DIVIDENDS AND TAXATION: A PRELIMINARY INVESTIGATION

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Research Discussion Paper
9211

October 1992

Economic Group

Reserve Bank of Australia

We are grateful to Philip Lowe and John Hawkins for helpful discussion and comments. The views expressed in this paper are those of the authors and do not necessarily reflect the views of the Reserve Bank of Australia.

ABSTRACT

Several recent tax changes have increased the incentive for companies to pay dividends compared to retaining earnings. These are the introduction of the Capital Gains Tax (CGT), dividend imputation and the taxation of the earnings of superannuation funds. In this paper we examine the determinants of a company's dividend policy and within this framework look at how these tax changes have influenced dividend payments.

We present some empirical results that suggest that both cash flow and tax considerations are significant determinants of dividend behaviour. Real dividends per share increased by about 38 per cent between 1985/86 and 1990/91. We estimate that the tax changes account for a rise in real dividends per share of about 20 per cent during that period.

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1. INTRODUCTION

From a macroeconomic perspective, dividend policy is important because of its effects on the financing behaviour of firms and because of its implications for corporate saving. The former is of particular significance to monetary authorities if a distinct change in the dividend policy of firms induces a shift in the financing preferences of firms. This has implications for the behaviour of credit and the transmission of monetary policy.

Recent changes to the tax system are likely to influence companies' dividend policies. These changes are the introduction of the capital gains tax in September 1985, the introduction of dividend imputation in July 1987 and the introduction of a 15 per cent tax on the earnings of superannuation funds in July 1988. Several recent papers have examined the impact that these changes have had on the dividend payout ratio (e.g., Nicol (1991)). In this paper we expand on this work by examining the payout behaviour over a longer time horizon and by estimating the impact of these tax changes on dividends.

We examine the behaviour of the dividend payout ratio over the period 1959/60 to 1990/91. We use three sources of data: aggregate data for private corporate trading enterprises, a sample of companies quoted on the Australian Stock Exchange, and earnings and dividend yield data from the Stock Exchange. To anticipate the results, we find that dividend payments are dependent on both cash flow and tax considerations. We estimate that the tax changes account for a rise in real dividends per share of about 20 per cent between 1985/86 and 1990/91.

The plan of the rest of the paper is as follows. Section 2 briefly discusses the theoretical determinants of dividend policy. Section 3 looks at some recent influences on the payout ratio in Australia. Section 4 examines

the trends in the payout ratio. We present some empirical results on the determinants of dividend policy in Section 5, and Section 6 concludes the paper.

2. THE DETERMINANTS OF DIVIDEND POLICY

One of the most influential works on dividend policy is by Miller and Modigliani (1961) who argued that, given a firm's investment decision, its dividend policy is irrelevant to its market valuation. The value of the firm is solely determined by the stream of future earnings. The division of earnings between dividends and retained earnings will not affect this value as long as the firm's investment policy is unaltered. There is no unique optimum dividend payout ratio. In the Modigliani/Miller environment dividends should not be paid out at all in a tax regime that discriminates against dividend income and all earnings should be retained when capital gains are taxed favourably. Of course, in practice, this is rarely the case. Other reasons have to be sought to explain the payment of dividends:

(i) Signalling

Signalling theory argues that managers (insiders) have better information about the firm's prospects than shareholders (outsiders), but the latter have an interest in receiving as much information as possible on the firm in order to determine their portfolio allocation.[1] Dividends convey a signal about a firms' present and future cash flows from investments.

(ii) Uncertainty

Gordon (1962) argues that dividends expected in the near future are less risky than those expected over a longer horizon. Risk averse shareholders will discount expected future dividends at a higher rate to compensate for the higher risk. Therefore investors will not be indifferent between the payment of current dividends and the retention

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[1] See Poterba and Summers (1984), Bhattacharya (1979), Miller and Rock (1985), Ofer and Thakor (1987) and John and Williams (1985).

of earnings. Crockett (1988) makes a similar point: if stockholders perceive the stream of cash flows generated by an investment as more uncertain than current dividend payments, they will discount it at a higher rate.

(iii) Agency costs

In agency cost models (Jensen and Meckling (1976)) the payment of dividends restricts the actions of management and so reduces costs from possible control problems caused by the separation of ownership and management.

(iv) Issue and Transaction costs

Modigliani and Miller argue that if a firm wishes to pay a higher dividend without changing its investment and borrowing plans, it may finance the dividend payment by issuing equity. In practice, this will require the company to meet the issue costs. Similarly, shareholders who require current income will be required to sell a portion of their share portfolio and will also be subject to transaction costs.

(v) Taxation

The dividend irrelevance theorem holds in a world without taxes. Differential taxes on dividends and capital gains alter the preference of individual investors for receiving income in one form or the other. This market imperfection is the main focus of this paper. Section 3 examines the effects of tax changes on individuals' preferences in the context of the switch in Australia from a classic double taxation system to a dividend imputation system.

Although the ideas presented above provide some rationale for the observed widespread payment of dividends, there is still considerable debate as to the appropriate framework for thinking about dividend policy. Without a strong theoretical foundation underlying dividend policy, it is not surprising then, that the literature provides little guidance as to the specific factors that managers consider when establishing a dividend policy. There is some agreement that firms have

target payout ratios, but are reluctant to change dividends when earnings change, believing that shareholders prefer a steady stream of dividends. However there is little agreement as to the factors that determine target payout ratios. In this paper we focus on two factors that appear to be important in Australia: cash flows and tax policy. Cash flow determines the long-run capacity of firms to pay dividends and the tax regime influences the preferences of shareholders as to the form of their returns. Other factors that may also be important are a firm's liquidity, funds requirements, access to capital markets, costs of securing external finance, income and capital gearing, and industry norms. Section 5 examines the significance of taxation, cashflow and other possible determinants of dividend payments.

3. INFLUENCES ON THE PAYOUT RATIO IN THE AUSTRALIAN CONTEXT

This section looks at factors influencing the dividend payout ratio in Australia. It focuses, in particular, on the tax treatment of dividends.

3.1 Taxes

Several major changes to the Australian tax system have been made since 1985. These have been aimed at reducing the distortions affecting company financing decisions and the allocation of investors' savings that were previously present in the tax system. Each of these changes has implications for dividend policy.

The capital gain on an asset acquired after September 1985 is subject to Capital Gains Tax (CGT). If the asset is held for more than one year, only the real gain is taxable. The capital gains tax was introduced to redress the bias in the tax system towards income received in the form of capital gains, and to reduce the distortion towards investment in those more 'speculative' assets yielding income in the form of capital gains.

In July 1987 a full imputation system was introduced which eliminated the double taxation of company income. Prior to this, company income

distributed as dividends was taxed twice, thus making returns in the form of dividends less attractive than other returns. This may have distorted investors' portfolio allocations away from equity.

The effect of dividend imputation was magnified in July 1988 when a tax of 15 per cent was imposed on the earnings of superannuation funds. Previously, superannuation funds were exempt from tax and therefore the introduction of imputation did not affect their returns. When the tax was introduced on their earnings, they were able to make use of the imputation credit. This increased the attractiveness of equity relative to alternative assets compared with the situation when funds paid no tax.

In the next section we explain how imputation operates and in the second section we examine the effects of the various tax changes on dividend policy.

3.1 (a) Dividend imputation - how it works

Corporate tax law is complex and a full discussion of dividend imputation is beyond the scope of this paper. In this section we present a simplified review of the main aspects of dividend imputation as it applies to several main classes of investors.

Prior to the introduction of dividend imputation, company tax was levied on profits earned and after-tax profits distributed as dividends were taxed again in the hands of shareholders. Dividend imputation ensures that company profits paid out as dividends are taxed only once. Companies credit their "franking accounts" with the amount of income that can be distributed as franked dividends. Credits arise mainly from tax payments made or from receiving franked dividends from the company's shareholdings. Debits arise from paying franked dividends. Table 1 provides estimates of the degree of franking for a sample of industrial and resource companies listed on the Australian Stock Exchange over the period 1987 to 1991.[2]

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[2] The sample is comprised of 126 leading industrials and 14 major resource companies.

Table 1: Franking Behaviour
(percent of dividends)

Half Year Ended	Industrials	Resources
December 1987	76.8	66.9
June 1988	84.9	52.1
December 1988	86.1	81.3
June 1989	89.0	70.1
December 1989	90.2	92.0
June 1990	82.8	88.6
December 1990	81.7	90.2
June 1991	82.5	95.5
December 1991	78.8	79.1

Source: J.B. Were & Son, *Profit Monitor*, May 1992

Shareholders receive franking credits to the extent that company tax has already been paid on dividends received. They are then able to offset these credits against taxable income that is derived from any source, not just dividends. Any excess credits cannot be refunded to a shareholder, offset against a shareholder's Medicare Levy, or carried forward. Therefore, if a shareholder has insufficient tax liabilities against which to offset the imputation credits, the credits will be lost.

Table 2 shows the effects of dividend imputation for four different groups of shareholders subject to different marginal tax rates, namely; individuals, companies, superannuation funds, and non-residents. We assume the following: a fully franked dividend of 61 cents per share is paid and each shareholder holds 100 shares.

Table 2: Impact of Dividend Imputation on Shareholders

	Individual	Super fund	Company	Non-residents
Marginal Tax Rate	47%	15%	39%	
Franked dividend	61	61	61	
Imputation credit $61*(τ/1-τ)	39	39	0	
Assessable Income	100	100	61	
Tax payable	47	15	24	
-tax credit	39	39	24	
Tax payable	8	-24	0	0
After tax return	53	85	61	61
Before-tax yield	6.1%	6.1%	6.1%	6.1%
After-tax yield	5.3%	8.5%	6.1%	6.1%

When paying tax on dividends received, shareholders are required to gross up the dividend by the amount of tax that has been paid by the company on the profit associated with the dividend. Given a 39 per cent company tax rate, τ, the tax paid is equal to

$$\text{Dividend} * \tau/(1-\tau)$$
$$= \$61*(0.39/0.61) = \$39$$

Thus for a 39 per cent company tax rate, the $61 dividend received must be grossed up by $39 and the grossed-up value of $100 must be included in their assessable income. Shareholders are then taxed at their marginal rate on the grossed up amount, but receive tax credits for the tax already paid by the company. For the individual shareholder on the top marginal rate of 47 per cent, the tax liability on the $100 is $47, but this is reduced by the tax credit of $39. The shareholder has to pay tax of $8 on the dividends received. Table 2 shows the different effects for the four groups of investors. Note that non-residents do not participate in the dividend imputation system but are exempt from dividend withholding tax if dividends received are franked.

The table shows the before and after tax yields of dividends for the different shareholders. Superannuation funds receive the highest after-tax return on dividends while individual shareholders paying tax at the top marginal rate receive the lowest. The latter group are nevertheless better off than in the previous regime where dividends would have been taxed twice, reducing the after-tax yield to 3.2 per cent (assuming unadjusted equity prices).

3.1 (b) The effect of tax changes on shareholders' preferences for retentions and dividends

In this section, we identify the effect of the changes in tax arrangements for dividends, capital gains and superannuation funds on the four different classes of shareholders previously identified: individuals, companies (other than superannuation funds), superannuation funds and overseas residents. Table 3 outlines the timetable of tax changes as they affect these groups of investors and shows the current tax position of each.

The above-mentioned tax changes should have had an influence on the desired dividend payout ratio of companies by altering the relative value of retained earnings vis-à-vis dividends. Poterba and Summers (1985) define a tax discrimination variable, θ, as the opportunity cost of retained earnings in terms of dividends foregone, both measured after personal tax. If there is no discrimination, the value of θ is one. If θ is less than one, capital gains are favoured by the tax system, if θ is greater than one, dividends are favoured. θ is defined as,

$$\theta = \frac{1-\sigma}{1-c}$$

where σ is the effective marginal personal tax rate on dividends and c is the effective marginal personal tax rate on capital gains. Below we consider θ for each of the four groups of investors we have identified and then construct an aggregate measure of θ.

Table 3: Taxation

	Individuals	Companies	Super funds	Non-residents
Dividends	Dividend imputation effective from 1 July 1987. Credits can be offset against income tax on the shareholders' income, but not against the Medicare levy.	Dividends received by a resident company are relieved from tax by the inter-corporate dividend rebate. The recipient company is able to pass the imputation credits to its shareholders.	Introduction of a 15 per cent tax on earnings in July 1988. Dividend imputation effective from that date.	Withholding tax on dividends, applied from 1 July 1960. From 1 July 1987 franked dividends exempt from withholding tax. Unfranked dividends are subject to 30% or 15% withholding tax depending on the double taxation treaty. (Most countries are covered by treaties.)
Capital Gains	Assets acquired after 19 September 1985 are subject to CGT. If the asset is held for more than one year, it applies to the real component only.	Same as for individuals.	All assets disposed of after 1 July 1988 subject to CGT at the rate of 15%. If the asset is held for more than one year, it applies to the real component only.	Assets acquired after 19 September 1985 subject to CGT. (Same marginal tax rate as applies to residents)

For **individuals**, there are a wide range of tax bands. Here, we consider two: the first for someone on average income, the second for someone paying the highest marginal personal income tax rate. The only difference this distinction makes is in the size of the tax bias. There is never a case where one of the groups of personal investors considered prefers dividends and the other prefers capital gains. There was a significant bias in favour of capital gains before the introduction of the capital gains tax. Between the introduction of the CGT and imputation, there was a slight bias in favour of capital gains. Since imputation, there has been a bias in favour of receiving dividends. Some individuals who are low marginal rate taxpayers and who have insufficient other income against which to offset the tax credits are effectively taxed at the

company tax rate. However, this is not likely to be very important because these people are unlikely to be major investors in equity.

Superannuation funds were indifferent between capital gains and receiving dividends prior to the introduction of the 15 per cent tax on their earnings in September 1988. However, the introduction of the tax, at a lower rate than the company tax rate, generated a strong bias towards receiving dividends for this group of shareholders. This is because superannuation funds can offset the extra tax credits against other taxable income.

For **overseas investors**, the withholding tax is not imposed on fully-franked dividends. This extends the benefits of imputation to overseas investors. However, because the amount of the withholding tax on a dividend will be less than the value of the imputation credit, overseas investors do not receive the full benefits received by domestic investors. Although foreign investors are disadvantaged relative to domestic investors insofar as they are unable to utilise fully tax credits derived from franked dividends, the combination of the introduction of CGT and the abolition of the dividend withholding tax for fully-franked dividends have contributed towards θ being greater than one. This, however, is only half the story, since we have not included the taxes imposed on non-residents in their home country.

To derive an aggregate measure of θ, the θ's for each group of investors need to be given appropriate weights. No data are available on equity holdings by sector. Therefore, the weights for each group are calculated from ABS data on dividends received.[3] Data are available from 1969/70. The calculated weights are plotted in Graph 1. These figures indicate that individuals' direct holdings of equity have fallen significantly over the period, from over 60 per cent in the late 1960s to 14 per cent in 1990/91. Holdings by superannuation funds and life offices rose to

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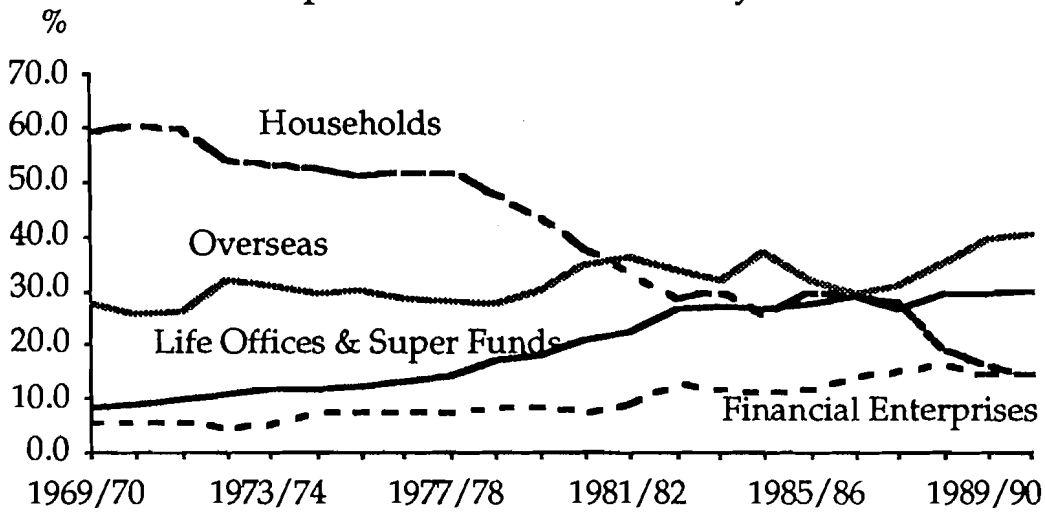
[3] The ABS provide data on dividends received by life offices and super funds and are unable to split the data any further. This complicates the analysis of tax changes since life offices are taxed at the company tax rate, while super funds are taxed at 15 per cent. However, as at September 1991 life offices held $61.8 billion of assets in super products, over 70 per cent of total assets, and these assets are taxed at the concessional rate of 15 per cent. Thus, not much is lost by making the simplifying assumption that all dividends are received by super funds.

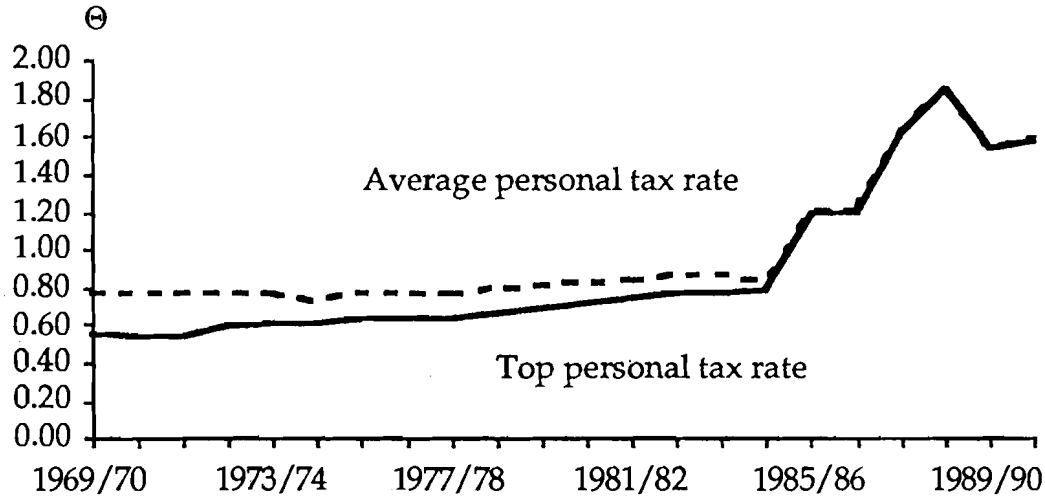
30 per cent in 1990/91 compared with about 7 per cent in the late 1960s. However, this rise has not matched the decline in individuals' holdings over the period. Holdings by overseas investors have also risen over the period.

Graph 1: Dividends Received by Sector



Graph 2 plots the aggregate measure of θ on the basis of both the average and top rate personal tax rates. Clearly, the net result of the changes in taxes since 1985/86 has been to encourage the payment of dividends by firms.

Graph 2: Aggregate Tax Discrimination Variable



3.2 Dividend Reinvestment Schemes

A related factor that has influenced the dividend payout ratio in recent years is the increase in dividend reinvestment schemes. These schemes allow shareholders to reinvest their dividend receipts in shares in the company. They resolve the conflict between a company's desire to retain profits and the shareholders' desire for a higher dividend payout by enabling the firm to recapture the dividends it pays out. Shareholders prefer to receive imputation credits sooner rather than later as the value of these credits declines in real value over time.[4]

Dividend reinvestment schemes became an important source of equity finance in the late 1980s, rising from 4 per cent of total equity raised in 1987/88 to 33 per cent in 1990/91 (see Table 4). Approximately one third of dividends were reinvested in 1990/91. Under the schemes, shares are normally priced at a discount to the market price and are attractive to small investors because of the lack of transaction costs. For companies where capital issue costs are high, dividend reinvestment plans are also a favourable option. The success of these reinvestment schemes has encouraged companies to pay a higher level of dividends in the knowledge that they will retain the funds.

Table 4: Dividend Reinvestment Schemes
(percentage of total equity raisings)

Year to June	1988	1989	1990	1991
per cent	3.8	14.2	28.9	32.7

[4] Also popular following the introduction of dividend imputation was the streaming of dividends so that franking credits were directed to those shareholders who could use them. For instance, investors could elect to receive a fully-franked cash dividend or either a bonus-in-lieu of dividends or an unfranked dividend. If the bonus shares were issued out of the share premium reserve they were not deemed as dividends. The main benefit from the latter accrued to shareholders who had pre-September 1985 shareholdings since the bonus shares issued were exempt from capital gains tax. However, from 1 July 1990 dividend streaming was brought to an end when bonus shares issued out of share premium reserves under streaming arrangments, resulted in a debit to the company's franking account.

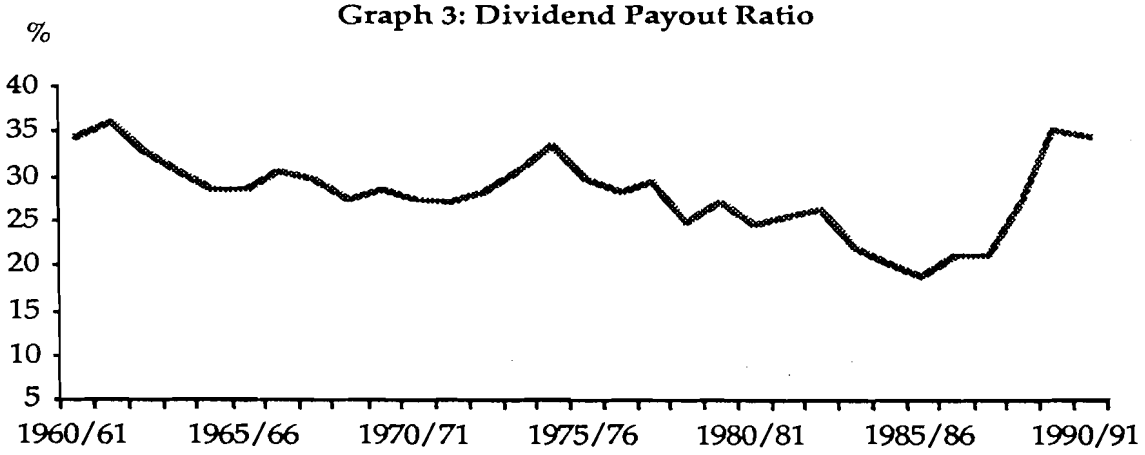
4. TRENDS IN THE DIVIDEND PAYOUT RATIO

In this section we present three different sources of information on the dividend-payout ratio. These are from the annual national accounts, from a sample of companies quoted on the Australian Stock Exchange, and from earnings and dividend yield data from the Stock Exchange. The payout ratios from the two sets of stock exchange data are significantly higher than that calculated from the national accounts data. This is partly due to the different denominators used to calculate the ratio; gross cash flow is used for the national accounts measure while net profit after tax is used for the stock exchange measures. A further reason is that the national accounts measure includes smaller companies that are more likely to have a lower payout ratio. For small firms internal funding may be much cheaper than other forms of finance as these firms are likely to face higher costs of raising debt and equity in the market.

Long-run data are available from the National Accounts. Graph 3 plots the dividend payout ratio from 1960/61. It suggests that the data can be split into four periods:

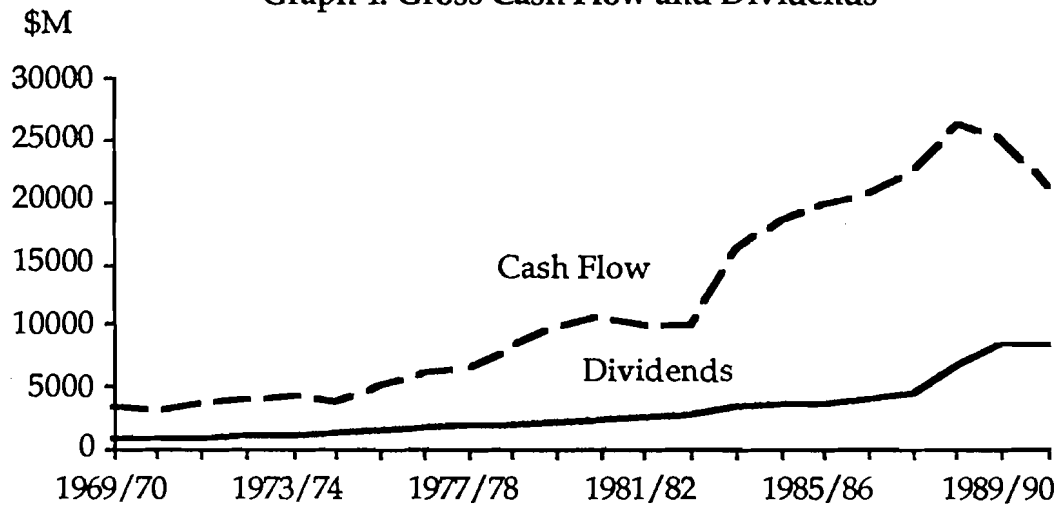
- the 1960s where the payout ratio followed a gentle downward trend.
- the mid 1970s when the payout ratio rose quite sharply.
- the mid-1970s to 1986 when the payout ratio declined sharply reaching a trough of 18 per cent in 1985/86.
- 1986/87 to the present when the payout ratio rose quite sharply.

Graph 3: Dividend Payout Ratio



Graph 4 shows the components of the payout ratio separately. Cash flow is used to approximate the amount of funds that a company has available either to distribute to shareholders in the form of dividends, or to retain to invest in the company. Dividends exhibited only slow growth until 1987. Indeed, in real terms they remained virtually unchanged. Changes in the payout ratio over this period simply reflected movements in cash flow which grew strongly between 1974 and 1980 and then again between 1983 and 1989. Since 1987, dividends (in real and nominal terms) have risen, driving the payout ratio upwards, although the fall in cash flow has also contributed to the rise in the ratio.

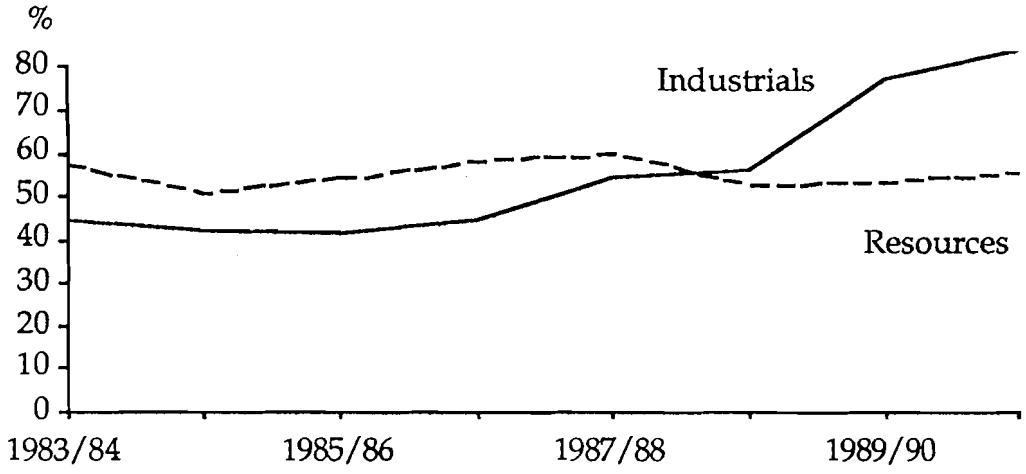
Graph 4: Gross Cash Flow and Dividends



A likely explanation of the change in dividend behaviour is that prior to the tax changes outlined earlier, companies retained at least part of any rise in cash flow because there was a significant bias in favour of retentions. More recently, changes in cash flow have been more fully reflected in changes in dividends because of the tax advantages to shareholders of receiving dividends over capital gains. Another explanation is that companies found it hard to obtain external financing during the 1970s because of credit controls and periodic weaknesses in the equity market and so chose to retain a large proportion of their earnings.

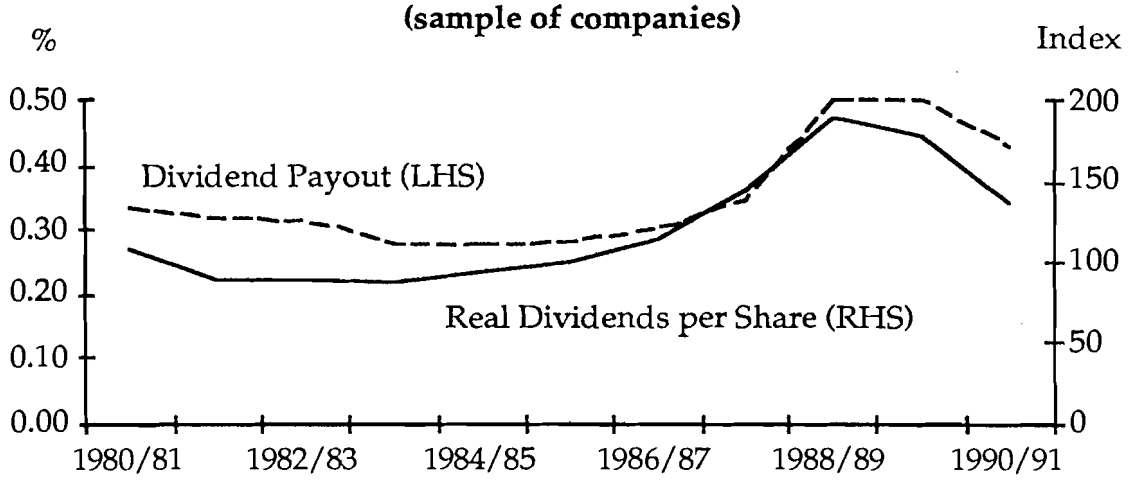
The dividend payout ratio calculated from the earnings and dividend yield data is shown in Graph 5 for companies in the industrials and resources indices. The industrial companies' payout ratio jumps sharply in 1988/89. The behaviour of the resource companies is somewhat different. The introduction of imputation appears to have had no impact on these companies and the payout ratio has remained around the 50 per cent level for much of the 1980s. Nicol (1991) suggests that mining companies pay less income tax relative to income earned than their industrial counterparts, and are less likely to be able to fully frank their dividends. Thus tax changes have a limited impact on these companies.

Graph 5: Stock Exchange Dividend Payout Ratios



Graph 6 plots two dividend payout measures for a sample of 55 non-financial companies quoted on the Australian Stock Exchange. The first measure is the average payout ratio and the second measure is an index of average real dividends per share. Both measures show a flat profile until 1987/88, a sharp rise and then a fall reflecting the depressed economic conditions in the early 1990s. The latter measure is used in the empirical work reported below.

Graph 6: Dividend Payout Ratios
(sample of companies)



The above discussion shows that tax changes have occurred which, in theory, should have led to an increase in the proportion of firms' earnings paid out as dividends. At the same time there has been an increase in the various dividend payout ratio measures. However, other factors also affect dividend payout ratios. In the final section we use an econometric model to apportion the changes in dividends to the various effects. We use a sample of 55 non-financial companies quoted on the Australian Stock Exchange. Data are available from 1980/81 to 1990/91.

5. THE DETERMINANTS OF DIVIDEND POLICY

5.1 The Model

The simple model of dividend behaviour presented below is based on the assumption that companies partially adjust dividends each period towards their target level. This partial adjustment behaviour is a common assumption in dividend models and may reflect both signalling behaviour and constraints that some companies face in capital markets. This target level of real dividends per share is given by,

$$D^*_{i,t} = \delta_i + \phi X_{i,t} \qquad (1)$$

where $D^*_{i,t}$ is the target real dividend level per share, $X_{i,t}$ represents the set of explanatory variables that affect the target level of real dividends per share, δ_i is a firm specific effect that captures the possibility that some firms may systematically wish to pay higher dividends, i=1, ..., 55 is the company index and t=1, ...,11 is the time index. The adjustment of actual dividends to their target level is assumed to be determined by,

$$\Delta D_{i,t} = \zeta(D^*_{i,t} - D_{i,t-1}) + \varepsilon_{i,t} \qquad (2)$$

where ζ is the adjustment parameter. Substituting (1) into (2) and rearranging,

$$D_{i,t} = \alpha_i + \beta_1 D_{i,t-1} + \beta_2 X_{i,t} + \varepsilon_{i,t} \qquad (3)$$

where $\beta_1 = (1 - \zeta)$, $\alpha_i = \delta_i \zeta$ and $\beta_2 = \zeta\phi$.

Note that the intercept term varies across firms but the other parameters are constant across firms. The set of explanatory variables $X_{i,t}$ includes the tax variable θ_t, calculated earlier, and a cashflow measure to capture the capacity of companies to distribute funds to shareholders. The cashflow measure, $C_{i,t}$, is real cashflow per share after adjustment of revenue and cost items associated with options, partly paid shares and convertible securities and after adjustment for intervening pro-rata issues to existing shareholders.[5] The dividend measure is real dividends per share adjusted for bonus and rights issues. All variables, with the exception of the tax discrimination variable, are in logarithms.

Other potential determinants of dividend policy were also investigated. These included capital gearing variables; the cost of debt and cost of equity; industry dummies to capture the effects of possible common features within industry groupings such as capital structure, asset profile, operating cashflow requirements, size and profitability; a size variable to proxy firms access to capital markets; and a depreciation variable. There was no evidence that these factors had a significant

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[5] For a discussion of the construction of these ratios see "The STATEX Guide to Ratios", Australian Stock Exchange.

influence on dividend policy and they were not included in the estimating equation reported below.

5.2 Estimation

Typically, panel data models are estimated using either fixed or random effects techniques. The fixed effect technique is predicated on the assumption that the effects which are specific to each firm are correlated with the other explanatory variables. As a result the individual effects are captured by the inclusion of a firm-specific dummy variable in each equation. The random effects estimator is based on the assumption that the individual effects are uncorrelated with the explanatory variables. As a result they are included in the error term and Generalised Least Squares is used.

In this case, neither technique is appropriate as (3) includes a lagged dependent variable (see Hsiao (1986)). Consistent estimates can, however, be obtained by first differencing (3) and then using instrumental variables,

$$D_{i,t} - D_{i,t-1} = \beta_1(D_{i,t-1} - D_{i,t-2}) + \beta_2(X_{i,t} - X_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \qquad (3')$$

The instruments used are the logarithm of the level of real dividends per share in period t-2, the contemporaneous change in the logarithm of real cash flow per share and the contemporaneous change in the tax discrimination variable. In the estimation, corrections were also made to the covariance matrix to allow for conditional heteroskedasticity. We also perform a test for parameter stability. To do this we split the sample into two subperiods 1980/81 to 1984/85 and 1985/86 to 1990/91 and perform a Wald test of the null hypothesis that the parameters are constant across periods. This procedure is used because we use an instrumental variables estimation technique and because we apply a heteroskedasticity correction. A review of estimation of panel-data models is provided in Appendix 1.

5.3 Results

The results of estimating equation (3') are reported in Table 5. The tax discrimination variable and the cashflow variable are correctly signed

and significant. A one per cent rise in real cashflow per share causes a 0.39 per cent rise in real dividends per share in the short run and a 0.58 per cent rise over the long run. This is consistent with the payout ratios described in Section 4 and suggests that the capacity to pay dividends is an important determinant of dividend payout behaviour.

In addition, the results support the idea that the tax system provides an incentive structure that influences whether dividends or capital gains are the preferred form of returns for investors. A 0.1 unit rise in the tax discrimination variable causes a 3.4 per cent rise in real dividends per share in the short run and a 5.0 per cent rise over the long run. A 0.1 unit rise in the tax discrimination variable is interpreted as an additional 10 per cent of a unit of after-tax dividends foregone for any given level of after-tax retained earnings.[6]

The point estimate of the coefficient on the lagged dependent variable suggests that dividends adjust fairly quickly to the desired level, with about two thirds of the adjustment occurring in the first year. The explanatory power of the model was poor. Although other factors, such as those mentioned above, may also influence dividend decisions, the influence of these factors cannot be identified in our sample. The null hypothesis of structural stability between the first and second half of the sample period could not be rejected.

The results of these regressions allow an estimate of the increase in dividend payments that resulted from the tax changes implemented since 1985 to be made.[7] Real dividends per share increased by about 38 per cent between 1985/86 and 1990/91. We estimate that the tax changes accounted for about a 20 per cent rise in real dividends per share over this period.

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[6] The effective marginal tax rates are bounded by 0 and 1 and these results apply to values within the normal ranges of these variables.

[7] The full effect on real dividends per share over the five-year period is calculated using an expanded version of equation (3') in which the lagged dependent variable is replaced using backwards substitution. The changes in the tax discrimination variable in each year are calculated and the estimated coefficients are used to calculate the current and lagged effects.

Table 5: Estimation Results

Estimated Equation:

$$D_{i,t} - D_{i,t-1} = \beta_1(D_{i,t-1} - D_{i,t-2}) + \beta_2(\theta_t - \theta_{t-1}) + \beta_3(C_{i,t} - C_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1})$$

Estimation Period: 1981-1991; 55 Non-Financial Companies.

Tax Variable	0.34
	(3.91)
Real Cashflow/Share	0.39
	(5.22)
Real Dividends/Share lagged	0.32
	(1.41)

(t-statistics in brackets)

$\bar{R}^2 = 0.08$

Structual Stability Test:
$\chi^2_{(3)} = 0.065$ (p = 0. 99)

6. CONCLUSIONS

Recent changes to the tax system have altered the incentive to pay dividends relative to retaining earnings. In this paper we highlighted the tax changes as they have affected different groups of investors and looked at other influences on dividend policy. Tax changes and cashflow are identified as two determinants of dividend policy in Australia. The estimates made in the paper suggest that the tax changes accounted for about a 20 per cent rise in real dividends per share between 1985/86 and 1990/91. Our preliminary investigations did not reveal any evidence that other factors, such as capital gearing, the cost of debt and cost of equity, industry grouping or size had a significant influence on dividend policy in Australia over the sample period.

APPENDIX 1: ESTIMATION WITH PANEL-DATA MODELS

Here we review the estimation of panel-data models. In particular we examine problems of estimation of panel-data models that contain lagged dependent variables.[8]

Consider the linear model

$$Y_{i,t} = \beta X_{i,t} + \alpha_i + \varepsilon_{i,t} \qquad (1)$$

where α_i is an individual specific component and $\varepsilon_{i,t}$ is a mean-zero time-varying error. OLS will yield consistent coefficient estimates only if $X_{i,t}$ is uncorrelated with the error term (where the error term $u_{i,t} = \alpha_i + \varepsilon_{i,t}$). Two estimators have been developed to handle the systematic tendency of α_i to be higher for some units than for others: the random effects estimator and the fixed effects estimator.[9]

If the individual specific component is assumed to be random with respect to the explanatory variables, the GLS (random effects) estimator provides efficient and consistent estimates. The GLS estimates can be obtained by OLS using the following transformation of equation (1)

$$Y_{i,t} - \psi Y_i = \beta(X_{i,t} - \psi X_i) + (\varepsilon_{i,t} - \psi \varepsilon_i) \qquad (2)$$

where variables without the time subscripts are the individual means, $\psi = 1 - \sigma_\varepsilon / \sqrt{(\sigma^2_\varepsilon + T\sigma^2_{\alpha,})}$ and where σ^2_ε is the variance of the time-varying error and σ^2_α is the variance of the individual specific error.

If however, α_i is not independent of X the random effects estimator will not give consistent estimates. In this case the individual effects are represented by a dummy variable for each individual (fixed effects estimator). Rather than include a dummy variable for each individual however, it is computationally easier to estimate the following model

$$Y_{i,t} - Y_i = \beta(X_{i,t} - X_i) + (\varepsilon_{i,t} - \varepsilon_i) \qquad (3)$$

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8 This review draws heavily on the recent paper by Keane and Runkle (1992).

9 See Amemiya and MaCurdy (1986) and Breusch, Mizon and Schmidt (1989).

The effect of subtracting individual means is to eliminate the fixed effect. The same result would be obtained if separate intercepts were estimated for each individual.

For consistency, both the fixed and the random effects estimators require that $X_{i,t}$ and $\varepsilon_{i,t}$ are uncorrelated at all leads and lags. This condition is not met in the case of a model incorporating a lagged dependent variable, as $E[Y_{i,t-1}\, \varepsilon_{i,t-1}] \neq 0$.

In this case the fixed and random effects estimators described above will not give consistent results and an alternate transformation must be used. Several authors have noted that the equation can be first differenced to remove the individual effects[10]

$$Y_{i,t} - Y_{i,t-1} = \beta_1(Y_{i,t-1} - Y_{i,t-2}) + \beta_2(X_{i,t} - X_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \qquad (4)$$

Consistent estimates of the parameters in equation (4) can be obtained using instrumental variables. OLS cannot be used as $(Y_{i,t-1} - Y_{i,t-2})$ is correlated with $(\varepsilon_{i,t} - \varepsilon_{i,t-1})$. Both $Y_{i,t-2}$ and $Y_{i,t-2} - Y_{i,t-3}$ are often suggested as appropriate instruments.

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[10] See Arellano and Bover (1990), Holtz-Eakin, Newey and Rosen (1988) and Keane and Runkle (1992).

APPENDIX 2: DATA SOURCES

Individual company data are taken from the STATEX database provided by the Australian Stock Exchange. Fifty-five companies were selected based on the following criteria: (i) the companies are in the top 100 companies by market capitalisation, (ii) the companies are non-financial entities and (iii) data from 1980/81 to 1990/91 is available. The cash flow measure is real cash flow per share after adjustment of revenue and cost items associated with options, partly paid shares and convertible securities and after adjustment for intervening pro-rata issues to existing shareholders. The dividend measure is real dividends per share adjusted for bonus and rights issues. The private consumption deflator from the *Australian National Accounts* (Australian Bureau of Statistics, Catalogue No. 5206.0, Table 11) is used as the price deflator.

The tax discrimination variable is calculated using tax rate data from *Australian Economic Statistics* (Occasional Paper No. 8, Table 2.23) published by the Reserve Bank of Australia, *"Report of the Commissioner of Taxation"*, Commissioner of Taxation and *"Budget Statements"*, Australian Government Publishing Service. Weights are calculated from data supplied by the Australian Bureau of Statistics.

Long-run dividend payout ratios are calculated using data from the *Australian National Accounts* (Australian Bureau of Statistics, Catalogue No. 5206.0, Tables 52 and 57). Stock Exchange dividend payout ratios are calculated using earnings yield and dividend yield data from the *Monthly Index Analysis* published by the Australian Stock Exchange.

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