contains 2,289 dividend events. In panel B we briefly consider how the portfolio statistics change if we control for the instantaneous dividend yield (instead of the annualised yield) by estimating the regression: $(P_c - P_e)/P_c = \alpha\,(D/P_c) + \beta\,(\text{PostFA97} * D/P_c) + \gamma\,(D/P_c * D/P_c) + \varepsilon$. 5% (10%) significant reform-effects or yield-effects are denoted by ** (*). Robust standard errors are reported in brackets.

Panel A: Portfolio Statistics - Clientele effects

	Unadjusted ex-day prices						Market-adjusted ex-day prices					
	α	β	γ	δ_1	δ_2	R^2	α	β	γ	δ_1	δ_2	R^2
Whole sample	0.795	-0.137**	0.013**	-	-	0.29	0.813	-0.110**	0.012**	-	-	0.30
	(0.04)	(0.04)	(0.00)				(0.04)	(0.04)	(0.00)			
	0.759	-0.090	0.018**	-0.007	-	0.29	0.771	-0.057	0.018**	-0.008	-	0.30
	(0.07)	(0.07)	(0.01)	(0.01)			(0.07)	(0.07)	(0.01)	(0.01)		
	0.771	-0.115**	0.016**	-	-0.000	0.29	0.790	-0.089**	0.015**	-	-0.000	0.30
	(0.05)	(0.05)	(0.01)		(0.00)		(0.05)	(0.04)	(0.01)		(0.00)	
Largest 250	0.918	-0.271**	0.019**	-	-	0.52	0.973	-0.226**	0.014*	-	-	0.55
	(0.05)	(0.04)	(0.01)				(0.05)	(0.04)	(0.01)			
	0.776	-0.068	0.045**	-0.036**	-	0.52	0.824	-0.013	0.041**	-0.038**	-	0.55
	(0.07)	(0.10)	(0.01)	(0.02)			(0.07)	(0.09)	(0.01)	(0.02)		
	0.884	-0.222**	0.025**	-	-0.001	0.52	0.947	-0.189**	0.019**	-	-0.000	0.55
	(0.05)	(0.05)	(0.01)		(0.00)		(0.05)	(0.05)	(0.01)		(0.00)	

Panel B: Portfolio Statistics - Clientele effects with instantaneous dividend yields

	Unadjusted ex-day prices				Market-adjusted ex-day prices			
	α	β	γ	R^2	α	β	γ	R^2
Whole sample	0.845	-0.131**	0.008**	0.29	0.862	-0.101**	0.006**	0.30
	(0.03)	(0.03)	(0.00)		(0.03)	(0.04)	(0.00)	
Largest 250	0.960	-0.241**	0.013**	0.52	1.007	-0.204**	0.009**	0.55
	(0.02)	(0.04)	(0.00)		(0.02)	(0.04)	(0.00)	

Table VIII: Dividend payout before and after FA97

Panel A shows annual mean and median dividends as a proportion of pre-tax profits (D/PTP) and of net profits (earned for ordinary) (D/EfO). We consider all firms in each sample as well as firms in the "highest pre-FA97 payout group" and "highest pre-FA97 yield group", which contain the top 25% of firms ranked according to D/PTP and dividend yield (D/market value) averaged over the years 1994-6. In panel B we consider companies in all payout-quartiles, where group 4 corresponds to the highest payout group in Panel A. For each company we calculate the mean dividend payout ratios both for the pre- and the post-FA97 period. We then compare mean and median (firm-specific average) D/PTP and D/EfO and report the t-statistic of the difference in means and the z-statistic of the Mann-Whitney test of the difference in medians. ** denotes a 5% significant decline in dividend payout in response to FA97. Companies included had at least 2 accounting year-ends both before and after FA97. The accounting year is assumed to run from July to June; i.e. year-ends between 1/7/199X – 30/6/199X+1 are grouped in year 199X. Thus, years 1994-6 are pre-FA97 year-ends and 1997-9 post-FA97 year-ends.

Panel A: Annual Dividend Payout Ratios

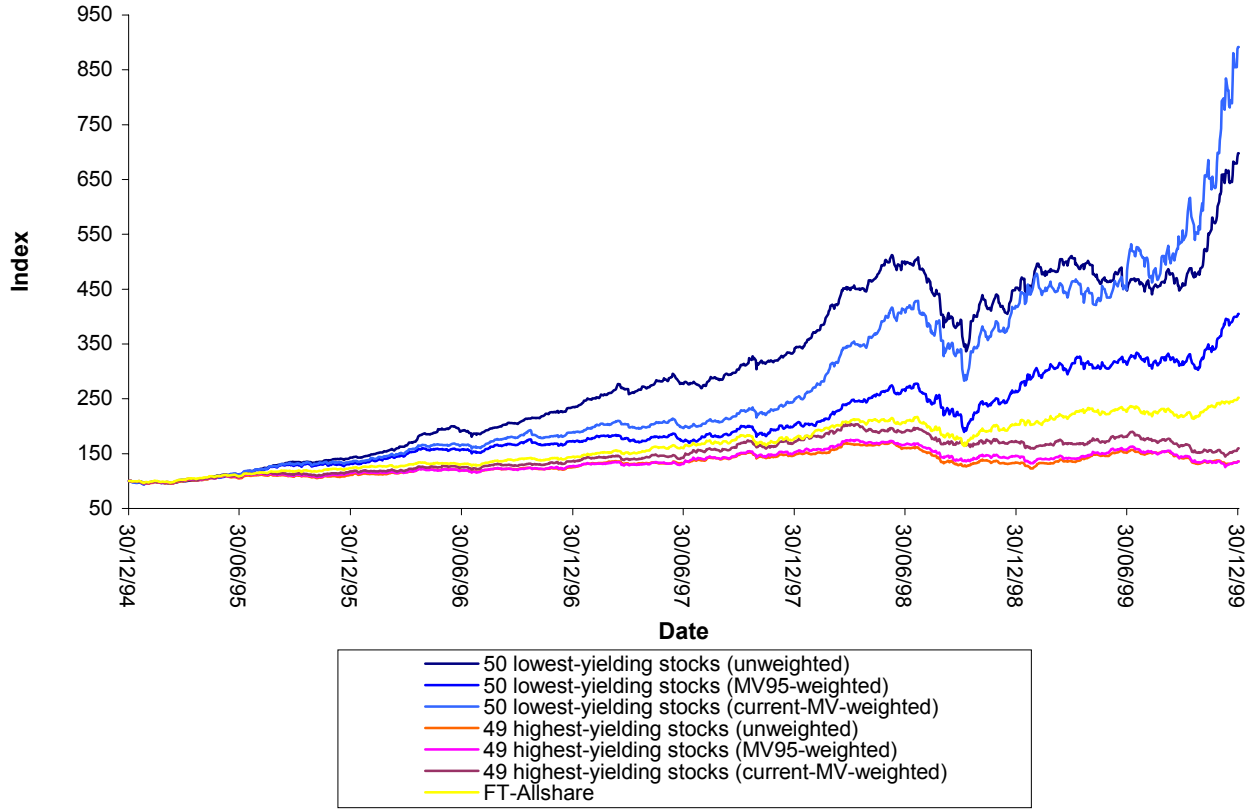
		All Firms In Sample					Highest Pre-FA97 Payout Group					Highest Pre-FA97 Yield Group			
			D/PTP		D/EfO			D/PTP		D/EfO		D/PTP		D/EfO	
Sample	Year	Obs	Mean	Median	Mean	Median	Obs	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Whole sample	1994	774	31.79	28.14	49.68	43.29	200	58.08	43.13	87.37	64.84	38.39	35.43	61.83	52.87
	1995	829	31.13	27.52	47.00	41.41	208	81.67	44.60	89.37	65.37	21.95	36.99	65.95	57.53
	1996	834	31.65	28.28	46.69	41.96	209	56.63	43.24	74.52	64.26	45.43	38.76	69.83	58.75
	1997	833	28.15	27.61	41.63	40.10	208	40.72	36.21	56.05	51.87	38.46	33.53	50.77	48.79
	1998	833	26.23	27.96	53.35	40.79	209	20.10	35.69	54.95	52.20	12.30	32.83	74.16	48.70
	1999	109	35.08	27.85	48.00	41.83	26	53.86	32.77	77.03	48.97	32.98	30.35	47.63	40.05
Largest 250	1994	248	30.28	29.81	49.95	46.03	60	50.24	45.10	79.79	67.12	36.18	36.22	65.50	56.33
	1995	257	32.57	29.89	50.76	45.88	63	54.24	45.88	84.90	75.10	46.97	39.11	74.67	61.20
	1996	257	34.65	30.84	52.22	45.31	64	54.26	45.52	78.80	69.11	54.10	42.44	83.81	64.23
	1997	256	32.47	30.57	48.30	44.74	63	47.68	37.41	70.28	54.52	47.07	36.56	68.28	53.04
	1998	256	35.65	30.73	70.84	45.33	64	52.55	37.76	72.72	53.82	41.17	39.48	113.04	54.81
	1999	34	38.22	27.33	55.11	37.91	9	51.68	39.23	75.12	55.77	49.12	27.12	71.49	37.12

Panel B: Average Dividend Payouts Before and After FA 1997

Sample: Payout			Mean D/PTP			Median D/PTP			Mean D/EfO			Median D/EfO		
Category		Obs	Pre-FA	Post-FA	t-stat.	Pre-FA	Post-FA	z-stat.	Pre-FA	Post-FA	t-stat.	Pre-FA	Post-FA	z-stat.
Whole sample:	1	209	3.65	14.40	1.64	14.41	17.53	5.05	19.73	32.55	2.02	22.50	25.32	3.61
	2	208	24.63	28.41	1.78	24.67	26.12	3.66	37.39	42.71	2.05	37.82	37.95	0.63
	3	208	31.88	36.74	1.20	31.91	31.34	0.15	49.34	59.67	1.03	48.21	45.96	-2.06**
	4	209	65.33	30.60	-2.57**	46.65	36.80	-8.70**	83.52	56.30	-2.77**	67.68	52.32	-8.10**
Largest 250:	1	65	16.51	15.03	-0.24	19.19	21.25	1.90	29.99	32.12	0.70	30.79	29.96	0.28
	2	64	27.00	26.40	-0.13	26.94	28.34	1.73	41.16	62.88	1.24	40.34	41.59	0.62
	3	64	34.30	45.78	1.46	34.19	36.52	2.38	52.52	73.04	1.01	51.74	51.81	-0.12
	4	64	53.31	49.70	-0.66	48.13	38.60	-4.71**	81.52	70.83	-1.01	72.37	55.81	-4.74**

Figure 1: Total return indices for low- and high-yielding companies

The lowest (highest) yield return indices consist of companies in the largest 250 sample which had complete daily return data during the period and which belonged to the lowest (highest) 25% according to the 1997 dividend yield and had below (above) average yields in the other years. For each sample we report three total return indices: unweighted, weighted by 1995 market value (MV95), and weighted by market value on the day of observation (current-MV). We also report the total return on the FT-Actuaries All Shares Index. The base date is 01/01/95.



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