DIVIDEND DECISIONS OF UK FIRMS AND EFFECTS OF THE FINANCIAL CRISIS

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ABSTRACT

This paper discusses the different interpretations that can be placed on the small set of variables generally used to explain dividend behaviour. Following a discussion of appropriate estimators it presents panel data estimates for declared dividend levels in the UK from 1997 to 2012, showing that fixed effect estimation is to be preferred. A number of different specifications for the aggregate sample are presented followed by disaggregated results for four groups differentiated by age and size. Interactive break dummies are used to identify changes in dividend policy during the period of the financial crisis. The paper finds considerable heterogeneity in dividend behaviour both across groups and over time.

1. Introduction

This paper studies dividend behaviour in UK public firms for the period 1997-2012. We address three specific issues in greater detail than some previous studies. First, we examine different rationales for standard specifications of the dividend model and propose multiple specifications. Second, we examine the implications of different estimation methods, including that caused by correlation between the regressors and the error term and also potential sample selection bias. Thirdly we examine the changes that may have occurred in dividend behaviour since the start of the financial crisis in 2007-8.

Although the study is a single-country one (the UK) and thus exhibits less institutional variation than some other work, we believe that this is balanced by having to worry less about un-measured cultural, policy and institutional factors. The paper is organised as follows. We begin with a selective literature review (Section 2) and then provide a set of basic specifications (Section 3). Estimation and sampling issues are dealt with in Section 4. Details of the sample and data are given in Section 5. Initial results are presented in Section 6. Issues connected with the financial crisis are introduced in Section 7. The results are discussed in Section 8. Robustness tests are reported in Section 9 with concluding comments in Section 10.

2. Dividend Theories

Much of what we know about the propensity to pay - and the intensity of - cash dividends has been established through surveys of company executives in Lintner (1956), Graham and Harvey (2001), Brav et al (2005), and Servais and Tufano (2006). There is considerable consistency over time and place, with many of Lintner's ideas reflected in the survey responses tabulated in Brav et al (2005) *viz*. the importance of the historical level; the existence of payout ratios or other targets; the tendency to smooth with respect to earnings; and an asymmetric penalty for cutting or ceasing payments. Theoretical work has informed the interpretation of these practitioner surveys. Major advances are summarised in overviews such as Allen and Michaely (2003), and Leary and Michaely (2011). Empirical econometric work has reported results from specifications based on these theories, including for the UK and EU, by Benito and Young (2003) and Von Eije and Megginson (2008).

We identify from the literature five sets of major issues, noting for each set the contending variables that represent or proxy for an influence. These sets are: substitution between sources and uses of funds; signalling and smoothing; agency concerns; mis-pricing issues and catering to investors; and company characteristics. We deal with these in turn.

2.1 Substitution between sources and uses of funds. National institutional features appear to affect dividend behaviour so that it is important not to infer behaviour from a single source. Survey evidence suggests that North American firms will prefer to defer or cut investment, borrow externally or sell assets before cutting dividends (Brav et al 2005). This is not true for all global regions however. Although firms may be reluctant to cut dividends, the global survey (Servais and Tufano 2006) shows that it will be done in 41% of cases where there is a shortfall in earnings. They will *defer* investment as a second choice (27% likely); with a third choice of borrowing up to the credit rating limit (26% likely) and in fourth place cutting investment or selling assets (14% each). The variety of results in these studies is much richer than the simple hierarchy assumed by Lintner (1956) with a sequential ordering of investment, dividends and borrowing.[1]

It is not generally reasonable to assume that either investment or financing decisions are independent of the dividend policy, and in particular investment may depend on dividends where firms face financing constraints. Maintaining the level of the dividend is reported by survey respondents to be more important than some positive NPV projects (Brav et al: 497). The literature sometimes assumes, following Lintner, that debt is the residual financing decision (Fama and French 1997; Aiviazian et al 2006) but that is moderated by the cost and availability of debt. More generally, the likelihood of payout will depend on access to external borrowing after internal funds are exhausted (Fazzari et al 1988). For dividends to be justified, their marginal benefits (or the costs of cutting dividends) have to be higher than the cost of external borrowing or alternatively the cost of turning down marginally profitable investment if that is preferred. Since we do not know whether the relevant shadow price is the marginal cost of external funds or the opportunity cost of investing we should include both. Since paying down debt is the most popular alternative to dividend pay-out and the propensity to reduce debt increases with the firm's debt ratio, it may be reasonable to proxy the marginal cost (or availability) of external funds by leverage (Brav et al 2005, Fig 2; Benito and Young 2003). However leverage targets tend to be industry specific (Graham and Harvey 2001, Table 12) so that leverage relative to the industry or sector mean may be more relevant.

Where pay-out is warranted, a final optimisation needs to be carried out with respect to the form of pay-out – cash dividends or repurchases, though the degree of substitutability may be weak and asymmetric. Reportedly, few firms would pay dividends out of foregone repurchases, presumably because dividends imply a continual commitment (Brav et al 2005, Fig 2.). Substitutability is supported for US data in Grullon and Michaely 2002, but other empirical results are conflicting; for the UK, evidence suggests only weak substitutability at least up to the early 2000s (Benhamouda 2007).

A further issue arises where merger and acquisition activity is considered. Here dividends may be paid as part of a final or liquidating pay-out which is hard to separate out from the data on cash dividends. The likelihood of such payments (sometimes recorded as special dividends) can be taken account of in the specification by including the change in asset value.

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[1] For US firms, Brav et al (2005) find a response of -0.3 on a five point scale for the proposition that investment decisions are made before dividends, while noting that dividend increases are secondary to investment increases.

In all these marginal decisions the role of taxes needs to be considered, though they are indicated to be "a second order concern" in Brav et al (p.485), especially where there is equality of tax treatment between capital gains from repurchases and dividends. It may be noted that even in countries where the tax regime has favoured capital gains in the past, most firms have tended to pursue dividend pay-outs.

2.2 Signalling under asymmetric information and dividend smoothing. The least restrictive version of signalling means that dividends are used to communicate information (such as future earnings) to investors, where due to industry characteristics or low analyst coverage such information is not transparent to outsiders. On this understanding, firms with good investment opportunities would pay dividends to achieve lower borrowing costs. However, without a good understanding of the hierarchy of decisions within a firm – and whether they are stable – it is hard to interpret the information content of dividends, so that signalling models that rationalise dividends in this way tend to be descriptive and perhaps circular. Formal models treat the creation of the signal as a costly investment by the firm on the grounds that otherwise any information content would not be credible. As with models of (truthful) advertising, effective dividend signals require a separating equilibrium whereby investors can distinguish future value-creating firms from those who simply mimic this. This may be achieved by a self-imposed cost i.e. dissipation of cash flow. Different models envisage this either as a higher risk of needing to borrow to sustain dividend flows, or as the cost of rejecting positive NPV projects so as to finance higher dividends. Such models have been criticised on the basis of their assumptions and empirical validity; for example signalling should benefit young firms most but these are least likely to pay dividends (Allen and Michaely 2003; Brav et al 2005). Other evidence shows that firms facing more asymmetric information pay out less (Leary and Michaely 2011).

The function of dividends as a signal may also seem at odds with dividend smoothing, an established practice which *attenuates* any earnings information. Dividend smoothing tends to be associated with asymmetric information as measured by idiosyncratic risk, analyst forecast error and dispersion of that error across analysts (Booth and Xu 2008). This is in keeping with the view that smoothing lower firm transactions cost (less unexpected capital raising) when earnings and investment needs are volatile or non-transparent. For owners also, smoothing removes the necessity to trade shares, perhaps important for less liquid holdings. The tendency to smooth dividends can also be understood through option theory. A dividend payout is hard to reverse with uncertain net benefits that depend on the future path of earnings. On this reasoning, smoothing would be more indicated under high uncertainty or low growth where there is less room for correcting errors.

2.3 Agency. Agency concerns arise under asymmetric information and could imply higher borrowing costs unless countered by adopting a conservative approach to retained earnings, thus favouring dividends. The argument follows from the notion of debt as a discipline on management, given that interest payments are a hard constraint and that debt finance involves more monitoring than either internal funds or that provided by dispersed shareholders. On one view debt and dividends are substitute forms of mitigating agency concerns so that higher leverage can reduce the need for dividend payments. On the other hand if higher leverage works to reduce over-investment, it may free up more cash flow that is available for distribution. Agency models of dividends are hard to distinguish from signalling models but one argument is that agency concerns *a priori* will be higher in large mature firms so that stock market reactions to higher dividend payments should be more favourable here. The evidence is however mixed (Allen and Michaely 2003: 396-7). Arguably, agency concerns will be greater under bond (rather than bank) finance and here the agency view has claimed support in a higher proclivity to pay dividends for those with credit ratings on the assumption that the latter status is independent of unobserved influences (Aivazian et al 2006). Survey evidence does not, however, strongly support the view of pay-out policy as self-imposed discipline to counter agency concerns with nearly 90% of executives rejecting this view (Brav et al 2005 Table 5).[2] Nor is it clear that dividends play an important disciplinary role where there is an effective market for corporate control that operates as a good substitute. Rather dividends might be interpreted as protection against takeovers, especially in the UK where forms of poison pills are illegal; take-over of a peer has been shown to be a trigger for higher payout (Servaes and Tamayo 2014).

2.4 Mis-pricing and catering to investors. Managers with inside information may value firms differently to investors, particularly if there is investor herding in regard to rumours or bias for or against certain market sectors. Stretched valuations cause managers to prefer to rely on internal funds. By contrast when valuations are unduly low, managers may offer a bigger payout or engage in share repurchases to return cash.

Shifts in investors' appetite for dividends in general may cause a separate pricing effect with a variable premium for dividend paying stock (Baker and Wurgler 2004; 2011). Some sets of investors, such as personal (retail) investors or pension funds may also have separate preferences for dividends, smoothed dividends or high pay-outs. Investors may be grouped into various classes or clienteles, some of whom prefer regular income in the form of dividends and others who prefer reinvestment. The reason could be tax liability, an agency concern, matching assets with liabilities or behavioural preferences. From time to time the weight of those favouring dividends may change and this is reflected in a differential return to dividend-paying or higher-dividend-paying stocks, leading to a herd movement towards pay-outs or increased pay-outs.

[2] Agency concerns can be mitigated by governance procedures such as monitoring and incentives, acting as substitutes for dividends, though both of these can be argued to have potentially perverse effects (Gromb et al 1997; Dhanani and Roberts 2009) so that any effect is unclear, theoretically.

Firm characteristics. Age and size are often found to be good predictors of dividend payout. Recent literature has suggested that lifecycle stage, as proxied by the fraction of retained earnings in total equity, may be especially important in the decision to pay dividends (DeAngelo and DeAngelo 2006; Denis and Osobov 2008).

3. Specification choices in dividend studies

The majority of previous empirical studies examine pay-out levels using the insights of Lintner (1956) which, despite imprecise theoretical foundations, is still the workhorse model for both dividends and total pay-out (Fama and Babiak 1968; Brav et al 2005; Aivazian et al 2006; Khan 2006). Less commonly there are studies that focus on or include the incidence of dividend payments (Benito and Young 2006; Von Eije and Meggison 2008; Denis and Osobov 2008). Some see merit in concentrating research on those firms likely to pay regular dividends - on the grounds that it is too difficult to have "a theory of everything" (Lambrecht and Myers 2012 p.1764).

Lintner's findings may be expressed by an equation that is now recognised as an equilibrium correction model, where the dynamics are nested in a target equilibrium ratio for dividends, but with the added twist that the adjustment is non-linear. Formally, for a representative firm for the case where earnings is the only target variable and debt is not used to support dividend payments:

$$\Delta D_t = \alpha + \beta(\gamma E_t - D_{t-1}) + \epsilon_{t,} \qquad \text{where } \alpha + (\gamma E_t - D_{t-1}) > 0$$

and (1)

$$\Delta D_t = \epsilon_{t,} \qquad \text{where } \alpha + (\gamma E_t - D_{t-1}) < 0$$

where D_t is dividend level at time t, E_t is earnings and the parameters α, β, γ represent respectively: (earnings independent) trend growth in dividends; the adjustment coefficient that may vary with direction of adjustment; and the target ratio of dividends to earnings. The lower the adjustment parameter $\beta < 1$, the lower the variance in dividends and the lower the risk of having to avoid having to suspend payments. This model appears to perform well in different contexts, though the non-linearities are often ignored: an exception is Leary and Michaely (2011) who find that firms adjust dividends quicker when they are below their target than when they are above. Some studies report that the adjustment parameter appears to have been reduced over time, possibly due to the increased use of share repurchases that can buffer changes in earnings as they do not need to be smoothed. For the US, Leary and Michaely (2011) argue that smoothing has *increased* over a long time-period and is unrelated to the level of repurchases.

The basic specification that we adopt for estimation is in levels and may be arrived at by manipulating (1) through substitution. [3]

$$\mathrm{D_{i,t}} = \alpha_i + \lambda(\mathrm{D_{i,t-1}}) + \beta X_{\mathrm{i,t-1}} + \partial_t + \epsilon_{\mathrm{i,t}} \quad (2)$$

where $\mathrm{D_{i,t}}$ is nominal dividends, and $X_{\mathrm{i,t-1}}$ is a vector of regressors lagged one period to minimise endogeneity and where the error term comprises a firm specific effect, a time effect and a white noise term. A variant on expression (2) is provided by redefining the dependent variable as a pay-out ratio of dividends to earnings or assets. We return to this specification in Section 4.

The set of explanatory variables is drawn from the literature and our discussion in Section 2; detailed definitions and sources are given in Table 4. From the discussion in 2.1 we use the earnings to asset ratio (EA) as an indicator of the affordability or desirability of dividends. Alternative earnings variables include the level of earnings before interest and after tax (EBIAT). The Market to Book ratio (MBF) is taken as an indicator of opportunity cost of investment. A further proxy for the opportunity cost is the rate of growth of assets (DAA), where the interpretation is, however, clouded when M&A activity has occurred. Leverage (LEV) is taken as a proxy for the marginal cost of funds, though others interpret it differently in agency terms. Any substitution effect of share repurchases on dividends can be examined by including repurchase (REP) as an additional control. As regards tax issues, for our UK data there were no major tax changes over the sample period, although in recent years, the main corporate tax rate was gradually reduced from 28% in 2008 to 24% by the end of the sample in 2012. Time dummies are included in the specification.

From the discussion in 2.2 we recognise the need for lags to capture dividend smoothing. Lags are used for all regressors except age to lessen endogeneity but we also experiment in some estimation sets with a lagged dependent variable. In robustness tests we also allow for asymmetric adjustment by modifying the basic specification to include, along with the earnings variable, the product of that variable with a dummy to capture positive earnings growth. The expectation is that when dividends are less affordable that is not immediately transmitted to dividend payment so that dividends should rise more than normal (with the coefficient on the return variable higher) when returns are falling.

[3] A differenced form may be preferable when the dependent variable is non-stationary. However, because of the non-linearity in (1) with dividends sticky downwards, stationarity tests are problematic; in effect, there are structural breaks of unknown frequency and timing in the dividend data. The levels form may also be justified by behavioural assumptions based on reference points and loss aversion which imply a partial adjustment model (Baker and Wurgler 2011). The levels form represses some non-linearity but that can be re-introduced by varying the estimation method – see below.

From the discussion in 2.3 we try to take account of agency costs by noting the effects of substitute agency cost control mechanisms such as high leverage, interacted as necessary with sector dummies. We also examine variables such as leverage for different sub-samples broken down by age and size.

From 2.4 we accept the need to test for catering behaviour which, however we represent more simply than in previous literature as a herding variable (CAT) based on industry peer behaviour.[4] Finally, from 2.5 we add basic characteristics of size and age. The alternative lifecycle variable that measures the ratio of earned equity to contributed capital was found insignificant in Von Eije and Megginson (2008).

4. Econometric Issues

4.1 The dependent variable. The dependent variable can be defined as a nominal or real cash sum or as a ratio reflecting some target objectives such as a stable dividend pay-out ratio. The literature shows much variety: survey evidence shows that the target objective varies across countries and firms within countries, with the most common approaches, globally, being to target stable or increasing dividend per share; stable or increased dividend payout ratio; setting dividends in line with cashflow; or stable or increased dividend yield (Servaes and Tufano 2006). For US firms, Brav et al (2008) reports a variety of different targets for dividends and also evidence that such targets are not often strict. Given the variety of targets the most general approach is to estimate dividends as a cash level, though with consideration given to inflation and exchange rate adjustments (Von Eije and Megginson 2008). There may be econometric advantages to modifying the cash level to minimise heteroscedasticity such as estimating in logs. Where a dividend ratio is used, scaling by asset may be preferred to scaling by earnings given the likelihood of zero and near-zero observations for earnings and the expectation of measurement error (Aivazian et al 2003).

4.2. Estimation methods: pooled and panel estimation. Equation 2 is estimated by several different techniques including Random Effects and Fixed Effect panel estimation. The use of a lagged dependent variable (LDV) in short panel regression may be expected to introduce Nickell bias in the LDV coefficient and in that of correlated variables. Nickell bias is often addressed by dynamic panel estimation techniques such as Generalized Method of Moments (GMM). In our context, the sample T is borderline short with a maximum of 15 years and an average of 9. However, the lagged dependent variable has a low coefficient so that the true value cannot be close to one and this will tend to reduce the severity of any downward bias.[5] Nevertheless the *t*-value is also biased so that the null is rejected too often particularly when N is much greater than T which tends to be the case in studies such as ours. In our results section we will therefore include runs without the LDV for comparison. The induced bias

[4] This argument finds some support in Brav et al (2005) who report the view that firms may delay dividend reductions until "air cover" is provided by competitors (p.501)
[5] See Cheng Hsiao (2003:72). We are grateful to Ron Smith for this reference.

for other regressors depends also on the sign and magnitude of the correlation coefficient and as with the LDV this increases the likelihood of falsely rejecting the null**.**

4.3 Selection bias. Sample selection bias also needs to be considered. Data availability often results in oversampling of certain types of firms and often checks are performed to assure the reader that sample statistics such as median values ratios are approximately similar to population values (Khan 2006). However, not all non-random sampling is problematic and the checks mentioned above may not always be necessary especially if no population inference is intended. Sampling on the basis of age or size – a default position when attention is confined to listed firms - may not be problematic where age and size are exogenous variables in the regression of interest – so called exogenous sample selection (Wooldridge 2013: p. 315).

Sampling issues are of particular importance where the dependent variable registers zero for a sizeable fraction of the dependent variable observations e.g. the case of firms paying zero dividends. Samples with large numbers of small, young firms are more likely to record zero payers. In the UK, using a sample drawn from Datastream, one study showed the number of never-payers (using a window of at least twenty years) rose from 4.4% in 1994 to 14.0% in 1999. This rise was largely accounted for the rise in total non-payers, given that those simply taking a dividend break were characterised by a cycle but not a trend (Benito and Young 2003). This rise in permanent non-payers is thought to reflect in part the changing nature of the population of listed firms with the introduction of the junior Alternative Investor Market (AIM) in 1995 increasing the proportion of smaller firms with the result that the unconditional propensity to pay dividends fell sharply. This and other works have shown that newly listing firms are increasingly likely to have characteristics that have traditionally been identified with non-payers so that, at least for the UK, "… there is little evidence of a systematic decline in the propensity to pay dividends", once the characteristics of firms are taken into account (Denis and Osobov 2008: p. 65). These authors reached this conclusion by modelling the cross-sectional behaviour of dividends in a period and applying the coefficients to subsequent years to obtain an expected dividend pattern based on the second-period characteristics which was then compared with the actual pattern to show little difference.

Where the interest is in the amount or proportionate amount of cash dividends paid, it would be possible to ignore the non-payers and simply estimate for the sample of dividend payers (Von Eije and Megginson, 2008, Table 6); and this is the main approach that we follow in this paper. Alternatively, where the theoretical model consistent with the notion of desired negative dividends, which cannot be observed due to institutional and legal issues, a Tobit model could be employed, designed to deal with censoring at the lower bound of zero. This latter option uses data on the non-dividend paying firms and is valid in the case of exogenous sample selection - where the additional firms do not have characteristics associated with unobserved influences in the dividend equation. Essentially, the Tobit model is designed for situations of censored data where the zeros represent unobserved realisations from a common distribution that also describes the observed outcomes.

More generally, however, the decision to pay or not to pay dividends may indeed be related to unobservables in the desired dividend payout equation for firms. This will result in (incidental) truncation bias, similar to the classical problem of estimating wage offer equations estimated for participants in the workforce without correcting for the likelihood of non-participation and different characteristics of non-participants. The appropriate procedure is to add an explicit selection equation to the dividend regression (Heckman 1979). Robustness tests to be reported later include Heckman estimation results though it may be noted that our dividends data, drawn from Compustat Global, conflates zeros and missing values after 2006 so the sample here is short.

5. Data and sample selection

We focus on dividend behaviour in the UK over the period 1997-2012. We search the Compustat Global database for financial and accounting data on FTSE All-share companies, active as well as inactive and suspended listings in order to avoid survivors' bias (von Eije and Megginson, 2008). Compustat fundamentals are widely used in studies of payout channels (Skinner, 2008). We use International Securities Identifying Number (ISIN) as a primary identifier of the companies in our sample. We complement this database with market data from Datastream. We further include information from Bureau van Dijk's Zephyr, one of the most comprehensive databases of deal information, for share repurchases data and Bureau van Dijk's Fame, a database of companies in the UK and Ireland, for share ownership data. Since we combine four datasets, the total sample results in some missing observations, as not all companies are matched on each year throughout the studied period. For example, companies found in both Datastream and Zephyr in a given year, but not in Compustat will not have accounting data. Hence, for such companies, we would not know if the accounting data was simply 0 or missing. We do not impute the data and leave the missing observations as such. This dataset includes 57,461 observations and provides payout information for 3,184 companies as of 2012. We have excluded firms in the Utilities and Financial sectors from our results.

The dividends' information is collected from Compustat Global on FTSE ALL-Share companies. There are 11,096 non-missing observations for dividends (including 0, when the firms do not pay dividends), which represents 19% of the total sample. This variable represents the total annual amount of dividends, other than stock dividends, declared on all equity capital of the company, based on the current year's net income, in millions of GBP, and is taken from the Income Statements. Listed UK companies typically pay dividends twice a year, with a relatively small interim dividend being paid during the accounting period, and a relatively large final dividend being paid when profits are reported (Bond et al., 2005). Our measure of dividends is the total of both these payments, and includes common/ ordinary dividends, preferred dividends and dividends on other share capital, which includes payments to holders of participation rights certificates (when such payments have not been charged to net income). The dividend declared we use as our dependent variable mainly differs from the dividend paid in terms of timing, but is a better measure in terms of understanding the strategic decision process.

Table 1 presents an annual summary of the number of observations for cash dividend declarations, as well as the number of firms that do share repurchases. The number of firms that declare cash dividends falls almost monotonically from a peak of 1064 in 1998 to 330 in 2012, reflecting similar trends noted elsewhere (Denis and Osobov, 2008; Von Eije and Megginson, 2008). Compustat records only a small proportion of firms declaring a zero dividend and we omit them in our main analyses. The number of companies doing share repurchases increases, from a low base to almost a third of dividend payers just before the financial crisis, and then falls back to around a fifth of dividend payers in 2012. Fig. 1 plots the numbers provided in Table 1.

[TABLE 1 AND FIGURE 1 HERE]

Table 2 (and Figure 2) detail the total value of dividend declarations and share repurchases, each year between 1997 and 2012. First, total dividends in the UK increase dramatically by 170% from GBP10.4bn in 1997 to GBP28.6bn in 2001. Total dividends then fall to GBP26.0bn in 2002, to recover at GBP27.3bn in 2003, as UK's economic recovery gathers pace. There is another dip in 2008-2009 around the credit crunch, but by 2011, the dividends recover to GBP44.3bn, well above their pre-credit crunch level of GBP42.4bn in 2007. Overall, the cash value of declared dividends increases at an 11% CAGR over the 15-year period and there is a clear business cycle effect. This feature of rising total dividend payout is also documented in von Eije and Megginson (2008) findings for Europe and in other findings for the United States (DeAngelo, DeAngelo and Skinner, 2004).

[TABLE 2 AND FIGURE 2 HERE]

Figure 2 shows little indication of substitution between dividends and repurchases except perhaps for the post-financial crisis period when repurchases continued an upward trend while dividends retreated. There is a 73% increase in share repurchases from 2000 (GBP9.0bn) to 2001 (GBP15.7bn), but this is largely reversed by 2003. A new cycle then sees share repurchases increase to nearly five times their 2003 level. In 2006, the value of share repurchases surpasses the value of dividend payouts by GBP4.2bn but this is not maintained and repurchases fall off to a sixth of the total payout by the end of the sample period in 2012. The figure shows how share repurchases have a higher volatility and cyclicality than dividends. The total value of share repurchases over the 15-year period (GBP237bn) represents 31% of total payout and 45% of cash dividends. This is in line with von Eije and Megginson (2008) findings regarding share repurchases for 15 European countries (p. 355). They report that repurchases represented 34% of total payout and 50% of cash dividends in 2005. They also report that among their sampled countries, the UK firms are the most active repurchasers of their own shares, accounting for half of the total share repurchases for their studied period (1989-2005).

Figure 3 shows the change in average dividends payments, average share repurchases, and average Earnings before Interest and After Tax (EBIAT). We observe a plateau from 1997 to 2003, then a striking increase in the average amount of annual dividends from GBP27.6 million in 2003 to GBP148.3 million in 2012, or a CAGR of 13% over the 15-year period.

Table 3 shows the sample mean and standard deviation of key variables (EBIAT, leverage, market-to-book ratio, growth in assets, age and size) for dividend payers and non-dividend payers (i.e. where dividends equal to 0), for the three sub-periods of our sample – 1997-2002, 2003-2007 and 2008-2012. Comparing those companies that paid a dividend with those that did not, it is clear that the latter are less profitable, have relatively higher leverage, higher assets growth in the earlier years, a higher market-to-book ratio and are younger.

[FIGURE 3 AND TABLE 3 HERE]

Denis and Osobov (2008) note a concentration of dividend payers. We also find a large difference between mean and median dividends, consistent with Denis and Osobov (2008) findings. In comparison, for the year 2000, we report a mean dividend per payer of GBP28.4 million and a median of GBP1.7 million, vs. GBP23.8 million and GBP1.7 million in Denis and Osobov (2008). For the year 2002, we report a mean dividend per payer of GBP27.6 million and a median of GBP1.3 million, vs GBP27.0 million and GBP1.9 million respectively in Denis and Osobov (2008). Mean and median dividends per payer increase over the period, as illustrated in Figure 4. The ratio of mean to median dividend payout increases monotonically from 1997 to 2004, indicating a rise in concentration during this period (as in Denis and Osobov, 2008).

[FIGURE 4 HERE]

[TABLE 5 HERE]

6. Initial Results

Preliminary estimation by pooled OLS of equation 1 shows that time dummies are jointly significant. The need for panel estimation methods is confirmed by the joint significance of the interaction of time dummies with the regressor set. Table 6 shows Random Estimation (RE) results for a variety of runs, where the first specification in column A follows broadly that in von Eije and Megginson (2008) (hereafter E&M) Table 6A. Column B includes a lagged dependent variable to represent the slow adjustment process that has been found in past studies of dividend behaviour. Column C and D include the level of earnings (EBIAT) which would be appropriate were the nominal value of dividends to track earnings. We initially included broad sector dummies based on the Global Industry Classification Standard but excluded these as only one was significant.

[TABLE 6 HERE]

The results support the specification of column A with significance found for the earnings ratio EA (positive), market to book ratio MBF (negative) and the catering variable constructed here to represent herding behaviour CAT (positive). The growth of assets variable (DAA) is positive but insignificant. The characteristic variables AGE and SIZE are both significantly positive. The time variables are jointly significant. There is however no significance for the leverage variable (LEV). Comparing with the results found for the total EU15 sample (of which the UK represents about half the dividends paid) we may note from E&M Table 6 Panel A that the significance of variables changes over the three sub-periods of the sample but for the total period all variables including LEV and DAA are significant with LEV having a negative sign and DAA a positive sign. Comparing our results with the sub-sample that most corresponds to them in E&M, for 2001-2005, DAA is recorded in E&M as significant with a reversed sign, i.e. negative. The two principal points of difference between our results in column A and those in E&M is that in our case both DAA and LEV are insignificant.

The specification in column A may be challenged on the theoretical grounds that it omits a lagged dependent variable. While its inclusion may compromise the statistical validity of RE estimation it is nevertheless hard to argue that a dividend equation can ignore the issue of smoothing which results in partial adjustment to targets. Accordingly column B includes a lagged dependent variable (LDV). As the coefficient on the LDV is 0.28, the remaining coefficients are not surprisingly lower. However for the LEV variable the coefficient takes on a much higher positive value, now with a p-value <0.1 while the DAA variable is now highly positively significant.

Another debateable feature of E&M is the use of a profitability ratio rather than an earnings level to explain the level of dividend payments. It may reasonably be argued that if dividends track earnings it would be appropriate to include the earnings level (EBIAT) as a regressor. Column C and D of Table 6 show strong support for including the natural log of EBIAT (LEBIAT), with the EA variable now significantly negative indicating that dividends fail to keep up with earnings when the earnings to asset ratio is rising. The variables MBF, SIZE, AGE and CAT all remain significant in Column C and this is also the case for Column D except for a loss of significance for SIZE.

Random estimation requires for consistency that the heterogeneous error term is uncorrelated with the regressors. This is *a priori* unlikely when the LDV is included and may even not be the case with LDV excluded. The assumption may be tested by employing the Correlated Random Effects (CRE) model in which the time-averaged mean of time-varying variables is included in the regressor set (Wooldridge 2013). Results of using this estimating technique are shown in columns E-H of Table 6 where the significance pattern of the previous four columns is much changed – only SIZE and earnings variables, along with the LDV are now consistently significant. In each case, the null hypothesis for the exclusion of time means was rejected decisively – at least at the 0.01% level. This indicates that RE estimates are biased and inconsistent and that other methods such as fixed effects (FE) estimation are preferred. However, it is still of interest to compare the magnitude of the discrepancy between the RE and the CRE coefficients as the latter correspond to FE estimates (Wooldridge 2013).[6]

FE estimation is generally less efficient and requires sufficient time variation in the data to be able to capture significant effects. The FE results are presented in Table 7 for the same specification as in Table 6, Columns A-D.

[TABLE 7 HERE]

The FE results in column A correspond to the E&M RE specification and, as expected, have lower explanatory power so that only earnings, size, age and catering are significant. Similar results are found with the inclusion of LDV in column B. Column C and D include the earnings level (LEBIAT) and here both MBF and DAA are significantly negative at least at the 10% level. Leverage LEV remains insignificant and a further set of runs was used to check whether this reflects the fact that leverage targets tend to be sector specific. However, interacting leverage with ten sector dummies produced only one at $p<0.1$.

The literature includes specifications where dividend levels are expressed as a ratio of earnings or assets. Here we use the ratio of dividends to assets, given that earnings are more volatile than assets and the ratio will be unstable when earnings are close to zero. Table 7 column E (with no LDV) shows that only the earnings ratio EA (positive), and the asset growth variable DAA (negative), are significant. SIZE, AGE and CAT are now all insignificant. The results in Column F are similar, though MBF is now positive and significant when the LDV is added. LEV remains insignificant even when interacted with sectoral dummies, where again only one (different) sector records a p-value<0.1

In many of the results so far both age and size are found to be important determinants of the dividend level so that it is of interest to run sub-samples based on these characteristics. We divide the total sample into four based on the median values of AGE and SIZE for the full Compustat sample. Table 8 reports three specifications for each group. The first is the standard specification in Table 7 Column A. The second includes both the LDV and LEBIAT. The third replicates the first specification but substitutes for the standard LEV variable a set of interactions of LEV with any sector that is individually significant at the 10% level when the full set is included. These are: Small & Young Sector 20 (industrials) and Sector 45 (IT); Small & Old Sector 25 (consumer durables); Large & Young Sector 15, Sector 35 and Sector 50 (materials, health care, telecoms services); Large & Old Sector 45 and Sector 50 (IT and telecoms services). Note that utilities and financial firms are excluded from our results.

[6] In Table 1 the CRE results are somewhat different to FE as we have not included the time average of the time dummies which strictly should be included for a non-balanced sample.

[TABLE 8 HERE]

For the Small & Young group, the earnings level LEBIAT is significant although the earnings ratio is not. MBF is highly significant negative; the LDV is marginally significant at exactly the 10% level in column B but highly significant in Column C. DAA is negative but not always significant. For the Small & Old group, neither the earnings level nor the earnings ratio is consistently significant. Nor is the LDV significant. Uniquely this group shows a significant negative leverage effect (with the LDV omitted) and there is a consistent significance for a negative MBF effect – though weaker than for the Small & Young group. For both these small groups, SIZE is consistently positive and significant; while AGE tends to be weakly positive and significant.

For the Large & Young Group, the earnings ratio (or alternatively the level) is consistently significant; MBF is consistently negative and significant, and there is some support for a significant positive DAA effect. The Large & Old group also has significance for the earnings level or ratio, but shows no clear MBF effect. There is some evidence for a positive DAA effect. This is the only group to have a positive CAT effect but this is only significant without the LDV. For both the large groups (as for both the small groups), SIZE is consistently positively significant while AGE is only consistently so for the Large & Young group.

Because leverage is inconsistently signed (and mostly insignificant) across specifications and categories, a sector interaction of this variable was attempted. Perhaps surprisingly, the Small & Old group which in Column D had indicated a significant negative LEV effects now shows only a weak effect for one sector (consumer durables) more in keeping with the insignificant result with the LDV in Column E. By contrast the Large & Young group which had shown no significance for LEV now has three interactive effects at varying level of significance (materials, health care and telecoms services). The Small & Young and Large & Old groups have two opposite signed interactive effects each.

7. The effects of the Financial Crisis

The stability of the coefficients may be affected by the financial crisis that began in the UK in 2007-2008. The crisis produced new economic conditions that would be expected to have had an impact on payouts. For example, a shortage of bank credit caused firms to turn to equity and bond markets for finance, especially in the immediate aftermath of the shock, while many firms struggled to get bank credit. The effects of continuous low worldwide interest rates encouraged firms to swap equity for debt which was affected to some extent by higher company pay-outs sometimes financed by debt. It is of interest to examine the stability of coefficients in the period that spans the onset of the crisis.

We define a crisis variable as a dummy variable that takes a value of 1 in the year 2008 or later. Thus we are testing for whether the influences on the dividend decision were altered in magnitude by events in 2008 that lasted throughout the period up to the end of the sample in 2012. The individual year dummies are also included. We interact each of the variables EA, MBF, LDAA, LEV, SIZE, CAT and LEBIAT with the CRISIS dummy and report the results for the full sample, and also for the four sub-samples, in Table 9.

[TABLE 9 HERE]

The results in Table 9 show whether the coefficients for the pre-crisis period are stable after 2008 as indicated by the significance or otherwise of the interaction terms. The period since 2008 is shown to halve the (negative) MBF coefficient, to more than double the size of the catering coefficient while the DAA coefficient which is insignificantly negative for the pre-crisis period becomes significantly *positive* after 2008. There are no other significant interactions and in particular the coefficient on the earnings ratio EA (and LEBIAT) remains the same. In column B similar effects are noted.

For the Small & Young group, Column C, the only significant interaction is for MBF where the coefficient turns positive in the crisis period. This also occurs in column D for the same group and here there is a weakly significant negative leverage effect in the crisis period. For the Small & Old group there are no significant interactions. It may be noted that the non-interactive leverage coefficient here support the previous finding in Table 3 of a weakly significant effect.

For the Large & Young group, in column G, the DAA coefficient becomes significantly positive, though this is not observed in the alternative specification in column H. Leverage become significantly negative after 2008 at the 10% level for column G and at the 1% level for column H. For the Large & Old group, columns I and K both show consistent effects of the crisis with a cancellation of the negative MBF effect and the emergence of a positive DAA effect.

8. Discussion of Results

We have shown that Random Effects panel estimation is likely to be biased for our sample and focus here on the FE results. Using the level of dividends as the dependent variable but the earnings (to asset) ratio as a regressor in line with E&M specification we find that only the earnings ratio, age, size and the catering variables are significant. Where the specification is modified to include the (significant) earnings level, we find negative MBF and DAA effects at least at the 10% level. Changing the specification so that the dependent variable is constructed as a ratio of dividends to assets shows a similar pattern of results for the earnings ratio, though none of the variables SIZE, AGE or CAT are now significant while MBF is either insignificant or positive significant. For none of these estimation runs is there any support for including the leverage variable LEV. One interpretation of these results is that they confirm the importance of investment opportunity (as measured by MBF or DAA) in dividend decisions.

The LDV is also significant throughout; as noted earlier, this normally indicates the need for special dynamic panel methods. For our estimates, as reported in Section 4.2, we believe that Nickell bias will be low on account of the panel length and the relatively small coefficient on the LDV, though there will be a greater tendency to reject the null as N is much greater than T. Because of this we also include specifications without the LDV. Induced bias for correlated variables will be limited as may be inferred from the correlation matrix (Table 5) where the highest (absolute) correlations are in respect of earnings variables. As earnings and dividends are positively correlated, the direction of Nickell bias should be positive but as noted from Column B of Table 7, the coefficient on EA falls with the introduction of the LDV.

The disaggregation of the sample into a two-by-two matrix on the basis of median size and age using data from the full Compustat database allows for a more granular view. It may be noted that for three of the four groups, where the earnings level is excluded there is at least one column where the earnings ratio EA is significant at the 10% level at least. The exception is the Small & Young group but in this case the earnings level is significant, and that is the case also for all other groups except Small & Old. Put differently there is significance for some measure of earnings in all groups. There is also consistent evidence for a negative MBF effect across three groups, the exception being Large & Old. There is weaker evidence of a negative DAA effect. Although DAA is negative for all specifications for both the small groups (significant only in one), it is positive for all specifications of the large groups (and significant for three). This suggests that the rate of change of assets is indicating (weakly) investment opportunity for small firms but that for larger groups something else is being measured by DAA, possibly mergers & acquisitions activity that is positively associated with dividend payments. The firm characteristic variables SIZE and AGE both tend to be positive and significant but AGE is less significant for old firms and not at all for the Large & Old category. The CAT variable is less likely to be significant for these disaggregated specifications given that it is defined relative to a non-categorised industry mean and indeed this is the case with only one out the 12 cases significant. The lagged dependent variable is significant but with a small value of about 0.07 for both the young groups while it is higher at about 0.17 for Large & Old – perhaps consistent with the view of this group as mature stable payers - and insignificant for Small & Old.

The disaggregated effects for leverage are also of interest. In only one of the eight disaggregated runs was LEV significant (negative for the E&A specification for Small & Old group at 5% significance). This hardly constitutes strong support for an agency interpretation, especially as these firms are likely, in the UK, to be dependent on bank finance and so subject to consistent monitoring. When we interact with sector dummies the strongest effect comes from three industries in the Large & Young group. Arguably these are hi-tech sectors with potentially high asymmetry of information giving some weak support to an agency interpretation that dividends are a disciplinary device.

We investigated the change in dividend policy occasioned by the financial crisis. From Table 9, looking across the interaction effects we see that the only significant earnings crisis interaction is a weak but quantitatively substantial effect for the Large & Young group, where the level of earnings is also included and has a stable coefficient. Thus there is some weak evidence that the dividend level for this group is affected more negatively by profitability in the crisis period for any given level of earnings. There is a strong interactive MBF effect, significant for seven of the 10 specifications (positive in all 10) in a way that makes the effect zero or positive after 2008. The exception here is the Small & Old group where this effect is not apparent. Thus there seems a diminishing investment opportunity effect as measured by this variable, for the crisis period. However, the DAA interaction is also positive across all 10 specifications and significant in the total case which seems to mainly reflect the strong interaction for the Large & Old group. As noted previously the pattern for the Old groups is that DAA appears to reflect something other than investment opportunity and the interactive DAA effect for the Large & Old group may simply be capturing lower merger and acquisition activity. The negative leverage effect noted in Table 8 for Small & Old is replicated in these results. Furthermore, the indication of a negative industry effect for some industries for the Large & Young group in Table 8 is complemented here in a strong negative interaction effect for this group after 2008. This is a quantitatively large effect and although it is not mirrored for the Large & Old group, it is reflected in the total sample interaction results so that the leverage effect overall is negatively significant after 2008. It is not clear however that this can be interpreted as an agency effect since there is no reason to suppose that agency concerns became more important after 2008. It seems more likely that the negative LEV effect is reflecting financial pressure on firms. The effect of SIZE appears stable over the sample for the total and for all groups. There is a weak positive interaction effect for CAT which may suggest that herding behaviour increased somewhat after 2008.

9. Robustness Tests and Future Issues for Research

[TABLE 10 HERE]

A number of robustness tests are reported in Table 10. First, the adjustment to earnings targets may be asymmetric and to account for this we add an interaction term between the EA variable and an indicator variable for whether earnings growth has been positive in the previous year. This interaction is significant as shown in columns A and B of Table 10. Furthermore DAA is now significantly negative at the 10% level for both specifications.

In the third column of Table 10 we report crisis interactions for the pay-out ratio used in Table 7 columns E and F, where these interactions have previously been reported only for the level of dividends in Table 9. There are two significant crisis interactions. First the negative DAA effect noted previously for this specification is now considerably more negative, while LEV becomes (weakly) significantly negative for the crisis period. It is somewhat hard to interpret the DAA effect. In order to introduce a clean time structural break we did not allow for a LDV in these specifications and since the dependent variable now has assets as denominator any change in the (omitted) adjustment coefficient might bias the DAA interaction effect. Nevertheless this is unlikely to be serious given the small and weak LDV effect noted in Table 7 column F and so may conclude that for the pay-out specification, that the DAA coefficient has become more negative in the crisis which could be interpreted either as a stronger focus on investment opportunities, a lessening of the factors that explained positive pressure on the DAA coefficient such as mergers and acquisitions with a consequent rise in unallocated cash.

The fourth column replicates the second column but with the inclusion of the level of share repurchases, lagged (REP) so as to test whether this affects the dividend decision. There is no significant effect. Finally, Column 10 reports a Heckman equation for the sample period up to 2006 for which Compustat is able to identify zero dividend declarers. In the selection period we use as an identifying variable the threshold variable EAQ1 lagged which is a dummy variable for the condition that earnings is greater than the sample first quartile value. The results here are simply indicative given that the sample is perforce quite short and that it includes a period of a significant jump in dividend payments. Certainly some of the coefficients are large in relation to the standard results. It is however of interest that the null hypothesis of no selection bias is rejected by the significant λ coefficient.

10. Conclusions

This paper has focused on dividend payers. For the unbalanced panel of firms recorded as declaring dividends in a given year 1997-2012 we have estimated dividend levels and ratios using a number of different estimators. Fixed Effects methods were indicated to be preferred.

The results indicate that earnings, market to book ratio and size matter most consistently for dividend payers across different categories, and there seems also to be a herding effect. Furthermore there is a consistent autoregressive effect, though the coefficient is low for large firms and even more so for smaller firms. Even for some of these variables there are exceptions – for example the market to book variable is not significant for the Large & Old group and is not negative at all when the dependent variable is expressed as a dividend-to-assets ratio. Other variables are less rarely significant. Leverage appears to have a negative effect mainly for selected industries in the Large & Young group. There is little evidence that this variable represents an agency effect as often claimed in the literature. The rate of change of assets tends to have a negative sign for small groups but a positive sign for large groups. When interacted with the financial crisis the market to book factor previously consistently negative appears to be cancelled out or to change sign, suggesting perhaps that investment opportunity is a less important concern. There is evidence of increased herding in this period. The coefficient on the change in assets variable suggests that there is a lower need for cash for expansion in the crisis period. The leverage variable becomes significantly negative in the crisis period, whether the dependent variable is expressed as a level or a ratio. However it is not clear that this can be represented as an agency effect and it seems more likely to represent a financial constraint. We do not see any consistent change in the relationship of dividends to earnings in the financial crisis, in contrast to some claims that this relationship has been upset by an increased secular trend in repurchases. Nor do we find a substitution effect from repurchases in our results.

Due to the concentration of dividends over time noted also in the literature the average payment size increases over time along with a shrinking number of firms in the sample. It is possible that this gives rise to sample selection bias. Our attempts to allow for this were hampered in this data set by conflation of zero dividends and missing data in the Compustat records after 2006. For the short panel where we have been able to employ a Heckman estimator, the general pattern of the results was similar to that obtained with other estimators and in particular, leverage remained insignificant.

FIGURE 1. THE EVOLUTION OF PAYOUT CHANNEL CHOICE OVER TIME. Proportion of firms with cash dividend data available (CD obs.), dividend payers, non-dividend payers, and share repurchases.

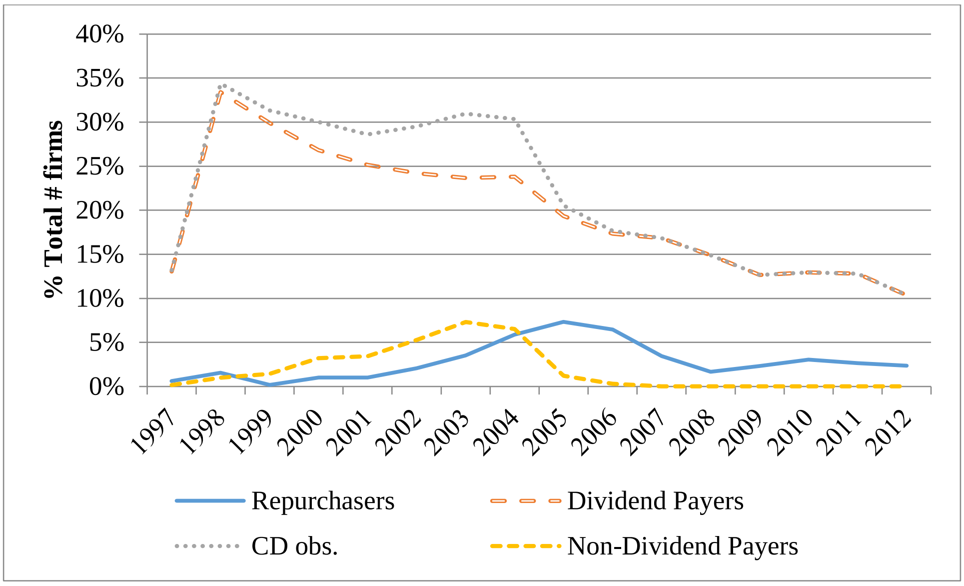
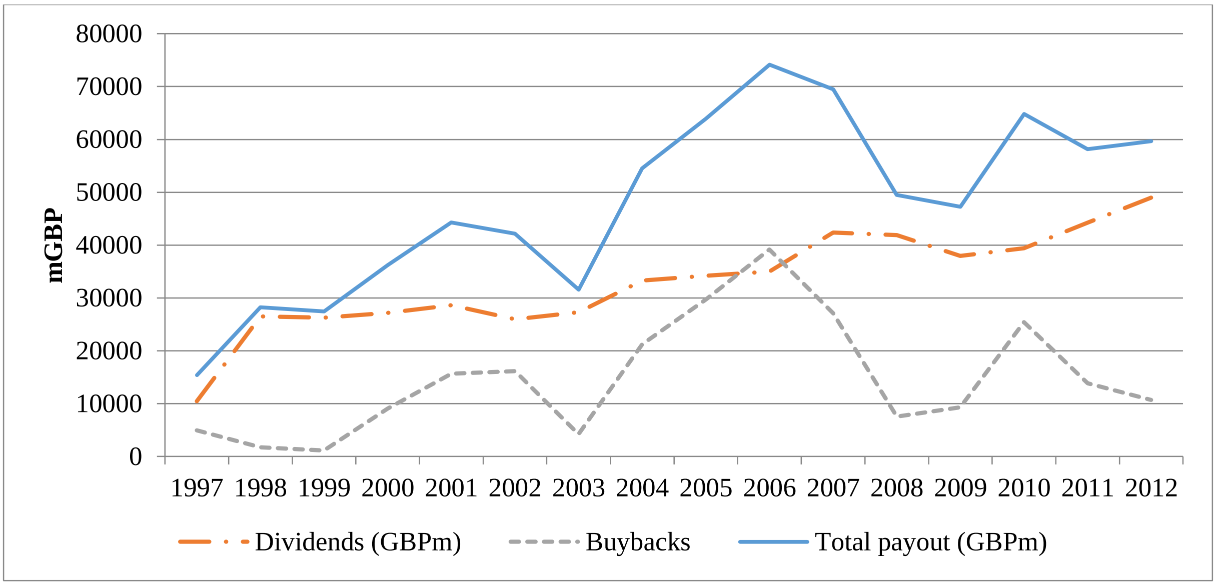
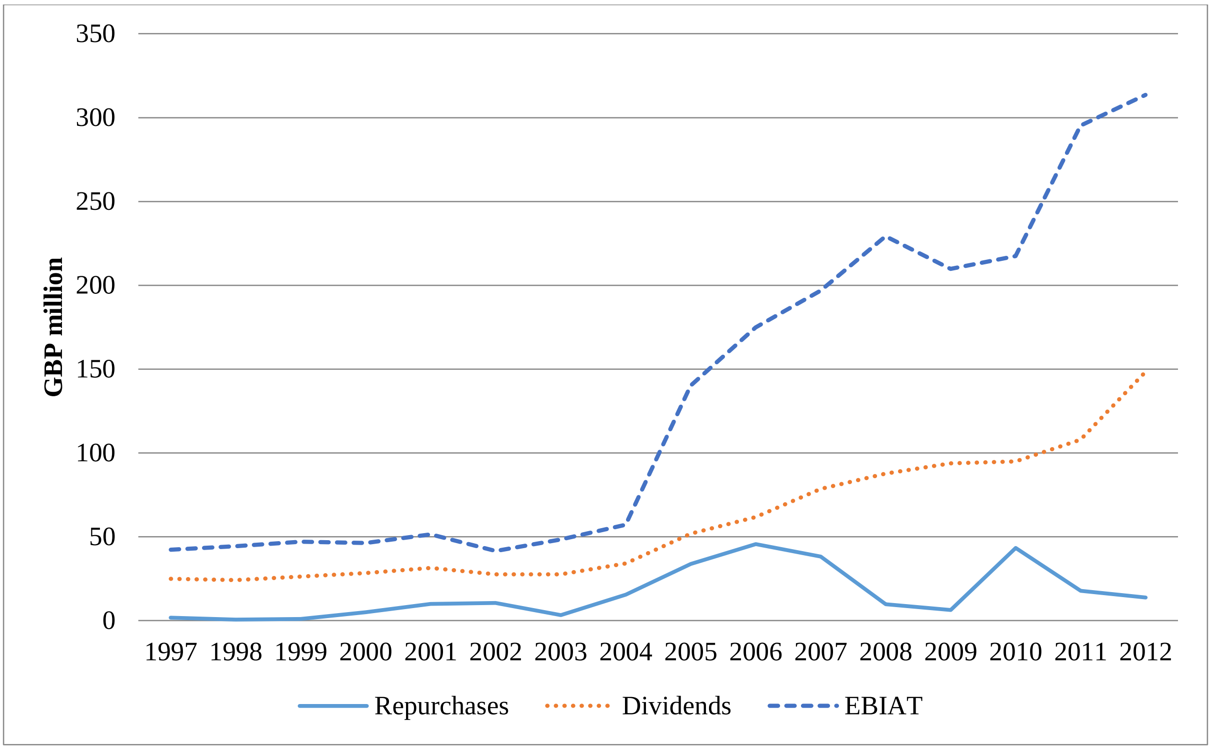


FIGURE 2. THE EVOLUTION OF TOTAL PAYOUT AMOUNTS OVER TIME



"CD obs." Represents the number of observations on dividend payers summed with the number of companies that pay no (zero) dividends (non div. payers)

FIGURE 3. MEAN DIVIDENDS, REPURCHASES AND EBIAT (GBP MILLION)



The figure shows the average distributed funds over time for dividend providers (i.e. for firms where dividends>=0).

FIGURE 4. MEDIAN VS MEDIAN DIVIDEND, IN MILLIONS GBP

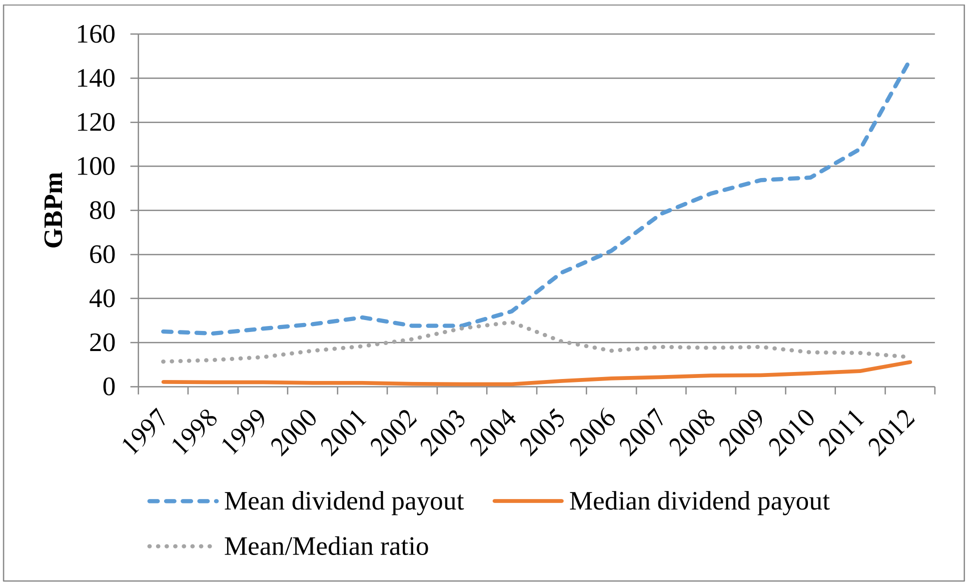


TABLE 1. NUMBER OF OBSERVATIONS FOR CASH DIVIDENDS DECLARED, SHARE REPURCHASES & TOTAL NUMBER OF FIRMS WITH DIVIDEND DATA EXPRESSED AS A PERCENTAGE OF TOTAL COMPUSTAT SAMPLE OF UK FIRMS 1997-2012

(1) Year	(2) Firms that pay cash dividends	(%) Total	(3) Firms that do share repurchases	(%) Total	(4) Firms with dividend data available ("CD Obs.")	(%) Total
1997	413	13%	19	1%	418	13%
1998	1064	33%	50	2%	1096	34%
1999	953	30%	6	0%	999	31%
2000	856	27%	33	1%	958	30%
2001	803	25%	33	1%	913	29%
2002	773	24%	66	2%	942	30%
2003	756	24%	113	4%	990	31%
2004	765	24%	189	6%	974	30%
2005	622	19%	236	7%	661	21%
2006	557	17%	208	6%	567	18%
2007	540	17%	111	3%	540	17%
2008	478	15%	54	2%	478	15%
2009	405	13%	74	2%	405	13%
2010	415	13%	98	3%	415	13%
2011	410	13%	85	3%	410	13%
2012	330	10%	75	2%	330	10%
1997-2012	10140		1528		11096	

TABLE 2. THE VALUE OF DIVIDENDS DECLARED, SHARE REPURCHASES & TOTAL FUNDS DISTRIBUTION (DIVIDENDS PLUS REPURCHASES) IN £ MILLION 1997-2012

(1) Year	The total value of dividend payments (GBP million)	%	The total value of share repurchases (GBP million)	%	The total payout (GBP million)
1997	10446	68%	4945	32%	15391
1998	26497	94%	1744	6%	28242
1999	26266	96%	1163	4%	27429
2000	27194	75%	9047	25%	36242
2001	28640	65%	15655	35%	44295
2002	25959	62%	16187	38%	42146
2003	27330	87%	4259	13%	31589
2004	33274	61%	21231	39%	54505
2005	34203	53%	29733	47%	63936
2006	34965	47%	39186	53%	74151
2007	42377	61%	27111	39%	69488
2008	41917	85%	7590	15%	49507
2009	37963	80%	9295	20%	47258
2010	39408	61%	25413	39%	64821
2011	44266	76%	13863	24%	58128
2012	48962	82%	10693	18%	59654
Total	**529668**	**69%**	**237115**	**31%**	**766783**

TABLE 3. SUMMARY STATISTICS: SAMPLE MEAN

Variables	Definitions	Dividend Payers		Non-Dividend Payers	
		Mean	Sd.	Mean	Sd.
1997-2002					
EBIAT	EBIAT (GBP million)	48.7	314.5	18.8	426.7
LEV	Leverage rate from book values	0.322	0.694	0.247	3.764
MBF	Market to book ratio	2.875	28.501	42.672	155.499
DAA	(Assets - Assets[_n-1])/Assets[_n-1]	0.254	1.196	5.445	51.595
Age	Age of a firm	20.1	12.7	11.6	9.2
Size	Ranking by market value	44.599	36.888	55.633	35.757
2003-2007					
EBIAT	EBIAT (GBP million)	115.8	593.0	53.7	682.6
LEV	Leverage rate from book values	0.203	4.508	1.167	19.923
MBF	Market to book ratio	2.538	24.506	4.404	16.002
DAA	(Assets - Assets[_n-1])/Assets[_n-1]	0.314	3.585	0.133	1.061
Age	Age of a firm	22.3	14.1	13.7	12.0
Size	Ranking by market value	52.385	28.248	41.988	30.979
2008-2012					
EBIAT	EBIAT (GBP million)	249.8	1004.3	NA	NA
LEV	Leverage rate from book values	0.293	0.309	NA	NA
MBF	Market to book ratio	1.071	6.842	NA	NA
DAA	(Assets - Assets[_n-1])/Assets[_n-1]	0.116	0.576	NA	NA
Age	Age of a firm	26.9	14.6	NA	NA
Size	Ranking by market value	52.645	28.029	NA	NA

TABLE 4. VARIABLE DEFINITIONS

Variables (l indicates 1-year lags)	**Description**
Cash dividends	Amounts paid by cash dividend payers, in nominal values and in millions of GBP, in natural logarithms, and transformed. We add 1 to these 0 values before logging them We use nominal rather than real dividends because the choice of deflator is not obvious and because we include nominal variables as right-side variables with time dummies included. Less than ten percent of our dividends are paid in non- sterling denominations and these have been converted using the relevant 2005conversion rates to GBP, with 2005 being the mid-point of our sample.
Dividend Ratio	Ratio of Cash Dividends to Total Assets
REP	Amounts declared by repurchasers, in nominal values and in millions of British Pounds, converted at mid-period annual exchange rates (as of 2005) if accounts are reported in foreign currencies (9% of the sample), in natural logarithms, and transformed.
EBIAT (LEBIAT)	(earnings before interest and taxes) – (total income taxes) in million GBP. LEBIAT refers to the natural log of EBIAT
EA	The earnings ratio of a company defined as the earnings before interest but after tax divided by the book value of assets, lagged
MBF	Market-to-book value of the firm , lagged
DAA	(change in total assets)/total assets, lagged
LEV	[(total long-term debt) + (total debt in current liabilities)] / (total assets)
SIZE	Percentile ranking of a company in the range of market values in the respective years, lagged
AGE	The age of the company.
YEAR	Time dummies
CAT	Industry dividend over sales ratio by industry in a given year, lagged. GIC Industries codes are used

TABLE 5. CORRELATION MATRIX

	Div. level	Div. ratio	EA	MBF	DAA	LEV	SIZE	AGE	CAT	EBIAT
ln (Div. level)	1									
Div. ratio	0.1578	1								
EA	0.0996	0.5358	1							
MBF	-0.0678	0.0032	0.0067	1						
DAA	0.0107	-0.0071	-0.0052	-0.0011	1					
LEV	0.2407	-0.0715	0.0280	0.0040	-0.0135	1				
SIZE	0.1695	0.0106	0.0764	0.0603	-0.0182	0.0009	1			
AGE	0.2576	-0.0303	-0.1203	-0.0279	-0.0270	0.0421	0.0767	1		
CAT	0.2725	0.1700	0.1259	-0.0449	-0.0150	0.1176	-0.0042	0.0153	1	
LEBIAT	0.9058	0.0095	0.1937	-0.0670	0.0123	0.2638	0.1810	0.1920	0.2414	1

TABLE 6. RANDOM EFFECTS & CORRELATED RANDOM EFFECTS Dependent variable ln of Dividends

	A	B	C	D	E	F	G	H
Const.	1.483***	1.188***	-0.013	0.039	-3.668**	0.530	-0.561	0.162
EA	1.263***	0.915***	-3.150***	-2.529***	1.174***	0.973***	-1.288*	-0.529
MBF	-0.004*	-0.003***	-0.001***	-0.001***	-0.004	-0.003	-0.002+	-0.002
DAA	0.000	0.000***	0.000	0.000	-0.000	-0.000	-0.000*	-0.000+
LEV	0.059	0.253+	-0.018	0.010	-0.051	-0.034	-0.126	-0.087
SIZE	0.008***	0.005***	0.002*	0.001	0.008***	0.006***	0.005***	0.004***
AGE	0.023***	0.014**	0.010***	0.007**	-0.217*	-0.123+	0.042	0.016
CAT	4.204***	3.101**	4.338***	2.904**	3.448***	1.443+	2.944***	1.468+
LDV	-	0.278***	-	0.200***	-	0.189***	-	0.160***
LEBIAT	-	-	0.638***	0.531***	-	-	0.336***	0.230***
Time dummies	YES***	YES***	YES***	YES***	YES***	YES***	YES***	YES***
Means of time-varying variables	NO	NO	NO	NO	YES***	YES***	YES***	YES***
No. obs.	3317	3232	3217	3142	3317	3232	3217	3142
No. groups	366	360	364	360	366	360	364	360
Sigma(u)	1.456	0.646	0.536	0.418	1.444	0.606	0.520	0.396
Sigma(e)	0.492	0.452	0.453	0.422	0.492	0.452	0.453	0.422
Rho	0.898	0.671	0.584	0.495	0.896	0.642	0.569	0.467

Notes:

(i) Legend: + p<0.10; * p<0.05; ** p<0.01; *** p<0.001. Sigma(u): standard deviation of residuals within groups. Sigma(e): standard deviation of residuals. Rho: proportion of the variance due to differences across groups.

(ii) Variable definitions:
EA: [(earnings before interest and taxes) – (total income taxes)]/(total assets)
MBF: (price*share/1000 market cap) / (total assets)
DAA: [(total assets) - (total assets)$_{-1}$] / (total assets)$_{-1}$
LEV: [(total long-term debt) + (total debt in current liabilities) / (total assets)
SIZE: Percentile ranking of a company in the range of market values in the respective years, lagged
AGE: number of years since firm birthday
CAT: (total dividends by year and industry) / (total sales/turnover by year and industry)
LDV: lagged dependent variable
LEBIAT:Ln of [(earnings before interest and taxes) – (total income taxes)]

(iii) EA, MBF, DAA, LEV, SIZE and CAT are lagged one period.

TABLE 7. FIXED EFFECTS Dependent variable ln Dividends (£million) (columns A-D) and Dividend to Asset ratio (Columns E&F)

	A	B	C	D	E	F
Const.	1.382***	1.296***	0.789***	0.860***	0.032***	0.028***
EA	1.190***	0.891***	-1.226*	-0.709	0.069***	0.042**
MBF	-0.004	-0.003	-0.002+	-0.002+	0.000	0.000*
DAA	-0.000	-0.000	-0.000*	-0.000+	-0.000***	-0.000**
LEV	-0.060	-0.042	-0.121	-0.080	-0.011	-0.005
SIZE	0.008***	0.006***	0.005***	0.004***	0.000	0.000
AGE	0.039***	0.030***	0.022***	0.019**	-0.000	-0.000
CAT	3.356***	1.497+	2.851***	1.502+	0.032	-0.001
LDV	-	0.172***	-	0.147***	-	0.145*
LEBIAT	-	-	0.331***	0.241***	-	-
Time dummies	YES***	YES***	YES***	YES***	YES***	YES***
No. obs.	3317	3232	3217	3142	3478	3229
No. groups	366	360	364	360	384	360
Sigma(u)	1.629	1.361	1.143	1.039	0.019	0.017
Sigma(e)	0.492	0.452	0.453	0.422	0.017	0.017
Rho	0.917	0.901	0.865	0.858	0.564	0.513

Notes: See notes to Table 6

TABLE 8. FIXED EFFECTS FOR AGE & SIZE GROUPS Dependent variable ln Dividends (£ million)

	SMALL & YOUNG			SMALL & OLD			LARGE & YOUNG			LARGE & OLD		
	A	B	C	D	E	F	G	H	I	J	K	L
Const.	1.682***	1.110***	1.624***	2.140***	2.243**	1.965**	1.496***	0.750**	1.505***	2.032***	1.223***	1.710***
EA	0.324	-0.067	-0.246	0.758	1.234	0.857*	1.514*	0.184	1.155*	1.546*	-1.308	1.596**
MBF	-0.104**	-0.065***	-0.065**	-0.229*	-0.225+	-0.203+	-0.002*	-0.001*	-0.001**	-0.000	0.001	0.001
DAA	-0.000	-0.000	-0.000**	-0.029	-0.015	-0.032	0.005	0.017**	0.017**	0.146**	0.058	0.111*
LEV	0.064	-0.045	-	-0.589*	-0.450	-	-0.380	-0.406	-	0.137	0.117	-
SIZE	0.005***	0.003*	0.003***	0.005**	0.005*	0.004*	0.005***	0.002*	0.004***	0.006***	0.002*	0.004***
AGE	0.032+	0.022	0.034*	0.026+	0.025	0.028+	0.076***	0.052***	0.066***	0.019	0.008	0.014
CAT	-1.477	-0.806	-1.442	-0.930	-1.603	-0.594	3.071	1.570	1.748	3.620*	1.849	1.581
LDV	-	0.070	0.087**	-	0.051	0.024	-	0.074*	0.077*	-	0.177***	0.206***
LEBIAT	-	0.183**	-	-	-0.063	-	-	0.281**	-	-	0.258***	-
LEV*S1	-	-	-1.554**	-	-	-0.540+	-	-	-2.129**	-	-	1.541+
LEV*S2	-	-	1.543+	-	-		-	-	-0.634*	-	-	-0.512+
LEV*S3	-	-		-	-		-	-	-1.987***	-	-	
Time dummies	YES	YES	YES	YES*	YES**	YES*	YES***	YES*	YES***	YES***	YES**	YES***
No. obs.	501	472	492	571	533	557	928	880	902	1317	1257	1281
No. groups	173	166	170	167	160	162	196	191	192	222	219	219
Sigma(u)	1.594	1.221	1.504	1.805	1.775	1.726	1.664	1.055	1.593	1.613	1.028	1.293
Sigma(e)	0.292	0.253	0.265	0.388	0.394	0.387	0.446	0.353	0.396	0.431	0.379	0.394
Rho	0.968	0.959	0.970	0.956	0.953	0.952	0.933	0.899	0.942	0.933	0.880	0.916

Notes: See notes to Table 6
Small if SIZE < median
Young if AGE < median

TABLE 9. FIXED EFFECTS FINANCIAL CRISIS INTERACTIONS Dependent Variable Ln Dividends (£ million)

	TOTAL SAMPLE		SMALL & YOUNG		SMALL & OLD		LARGE & YOUNG		LARGE & OLD	
	A	B	C	D	E	F	G	H	I	J
Constant	1.613***	0.999***	1.783***	1.118***	2.572**	2.886*	1.453***	0.595*	2.422***	1.582*
EA	1.140***	-1.148*	0.341	-0.173	0.569	0.096	1.530*	0.874	1.547*	-1.863*
MBF	-0.004+	-0.002*	-0.096**	-0.076***	-0.253*	-0.244*	-0.002*	-0.001**	-0.001	-0.001
DAA	-0.000	-0.000	-0.000	-0.000	-0.037+	-0.042+	0.003	0.005+	0.082	-0.002
LEV	0.051	0.045	0.090	0.047	-0.765*	-0.735*	-0.124	-0.076	0.019	0.054
SIZE	0.007***	0.005***	0.005***	0.002*	0.005**	0.005***	0.005***	0.003*	0.005***	0.003**
AGE	0.028**	0.014	0.011	0.001	0.013	0.007	0.085***	0.076***	0.007	0.002
CAT	2.466*	2.246*	-1.447	-0.607	-0.462	-0.488	1.355	0.240	3.436*	3.162+
EBIAT	-	0.312***	-	0.248***	-	-0.023	-	0.291**	-	0.336***
CRISIS*EA	0.407	0.053	0.746	-0.749	0.552	0.856	0.113	-2.258*	0.230	0.077
CRISIS*MBF	0.002***	0.002***	0.205+	0.201+	0.100	0.070	0.045	0.117**	0.001***	0.001***
CRISIS*DAA	0.157**	0.098**	0.456	0.213	0.375	0.438	0.196*	0.121	0.322*	0.231+
CRISIS*LEV	-0.486+	-0.640**	-0.349	-0.800+	0.334	0.269	-0.823+	-0.937**	0.361	0.137
CRISIS*SIZE	0.002	0.001	0.000	-0.000	0.001	-0.001	-0.002	-0.003+	-0.000	-0.001
CRISIS*CAT	3.315*	1.993	4.554	3.497	-2.309	-3.050	3.451	1.891	1.254	0.832
CRISIS*LEBIAT	-	0.029	-	0.066	-	0.027	-	0.049	-	0.005
Time dummies	YES***	YES***	YES	YES	YES	YES	YES**	YES+	YES***	YES**
No. obs.	3317	3217	501	479	571	546	928	902	1317	1290
No. groups	366	364	173	168	167	164	196	195	222	222
Sigma(u)	1.612	1.153	1.564	1.200	1.803	1.841	1.681	1.188	1.630	1.209
Sigma(e)	0.487	0.449	0.290	0.263	0.389	0.395	0.441	0.395	0.430	0.405
Rho	0.916	0.868	0.967	0.954	0.956	0.956	0.936	0.900	0.935	0.899

Notes: See notes to Table 6.
CRISIS: dummy variable = 1 if year ≥ 2008

TABLE 10. ROBUSTNESS TESTS. FIXED EFFECTS. Dependent variable ln Dividends £m (columns A, B D and E&F) and Dividend to Asset ratio (Column C)

	A	B	C	D	E	F
Const.	1.380***	1.294***	0.025**	1.312***	-0.106	-0.180
EA	0.806**	0.364+	0.070**	0.358+	4.711***	3.433**
MBF	-0.004	-0.003	0.000	-0.003	-0.004***	-0.001
DAA	-0.000+	-0.000+	-0.000**	-0.000+	0.000***	0.000***
LEV	-0.050	-0.035	-0.004	-0.034	2.551***	0.337+
SIZE	0.008***	0.006***	-0.000	0.006***	0.003*	0.000
AGE	0.039***	0.030***	0.000	0.029***	0.042***	0.027***
CAT	3.386***	1.549+	0.033	1.570+	18.568***	3.126
LDV	-	0.174***	-	0.174***		
EA*ΔEA	0.618*	0.828***	-	0.829***		2.696**
CRISIS*EA			-0.019			
CRISIS*MBF			0.000			
CRISIS*DAA			-0.001**			
CRISIS*LEV			-0.022*			
CRISIS*SIZE			0.000			
CRISIS*CAT			0.028			
REP	-	-	-	0.002		
EA*Q1						0.674**
Time dummies	YES***	YES***	YES***	YES***	YES	YES***
No. obs.	3317	3232	3314	3232	2572	
No. groups	366	390	366	360	490	
Sigma(u)	1.629	1.357	0.019	1.356	-	
Sigma(e)	0.491	0.451	0.017	0.451	-	
Rho	0.917	0.901	0.560	0.900	-	
Athrho						0.793***
Lnsigma						0.456***
Lambda (*s.e.*)						1.040 (0.202)

Notes: See Notes to Table 6. Column F: Selection equation for Heckman's estimator. CRISIS: dummy variable = 1 if year ≥ 2008. Q1: dummy variable = 1 if EA>Quartile 1. Athrho: inverse hyperbolic tangent of correlation coefficient of errors, ρ. Lnsigma: natural log of residuals in the dividend equation, σ. Lambda: selectivity coefficient $\lambda = \rho\sigma$

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