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Corporate governance, dividend payout policy, and the interrelation between dividends, R&D, and capital investment

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Abstract

This paper investigates the relationship between dividends and the ownership and control structure of the firm. For a panel of Austrian firms over the 1991/99 period, we find that state-controlled firms engage in dividend smoothing, while family-controlled firms do not. The latter choose significantly lower target payout levels. Consistently, state-controlled firms are most reluctant and family-controlled firms are least reluctant to cut dividends when cuts are warranted. The dividend behavior of bank- and foreign-controlled firms lies in between state- and family-controlled firms. This is consistent with the expected "ranking" of information asymmetries and managerial agency costs. The above results hold for firms with good investment opportunities. We find that firms with low growth opportunities optimally disgorge cash irrespective of who controls the firm.

JEL classification: G3; L2; D9
Keywords: Corporate governance; Dividend policy; Simultaneous equations

1. Introduction

In March 1999, Richard Schenz, the CEO of OMV AG, the largest Austrian corporation, announced a dividend increase of 10% despite the fact that ordinary earnings had declined by 47%. In April 2000, Claus Raidl, the CEO of Böhler–Uddeholm AG, an Austrian steal company, announced an earnings drop of 31%, nevertheless

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dividends increased by 2% points. Both, OMV and Böhler–Uddeholm have one thing in common: they are ultimately owned and controlled by the state, i.e. by the Republic of Austria. This paper tries to answer the questions why dividends are sometimes not cut when cuts are warranted and more generally why some firms smooth dividends, despite the potential costs involved for shareholders. [1] It argues that the answers to these questions can be found by examining company corporate governance structures.

The causes and consequences of different corporate governance systems in place all over the world have been the subject of extensive scrutiny in recent years. In most Anglo-Saxon countries like the US or UK, law often postulates fiduciary duties for management such as loyalty to shareholders, and governance is exerted mainly via "markets for corporate control" in the form of takeovers, proxy fights, or LBOs. In contrast, governance systems in non-Anglo-Saxon countries differ remarkably. In Japan, *keiretsus* and cross-shareholdings are common governance devices while law requirements for management are rather weak. In Continental Europe, as in Germany, Italy, France or Austria, a concentrated ownership structure is the distinguishing feature, and corporate law again plays a minor role. [2]

Indeed, La Porta et al. (1999) assert that in most countries other than the USA or UK ownership and (even more so) control is concentrated in the hands of a few owners. Moreover, since the structure of capital markets and corporate governance systems is so much different, the determinants of key corporate decision variables are likely to differ as well. This paper asserts that dividend payments are dependent on the identity of the controlling owner of the firm. Besides tremendous ownership concentration, a peculiarity of the corporate governance system in Austria is that the state still holds many controlling equity blocks in non-financial companies. Likewise, large and controlling stakes of banks, foreign firms, and families are commonplace. This variation across identities of large shareholders makes Austria an ideal laboratory for testing for the effects of the identity of the controlling owners on key firm decisions such as dividend payout or investment. [3]

[1] For example, taxes. Allen and Michaely (1995) report that most dividends are received by individuals in high tax brackets in the US. In Austria, resident individual's dividend income is taxed by a 25% withholding tax while capital gains are tax free after a holding period of one year.

[2] Prowse (1992) compares corporate governance structures in Japan and Germany, Berglöf and Perotti (1994) analyze *keiretsus* in detail. Charkham (1994) and Hopt et al. (1998) highlight comparative aspects of corporate governance. Barca and Becht (2001) and La Porta et al. (1999) analyze ownership structures. Gugler (2001) analyzes corporate governance and profitability.

[3] Franks and Mayer (1997) characterize an "insider system" of corporate governance by (i) few listed companies, (ii) a large number of substantial share stakes and (iii) large intercorporate equityholdings. Austria exhibits all of these features, and thus can be characterized as an "insider" system of corporate governance. Gugler (1998) reports that nearly 30% of the employees of the 600 largest non-financial companies in Austria are (still) under state-control, 35% of the employees are governed by families or individuals, foreign firms command 26.1%, and around 10% are under bank-control. Historically, banks converted debt to equity and took over control in (former) state-influenced companies in case of financial distress (Mathis, 1990). Other institutional investors, such as pension funds, are unimportant in Austria to date, since it is possible to form pension funds only since 1990 (see Jud, 1993). For a detailed description of the corporate governance system in Austria see Beer et al. (1991), Gugler (1998), Gugler et al. (2001), Gugler et al. (2000b) and Gugler (2001).

One of the most important financial decisions that a firm's managers face is on the amount and stability of dividends. Dividends have always been a bit of a puzzle in the theory of the firm. In the neoclassical world of Miller and Modigliani (1961) "dividends do not matter" which is to say that they drop out as a pure residual, once the optimal level of investment has been determined. Yet models *to explain* dividend payouts often fit the data even better than investment models (Kuh, 1963). In his classic study, Lintner (1956) made the observation that managers are particularly concerned with the stability of dividends. Managers appeared to believe strongly that the market puts a premium on firms with a stable dividend policy. [4]

There have been many explanations of this observation including risk aversion on the part of investors, lack of investment opportunities or signaling theories (Black, 1976). This paper views dividend policy as a consequence of the separation of ownership and control. Agency theory predicts substantial and stable dividends. The higher dividends are, the less free cash flow there is, ceteris paribus, in managers' hands to spend on negative net present value projects. The higher dividends are, the greater is also the need to go to the capital market for new outside funds, and the greater the effectiveness of monitoring. If the primary function of dividends is to force firms into the capital market, regular and stable payouts are more valuable (Easterbrook, 1984). Fudenberg and Tirole (1995) explain income and dividend smoothing based on incumbency rents. If managers enjoy private benefits from being in control they, individually and rationally, smooth dividends. In bad times, they payout too much dividends to lengthen their tenure. In good times, they are less concerned by their short term prospects and information decay allows them to save for future bad times. [5] Finally, La Porta et al. (2000) conjecture that minority shareholders press corporate insiders to pay dividends, since they cannot be sure to get a fair return particularly in countries where shareholder rights are not well developed.

We find evidence that target dividend levels, the smoothing of dividends, and the reluctance to cut dividends depend on the identity of the (ultimately) controlling owner. State-controlled firms engage in dividend smoothing and have the highest target payout ratios while, in marked contrast, dividend payments of family-controlled firms are not subject to dividend smoothing. Furthermore, state-controlled firms are most reluctant to cut dividends while family-controlled firms are least reluctant to cut dividends.

These findings apply to firms with good growth prospects (positive R&D spending). For these firms, even minority shareholders may find it optimal to wait for their dividends. Recently, La Porta et al. (2000) found evidence for the "outcome model" of dividends, where dividends are the result of effective pressure by minority shareholders to force corporate insiders to disgorge cash. [6] Consistent with their findings we find for firms with low investment opportunities (no R&D spending) much larger

[4] See also Fama and Babiak (1968), Kallapur (1994), or Dewenter and Warther (1998).

[5] Fudenberg and Tirole (1995) mean by "information decay" that recent income observations are more informative than older ones about the future.

[6] See also Faccio et al. (2001), who find that corporations that exhibit a wider discrepancy between ownership and control pay higher dividends.

target payout ratios which do not differ significantly across control categories. This implies that firms with bad growth prospects find it optimal—presumably as a response to pressure by outside shareholders—to pay substantial amounts of cash as dividends, irrespective of who controls the corporation. [7]

This is consistent with Fama and French (2001), who find that firms with good investment opportunities payout substantially less or are much more likely to payout nothing than other firms in the USA. Moreover, the authors find that firms have become less likely to pay dividends, whatever their characteristics (such as size, profitability or investment opportunities) during the period 1978–99. A lower propensity to payout dividends can be explained by better corporate governance technologies in the 90s as compared to the 70s and early 80s. [8]

The results are also consistent with the findings of the recent literature about dividends as a mechanism to reduce agency costs. Rozeff (1982) found for a sample of 1000 US firms that higher dividend payouts are established when insiders hold a lower fraction of the equity and/or a greater number of stockholders own the outside equity. Gaver and Gaver (1993) find significantly lower dividend yields for growth firms than for non-growth firms, Noronha et al. (1996) find simultaneity between capital structure and dividend decisions, and Jensen et al. (1992) find substitution between insider ownership, debt, and dividends as control devices. Dewenter and Warther (1998) conclude that Japanese corporations face less information asymmetry and agency conflicts than US firms.

These results for large corporations from "market-based" systems of corporate governance are remarkably similar to our results in an "insider" system for those corporations *where* managerial agency costs are likely to be present. The dispersion of ownership claims and lower insider holdings induce managerial agency costs in the large public corporation in the US and thereby motivate dividend payments. State-holdings also give rise to managerial discretion despite concentrated ownership stakes and again call for dividends as a monitoring device. For firms with bad growth prospects dividends optimally reduce the amount of cash in the hands of corporate insiders. In contrast, the family-controlled firm with good growth opportunities does not see the need to consistently payout a large fraction of its earnings to check managerial agency costs or to signal market value to outside investors. [9]

To test the "smoothing of dividends" phenomenon correctly, a simultaneous equations framework is employed. In a world of perfect capital markets, optimal in-

[7] Note also that our results are not necessarily inconsistent with the dividend signaling model. Our sample consists predominantly of unlisted firms and is not ideal for testing the signaling hypothesis. For recent tests of the dividend signaling hypothesis see Yoon and Starks (1995) and Bernheim and Wantz (1995); for a theoretical treatment see Kumar (1988).

[8] For example, Hall and Liebman (1998) report a tremendous rise in the pay–performance relationship for US CEOs in the period 1980–94. The median elasticity of CEO compensation with respect to firm value more than tripled, from 1.2 in 1980 to 3.9 in 1994. The main reason for this increase in pay–performance elasticity is the increased use of stock options. This implies a better alignment of managerial and shareholder interests, and thus less need to payout cash as dividends.

[9] However, there may also be costs for the family-controlled firm, e.g. cash constraints (see Gugler, 1997).

vestment decisions by a firm are independent of how such decisions are financed (Miller and Modigliani, 1961). While Fama (1974) finds evidence consistent with a perfect capital market, Mueller (1967), Dhyrmes and Kurz (1967), and Grabowski and Mueller (1972) do not. These authors analyze the firm decision process as a choice among investment in capital and technological stocks or the payment of dividends.

The paper is organized as follows. Section 2 formulates the hypotheses, Section 3 sets up a simultaneous equations model with the three key decision variables capital investment, R&D, and dividend payments. Section 4 briefly describes the sample. Section 5 reports the main results, and Section 6 concludes.

2. Dividends, agency costs, and the perfect capital markets hypothesis

High ownership concentration is present in most Continental European countries, and one key to understanding corporate control failures in these systems of finance is, therefore, to identify the large controlling owners. In what follows we discuss plausible effects of the most important identities of shareholders in Austria on dividend payout policy, i.e. the state, families, banks and foreign firms. [10]

State-controlled corporations can be viewed as manager-controlled. In a state-controlled corporation a *double* principal–agent problem even exists. The ultimate owners of the corporation are the citizens. They do not control the corporation directly, however, their elected representatives do (or should). Large numbers again lead citizens "to shirk" on their monitoring role of politicians, and thus the politicians themselves may not actively monitor the companies the state owns. These considerations lead us to expect even greater principal–agent problems between managers and the citizen-"owners" of state-owned companies than for private corporations. Elected politicians are held accountable for all of the activities of government. They can be expected to have a particularly strong interest in seeing a steady flow of dividends from a company controlled by the state, since (1) dividends may suffice to convince citizens that the company is performing well, and (2) a steady stream of dividends reduces the cash flow in the hands of the managers. Alternatively, asymmetry of information allows managers to smooth dividends, and to defend incumbency rents makes them reluctant to cut dividends.

Neither major conflicts of interest nor large asymmetries of information between management and the ultimate owners are present in family-controlled companies. Managers and large family shareholders are either the same persons, and therefore, the residual claimants bearing (nearly) all of the costs and receiving (nearly) all of the benefits of their actions, or, the large shareholders have enough incentive and ability for efficient direct monitoring. If monitoring is direct via "voice" or if

[10] We do not examine share repurchases, since these were effectively forbidden by law until recently in Austria. The Aktienrückerwerbsgesetz (act on share repurchases), effective since 1 February 2000, allows share repurchases up to 10% of total capital subject to certain conditions (see Section 82 (9) of the Stock Exchange Act (Börsegesetz)).

owner-managers are themselves the residual claimants, dividends and/or dividend stability are less valuable, and owner-managers are more likely to cut dividends when necessary.

Predictions about dividend policy in bank- and foreign-controlled firms are ambiguous. On the one hand, dividend smoothing is not expected to be important in bank-controlled firms. Holding both the debt and the equity of a corporation, the bank has incentives to favor lower and not necessarily stable dividend payouts to shield its debt better from bankruptcy risks (Amihud and Murgia, 1997). On the other hand, ultimate owners of banks are either the state or cooperatives in Austria where one would expect agency costs. [11]

Owners of foreign firms can be families, banks, institutional investors or governmental agencies where no unambiguous predictions are again possible. [12]

Our predictions of the effects of the identity of the large shareholders on dividend payout policy depend on the investment opportunity set of the firm. Shareholders of a firm with good investment opportunities may find it optimal to realize profitable growth opportunities and wait for dividends. [13] On the other hand, shareholders of a firm with little or no growth opportunities may want to press corporate insiders to disgorge cash so that these earnings cannot be used to benefit corporate insiders. These predictions should be valid irrespective of the identity of the controlling owners. Thus, we would expect that all firms (and therefore also family-controlled firms) with little or no growth opportunities should have the desire to pay substantial

[11] Schmidt (1997) analyzes the relationship between ownership structure and performance for 55 Austrian credit unions (co-operative associations) over the period 1991–93. The more members the co-operative has and the smaller the Herfindahl-index of voting power concentration, the worse the performance measure return on assets. This is consistent with the management discretion hypothesis. Credit co-operatives can be classified as manager-controlled firms, since the average number of members of co-operatives is more than 6000. A large separation of ownership and control is furthermore expected, since voting concentration is even more dispersed than ownership concentration: There is the so called "*Kopfstimmrecht*" ("one-head-one-vote" instead of "one-share-one-vote") implying an even distribution of voting rights, although cash flow rights may be concentrated. In essence, this is a voting cap. See Gugler (2001) for further details.

[12] Unfortunately, we do not have information on ultimate owners of foreign firms. In a nearly comprehensive study of ownership structures in Austria (32,227 corporations or 65% coverage), Beer et al. (1991) report that 39.3% of the foreign equity holdings in Austria are owned by German corporations. The ownership structure in Germany in turn is very similar to the Austrian structure with important family, state, bank, and other industrial firm holdings (see Boehmer, 1998).

[13] This statement is of course only true if minority shareholders can be confident that they will get a fair share of the future cash flows. The legal system is a major determinant of minority or dispersed shareholders being able to extract cash from corporate insiders (see La Porta et al., 2000). In recent years considerable effort was devoted to alleviate the legal rights of minority shareholders in Austria. For instance, a new take-over law (Übernahmegesetz) stipulates a compulsory offer to minority shareholders in case of a controlling offer. Amendments to existing laws improving transparency and the legal rights of minority shareholders include the amendment of the Stock Exchange Act (Börsegesetz), which, among other things, criminalises insider dealing and tightens transparency regulations. Section 91 of the Stock Exchange Act implementing the EU's Large Holding Directive (88/627/EEC) goes beyond the EU minimum requirements and specifies the notification thresholds 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%, 75% and 90% of the total voting rights of the company.

amounts of dividends to return cash flows to the shareholders. These firms may also pay dividends on a regular basis and thus smooth dividends.

We summarize the above discussion by Hypothesis 1: Managers of state-controlled firms have the incentive and discretion for dividend smoothing. In determining their dividend policy this year, therefore, state-controlled firms put more weight on the dividends they paid last year than family-controlled firms, holding investment opportunities constant. Thus, a positive and larger autoregressive coefficient in a dividends equation is expected. For the same agency cost reasons, Lintner-type target payout ratios are predicted to be higher for state-controlled firms than for family-controlled firms. Across control categories, state-controlled firms are most reluctant to cut dividends. Firms with little or no growth opportunities may find it optimal to return cash flows to shareholders irrespective of who controls the firm. Target payout ratios and smoothing should be substantial for all control categories in this case. [14]

If the perfect capital market/neoclassical firm hypothesis is valid, there should be no negative association between current dividend payments, capital investment, and R&D. Significant (and negative) coefficients on dividends would imply the existence of capital market imperfections, and jointness in the dividend and investment decisions would require treating them in a simultaneous equations model as interdependent endogenous variables. We formulate Hypothesis 2 as: Investment, R&D, and dividends are significantly and inversely related to one another and thus the perfect capital markets hypothesis is not valid.

3. A simultaneous equations system

Following Grabowski and Mueller (1972), we treat the three key decisions investment in physical capital I, research and development R, and dividends D, as jointly determined variables. The marginal returns and marginal cost schedules of the firm are

$$\begin{aligned} \mathrm{mrr}_R &= a_R + b_R I + c_R R + e_R X_R, \\ \mathrm{mrr}_I &= a_I + b_I I + c_I R + e_I X_I, \\ \mathrm{mrr}_D &= a_D + b_D I + c_D R + d_D D + e_D X_D, \\ \mathrm{mcf} &= g(R + I + D) - hZ, \end{aligned} \tag{1}$$

where mrr_j, $j = R,I,D$ are the expected marginal returns of R&D, capital investment, and dividends, respectively, and mcf is the marginal cost of obtaining an additional unit of financing. [15] Each X_j is a set of exogenous variables specific to the firm outlay,

[14] The empirical analysis of Section 5 takes care of this distinction by discriminating firms on the basis of whether they spend resources on research and development or not. Our proxy for the growth opportunities of the firm (R&D spending) has the virtue that it potentially reflects *future* opportunities in contrast to past sales growth or the like reflecting at least in part *past* opportunities (see La Porta et al., 2000). Further, R&D better measures *internal* growth opportunities while sales growth may confound internal and *external* growth via mergers and acquisitions.

[15] The marginal rates of return of I and R do not depend on D, since the rates of return of these two investments are determined by technological rather than financial factors.

and Z is a set of exogenous variables determining the marginal cost of capital. The marginal "return" to dividends is the marginal utility (owner-) managers derive from paying additional dividends. The law of diminishing returns suggests that b_I and c_R are negative, i.e. the more investment in capital or R&D is undertaken, the lower the expected marginal return from incremental investment or R&D spending, and d_D is assumed negative as the marginal utility to dividends diminishes.

Alternatively, b_R and c_I can be of either sign depending on whether substitutive (negative sign prediction) or complementary (positive sign prediction) effects between investment in capital stock and technological stock are dominant. Managerial theories of the firm point to positive b_D and c_D coefficients: Additional oulays of I and R (beyond firm value maximization) will raise the managerial returns to paying dividends by increasing security from takeovers and/or by placating firm owners.

In equilibrium, profit and/or utility maximization implies that managers equate the marginal returns of each expenditure to the marginal cost of financing an additional outlay. Adding random disturbance terms yields the following simultaneous equations system:

$$\begin{aligned} R &= \frac{a_R}{g-c_R} + \frac{b_R-g}{g-c_R} I - \frac{g}{g-c_R} D + \frac{e_R}{g-c_R} X_R + \frac{h}{g-c_R} Z + u_R, \\ I &= \frac{a_I}{g-b_I} + \frac{c_I-g}{g-b_I} R - \frac{g}{g-b_I} D + \frac{e_I}{g-b_I} X_I + \frac{h}{g-b_I} Z + u_I, \\ D &= \frac{a_D}{g-d_D} + \frac{c_D-g}{g-d_D} R + \frac{b_D-g}{g-d_D} I + \frac{e_D}{g-d_D} X_D + \frac{h}{g-d_D} Z + u_D. \end{aligned} \tag{2}$$

Since g is assumed to be positive (rising capital cost schedule) and all other coefficients in the denominators negative, these denominators are positve. Therefore, dividends should have a negative coefficient in both the R&D and capital investment equations for cost of capital reasons. We next discuss the exogenous variables employed.

Following the investment-cash flow literature, internally generated cash flows are assumed to determine the slope of a firm's cost of capital schedule. [16] The Z set includes three measures of internally generated cash flows, i.e. profits after taxes (Π_{it}), depreciation allowances (DEP_{it}), and the stock of available liquidity or corporate cash reserves (LIQU_{it}), where i denotes firms and t time. [17]

Research on the determinants of R&D expenditures suggests that the productivity of R&D is systematically related to (at least) three factors, (1) the scale of operations, (2) "technological opportunities", and (3) firm specific variables as e.g. the degree of appropriability (see Pakes and Schankerman, 1984). Accordingly, the X_R set con-

[16] See theoretically Myers and Majluf (1984). A number of studies found that liquidity indeed matters for investment (Fazzari et al., 1988; Himmelberg and Petersen, 1994; Harhoff, 1996; Gugler, 1997; Gugler et al., 2000a) pointing to a rising external cost of capital schedule. For a recent survey on cash constraints see Hubbard (1998).

[17] When we additionally include the coefficients of variation of the cash flow to sales or the profits to sales ratio to capture the influence of non-diversifiable risk on the cost of capital, these coefficients are insignificant, thus we do not report them.

tains: (1) Total contemporaneous sales (SAL_{it}) as a proxy for the scale of operations. Larger firms have a greater incentive to engage in unit cost-reducing innovations as these cost reductions pertain to a larger number of units (Shaked and Sutton, 1987). Therefore, the value of R&D is proportional to the level of output produced by the firm. Likewise, the larger the firm the greater the output over which its fixed costs of R&D can be spread (Klepper, 1996). However, inventive inputs may increase less than proportionately with firm size because there are diminishing returns to some aspects of R&D (Scherer, 1965). Thus sales squared (SAL_{it}^2) are included to capture possible non-linearities in the relationship between R&D and size, (2) 18 industry dummies at the two-digit ISIC level (International Standard Industrial Classification) are incorporated to proxy for industry specific "technological opportunities", (3) the number of patents applied for (PAT_{it}) is included as both a measure of the degree of appropriability (Jaffe, 1986) and a measure for the past productivity of R&D efforts (Grabowski, 1968).

The X_I set is defined to reflect demand pull considerations in the form of accelerator variables (change in sales, ΔSAL_{it}, see e.g. Eisner (1964, 1967)). Unfortunately, Tobin's q cannot be included since only 42 out of the 214 firms are listed. Another conditioning variable in the simple accelerator model is capital stock one period lagged ($CAP_{i,t-1}$).

The variables assumed exogenous to dividends (the X_D set) are chosen to reflect the famous Lintner (1956) model. Changes in dividends are determined by the difference between last year's dividends and this year's target pay-out level which is assumed to be a fixed proportion of earnings, i.e.

$$\begin{aligned} &D_{it}^{*} = \tau \Pi_{it}, \\ &\Delta D_{it} = \gamma + \alpha(\tau \Pi_{it} - D_{it-1}) + \varepsilon_{it} \text{ or} \\ &D_{it} = \gamma + \alpha\tau \Pi_{it} + (1-\alpha) D_{it-1} + \varepsilon_{it}, \end{aligned} \tag{3}$$

where D_{it}^{*} is the target payout of firm i in period t, τ the target payout ratio, Π_{it} are current earnings, ΔD_{it} changes in dividend payments from period $t-1$ to t, γ a constant term, α a speed of adjustment coefficient, D_{it-1} lagged dividends, and ε_{it} the error term. [18] Thus, τ and $(1-\alpha)$ are the key parameters to test Hypothesis 1 as these determine the dividend payout policy "bundle", i.e. target level and smoothing. A lower value of $(1-\alpha)$ indicates a speedier adjustment to target payout levels, whereas a lower value of τ indicates less need to optimally payout dividends.

4. The data

Our strategy to test Hypotheses 1 and 2 is to categorize firms according to their control structure. Austria is probably the country with the highest ownership concentration in Continental Europe (see Barca and Becht, 2001; Gugler et al., 2001). Thus, large shareholding is the most important corporate control device and the most natural to use to classify firms in Austria. To group the ownership data in a

[18] In Section 5, D_{it-1} is not treated as an exogenous variable and it is instrumented.

way which reflects the most important elements of Austrian corporate governance, different control categories for owners are established, i.e. bank, state, foreign firm, and family/individual control. [19] The criterion for categorization is the largest ultimate shareholder of a company where ultimate ownership includes direct and indirect holdings via pyramiding. The additional criterion is an unbroken chain of controlling equity stakes (>25%) of the ultimate owner in the companies on the way to the top layer. The principal data sources used to make this classification are the "Wirtschafts-Trend-Zeitschriftenverlagsgesellschaft m.b.H", Hoppenstedt's "Großunternehmen in Österreich" and "Der Finanzcompass" (several annual editions).

OMV AG highlights our criterion for categorization. Fig. 1 shows that OMV AG is owned by ÖIAG (49.9%), IPIC (19.6%) and dispersed holdings (30.5%). To determine the ultimate owners of a corporate pyramid one must identify the owners at each consecutive level until the top layer of the pyramid is reached. Thus, since the Republic of Austria wholly owns Österreichische Industrieholding Aktiengesellschaft (ÖIAG) and ÖIAG further fulfills our additional criterion of holding more than 25% of OMV AG, OMV AG is ultimately controlled by the state. [20]

The sample to test Hypotheses 1 and 2 consists of 214 non-financial firms over the period 1991–99 drawn from the 600 largest non-financial firms in Austria on the basis of data availability. This sample covers around 10% of Austrian private sector employment. By far the largest part of ultimate shareholders (90%) maintain a chain of *majority* (>50%) ownership stakes. This guarantees a controlling influence in each layer of the pyramid. Only five firms do not fulfill the 25% requirement and thus do not have large shareholders as we define them. Three of these five firms were classified as ultimately state-controlled, since they were privatized only in 1993/94 and the management and supervisory boards are still dominated by representatives of the state. The other two were classified as ultimately family-controlled, since the founding family was still present on the supervisory board. Given the importance of large shareholders in Austria, errors due to misclassification of firms are likely to be minor.

Applying the above classification scheme to the sample of 214 firms there are 45 state-, 31 bank-, 58 family-, and 80 foreign-controlled firms in the sample (see Panel A of Table 1).

On average, the largest shareholder owns 78.5% of the equity (median 80.0%). Thus, the largest shareholder usually has enough voting power to exercise majority control. Ownership concentration remains high across control categories, and also when we consider only firms that spend resources on R&D (Panel B of Table 1). Average minority ownership, defined as the percentage holdings of minority shareholders where minority shareholders are owners holding less than 5% of the equity, is

[19] As already mentioned, institutional investors, such as pension funds, are unimportant as controlling owners in Austria to date, since it is possible to form pension funds only since 1990 (see Jud, 1993) and there are a lot of restrictions for them to exercise control (see Gugler, 2001).

[20] In 1996, ÖIAG sold 14.9% of the equity of OMV AG on the Vienna Stock Exchange, however retained 35% so that the Republic of Austria is still the largest ultimate shareholder of OMV AG.

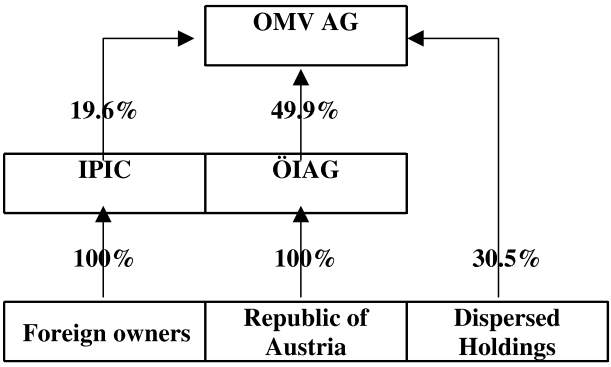

Fig. 1. Ownership and control structure of OMV AG.

only 7.4%. The difference between minority ownership in state-controlled firms (11.4%) and family-controlled firms (8.2%) is not statistically significant at the 5% level. [21]

The data source for balance sheets and income statements is the "Arbeiterkammer Österreich", R&D data are obtained from the annual survey of the *Trend* magazine available from its webpage www.trend.at, and patents are supplied by the Austrian Patents Office. [22] Panel A of Table 1 further reveals that state-controlled firms are the largest and family-controlled firms are the smallest (the differences in both means and medians are statistically significant). Interestingly bank- (family-) controlled firms apply for the most (least) patents on average (1.9 and 0.6, the difference is significant at the 5% level). However, the median firm year is devoid of patents irrespective of control.

Consistent with an agency cost explanation, all dividend payout ratios are largest for state-controlled firms. The average (median) dividend-to-earnings ratio is 31.4% (23.4%), confirming that a substantial share of earnings is paid out as dividends in Austria. State firms are most unlikely to cut dividends (see last row). Conversely, family-firms payout less and are least reluctant to cut dividends. Dewenter and Warther (1998) find unconditional probabilities for a dividend cut of 5.5% for the US and 10.9% for Japan. We find 25.2% for Austrian firms. Clearly, dividend payout decisions differ greatly across governance systems.

As already mentioned, growth opportunities should be crucial determinants of dividend payout policy irrespective of and in addition to the corporate governance structure of the firm. Firms with positive R&D spending should have better growth opportunities, and if investment opportunities are good even minority shareholders

[21] There are also no significant differences in minority ownership when we consider the subsample of R&D firms or median values.

[22] Patents include international patents, i.e. those patents for which the parent firm applied in Austria. Patents data are only available until 1998. Around one third of the firms patented at least once during the period 1987–98. More than 60% of the firms that do R&D patented at least once during that period.

Table 1
Descriptive statistics

	All	State-controlled firms	Bank-controlled firms	Family-controlled firms	Foreign-controlled firms
Panel A: All firms					
Number of firms	214	45	31	58	80
Number of firms listed on a stock exchange	42	10	6	13	13
Largest shareholder (% of total equity)	78.5 (80.0)	77.7 (81.5)	63.4 (55.0)	74.3 (75.2)	87.8 (89.8)
Minority ownership (% of total equity)	7.4 (6.1)	11.4 (8.0)	11.6 (10.3)	8.2 (7.6)	2.9 (1.0)
Size (number of employees)	1010 (649)	1397 (1001)	1106 (682)	746 (565)	947 (559)
Profit-sales ratio (in %)	2.6 (2.8)	1.4 (1.8)	1.1 (2.1)	2.3 (2.7)	4.1 (2.9)
R&D-sales ratio (in %)	2.0 (0.5)	0.9 (0.2)	2.5 (0.8)	1.3 (0.5)	3.1 (1.2)
Patents applied for (number per year)	1.52 (0)	1.78 (0)	1.90 (0)	0.61 (0)	1.88 (0)
Dividend-earnings ratio (in %)	31.4 (23.4)	33.7 (27.6)	33.0 (25.4)	30.3 (20.9)	26.6 (20.0)
Dividend-cash flow ratio (in %)	13.8 (10.1)	15.4 (12.3)	15.0 (11.2)	11.9 (8.2)	13.0 (8.5)
Dividend-sales ratio (in %)	1.8 (1.1)	2.5 (1.9)	1.6 (1.4)	1.4 (0.9)	1.6 (0.9)
Increases in dividends (% of years)	33.9	39.2	40.8	33.0	29.0
Unchanged dividends (% of years)	40.7	39.8	35.7	40.3	43.4
Decreases in dividends (% of years)	25.2	20.7	23.5	26.3	27.5
Panel B: R&D doing firms					
Number of firms	137	34	16	36	51
Number of firms listed on a stock exchange	37	9	5	12	11
Largest shareholder (% of total equity)	76.4 (78.5)	74.8 (80.1)	63.4 (63.5)	66.2 (68.9)	88.3 (89.0)
Minority ownership (% of total equity)	9.1 (8.3)	13.4 (11.0)	13.4 (12.3)	9.5 (8.1)	4.2 (2.0)
Size (employees)	1232 (780)	1690 (1200)	1429 (968)	798 (664)	1136 (666)
Profit-sales ratio (in %)	2.9 (3.4)	0.4 (1.2)	2.0 (2.9)	3.5 (3.7)	5.2 (3.9)
R&D-sales ratio (in %)	3.0 (1.5)	1.3 (0.6)	3.3 (1.6)	2.3 (1.6)	4.7 (3.1)
Patents applied for (number per year)	2.35 (2.0)	2.64 (2.0)	3.20 (2.0)	0.93 (1.0)	2.75 (2.0)
Dividend-earnings ratio (in %)	28.1 (20.5)	33.5 (27.5)	29.7 (22.1)	26.6 (18.2)	25.4 (18.5)
Dividend-cash flow ratio (in %)	12.5 (8.0)	13.7 (10.6)	13.6 (9.1)	10.4 (7.5)	13.1 (7.9)
Dividend-sales ratio (in %)	1.5 (0.8)	2.2 (1.6)	1.3 (0.9)	1.2 (0.7)	1.4 (0.7)
Increases in dividends (% of years)	38.1	44.1	46.4	36.7	31.6
Unchanged dividends (% of years)	36.2	37.0	27.5	34.6	40.2
Decreases in dividends (% of years)	25.6	18.9	26.1	28.3	28.2

Table 1 (*continued*)
Annual average values; median values in parentheses.
Note: Panel A includes a sample of 214 non-financial firms drawn from the 600 largest non-financials in Austria in 1991. This sample was drawn on the basis of data availability for the relevant variables used in the subsequent regression analysis. The sample of Panel B includes only R&D spending firms. The sample period is 1991–99. The control categories state, banks, families, and foreign firms reflect the most important controlling owners in Austrian corporate governance. The criterion of categorization is the largest ultimate shareholder of a corporation (see Fig. 1 for details).
"Number of firms listed on a stock exchange" is the number of firms that are listed on the Vienna Stock Exchange during the sample period. "Largest shareholder" is the percentage holdings of total equity attributable to the largest shareholder of the company. "Minority ownership" is the percentage holdings of minority shareholders. Minority shareholders are defined as owners holding less than 5% of the equity. "Size" is the average annual number of employees. "R&D" is the annual spending on R&D activities as obtained by the annual survey of the Trend magazine available from its webpage www.trend.at. "Patents-applied-for" is the annual number of patents for which the firm applied at the Austrian Patents Office including international patents, i.e. those patents for which the parent firm applied in Austria. Patents data are only available until 1998.
We apply three measures of dividend payout ratio where the numerator in these ratios is the total cash dividend paid to common and preferred shareholders and the denominators are earnings, cash flow and sales, respectively. For these calculations we exclude firm years with negative earnings or cash flows and firm years with dividend payout ratios in excess of one. "Profits (earnings)" are profits after taxes, "cash flow" is profits plus depreciation allowances. "Sales" is annual turnover. "Increases (decreases) in dividends" is the percentage of years during the period 1991–99 where the company increased (decreased) its dividends from year $t-1$ to t. "Unchanged dividends" is the percentage of years during the period 1991–99 where the company left its dividends unchanged from year $t-1$ to t.

may find it optimal to forego current dividends for the prospect of larger future earnings.

Panel B of Table 1 presents summary statistics of a subsample of 137 R&D doing firms over the period 1991–99. Compared to Panel A, R&D doing firms are larger, are more profitable (with the exception of state-controlled firms), and apply for more patents. As one would expect if growth opportunities optimally delay dividends, R&D doing firms payout less of their earnings as dividends and are least reluctant to cut their dividends when cuts are necessary. Note, however that R&D doing state-controlled firms cut their dividends *less* often than other state-controlled firms. [23]

5. The results

We present the results in three steps. First, Tables 2 and 3 present the estimation results for Eq. (2) by incorporating the restrictions imposed by Eq. (3) and differentiating the key parameters according to the identities of controlling owners, i.e. the state, families, banks and foreign firms. Table 2 gives the results for the whole system, while Table 3 summarizes the key parameters of interest with respect to the dividends equation. Panels A of Tables 2 and 3 display the results for all 214 firms,

[23] Fama and French (2001) find for their sample of more than 5000 US firms that only 20.8% pay dividends in 1999. Most firms (89.6%) that pay dividends in $t-1$ continue to pay in t, however. One difference between the Fama and French (2001) sample and the one used here is that the former contains many new recent listings and start ups while the median founding year in our sample is 1970.

Table 2
The determinants of dividends, R&D, and capital investment

Dependent variables	D_{it}	I_{it}	R_{it}
Panel A: All firms			
Constant	27,035 (3.83)***	39,032 (3.18)***	18 2-digit ISIC industry dummies[a]
R_{it}	0.10 (1.17)	−0.12 (−1.45)	–
I_{it}	−0.12 (−4.23)***	–	0.05 (1.34)
D_{it}	–	−0.48 (−2.24)**	0.14 (1.17)
DST × D_{it-1}	0.58 (9.03)***	–	–
DBA × D_{it-1}	0.36 (1.75)*	–	–
DFAM × D_{it-1}	0.28 (1.85)*	–	–
DFF × D_{it-1}	0.25 (1.19)	–	–
Π_{it}	–	0.36 (6.22)***	0.08 (2.01)**
DST × Π_{it}	0.18 (7.78)***	–	–
DBA × Π_{it}	0.22 (2.88)***	–	–
DFAM × Π_{it}	0.18 (2.87)***	–	–
DFF × Π_{it}	0.26 (3.43)***	–	–
DEP_{it}	0.08 (4.80)***	0.50 (10.91)***	0.02 (0.34)
$LIQU_{it}$	0.05 (2.10)**	0.13 (3.34)***	0.12 (5.33)***
CAP_{it-1}	–	0.03 (5.90)***	–
ΔSAL_{it}	–	0.02 (1.89)*	–
SAL_{it}	–	–	0.02 (3.59)***
SAL_{it}^2	–	–	1.09e−10 (0.81)
PAT_{it}	–	–	5047 (3.08)***
R^2-bar	0.61	0.73	0.44
No. observations	1605	1605	1605
Panel B: R&D doing firms			
Constant	22,035 (4.05)***	73,055 (4.23)***	18 2-digit ISIC industry dummies[b]
R_{it}	−0.06 (1.07)	−0.24 (−3.40)***	–
I_{it}	−0.08 (−3.99)***	–	−0.39 (−8.01)***
D_{it}	–	−0.72 (−3.64)***	−0.22 (−1.57)
DST × D_{it-1}	0.49 (9.13)***	–	–
DBA × D_{it-1}	0.32 (0.87)	–	–
DFAM × D_{it-1}	−0.23 (−0.76)	–	–
DFF × D_{it-1}	0.28 (1.59)	–	–
Π_{it}	–	0.41 (6.46)***	0.17 (2.65)***
DST × Π_{it}	0.17 (8.13)***	–	–
DBA × Π_{it}	0.13 (2.01)**	–	–
DFAM × Π_{it}	0.16 (2.12)**	–	–
DFF × Π_{it}	0.10 (1.61)*	–	–
DEP_{it}	0.10 (5.10)***	0.51 (10.79)***	0.05 (0.71)
$LIQU_{it}$	0.02 (2.02)**	0.11 (3.14)***	0.16 (7.43)***
CAP_{it-1}	–	0.02 (3.31)***	–
ΔSAL_{it}	–	0.01 (0.98)	–
SAL_{it}	–	–	0.04 (5.89)***
SAL_{it}^2	–	–	−3.27e−10 (−1.80)*
PAT_{it}	–	–	7250 (4.21)***
R^2-bar	0.60	0.69	0.56
No. observations	973	973	973

Coefficient estimates for Eq. (2).
"*t*-Values" defined as coefficient/asymptotic standard errror are in parentheses.

Table 2 (*continued*)

Note: This table presents the estimation results for Eq. (2) incorporating Eq. (3) in the text. Panel A includes a sample of 214 non-financial firms drawn from the 600 largest non-financials in Austria. Panel B includes a subsample of 137 R&D spending firms. The sample period is from 1991 to 1998. Due to missing observations on relevant variables the number of observations is not $8 \times 214 = 1712$ but only 1605 for Panel A and not $8 \times 137 = 1096$ but 973 for Panel B. Year dummies are included but not reported. The estimation method is 3SLS, which makes use of the cross equation correlations of the disturbances ("full information" method) and is consistent. The instruments are 18 industry dummies at the 2-digit ISIC level; 7 year dummies; ultimate ownership dummies for state-, bank-, family- and foreign-control; current and lagged profits, depreciation and capital stock; and current sales, sales squared, sales changes, patents applied for and liquidity stock. From the choice of the exogenous variables in each structural equation it becomes clear that both the rank and the sufficient order conditions are satisfied. In fact, all equations are overidentified. However, Hansen (1982) tests for overidentifying restrictions do not suggest that exogenous variables have been inappropriately omitted from the respective equations.

Variable definitions: R_{it}, I_{it} and D_{it} denote R&D, capital investment, and dividend expenditures in 1000 ATS of firm i in year t. DST, DBA, DFAM, DFF are dummies equal to one when the state, a bank, a family or a foreign firm holds ultimately the largest stake in the firm, zero elsewise; Π_{it}—profits after taxes; DEP_{it}—depreciation allowances; LIQU_{it}—stock of liquidity, i.e. balance of cash, checks, and credit balance at banks; CAP_{it-1}—book value of fixed assets in $t-1$; SAL_{it}—annual turnover; $\Delta\mathrm{SAL}_{it}$—absolute value of change in turnover from period $t-1$ to t, SAL_{it}^2—turnover squared; PAT_{it}—annual number of patents applied for at the Austrian Patents Office.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

[a] $\chi^2(17) = 110.15$, i.e. fixed industry effects are significant beyond the 1% level.

[b] $\chi^2(17) = 116.14$, i.e. fixed industry effects are significant beyond the 1% level.

while Panels B display the results for the subsample of R&D doing firms. By explicitly accounting for investment opportunities, we expect Hypotheses 1 and 2 to be confirmed more clearly for the latter firms. Second, Table 4 presents our results on the decision to cut dividends. Finally, we discuss the robustness of our results to several alternative specification strategies.

5.1. Dividend payout policy and corporate governance

Eq. (2) is estimated by 3SLS, because the endogenous variables are all correlated with the disturbances and, therefore, OLS estimates of the parameters on the right-hand side variables are inconsistent. The panel set is pooled to gain degrees of freedom. In particular, we are interested in the heterogeneity of τ and $(1-\alpha)$ across ownership categories. [24]

Panel A of Table 2 displays the results for all 214 firms over the 8 year period 1991–98. Three out of the six coefficients of the endogenous variables are negative and two are negative and significant. A change in dividends D significantly reduces investment I, however leaves R&D unchanged. The sum of the coefficients on D is -0.34 ($t = 1.71$) not significantly different from zero at the 5% level of significance. This leaves doubt whether Hypothesis 2 is confirmed for all firms.

[24] All qualitative results carry over when firm effects are removed and are available upon request.

Panel B of Table 2 presents the results for the subsample of firms that spend resources on R&D. Hypothesis 2 is more clearly confirmed by the coefficient estimates and their significance for this subsample. All of the six coefficients of the endogenous variables are negative and four are negative and significant pointing to the existence of competing and limited internal funds. Once all effects settle throughout the system, factors positively influencing the marginal rate of return to one of the jointly determined variables ultimately crowd out the other two variables. In particular, a change in dividends results in an almost equal and opposite change in investment and R&D spending (the sum of the coefficients is -0.94 and significantly different from zero). This contradicts the hypothesis of perfect capital markets because investment decisions are significantly and inversely related to dividend decisions. The magnitude of the coefficients points to sharply rising costs of external capital (large g in Eq. (2)). Therefore, dividends are an outlay that competes with R&D and capital investment for a firm's internal cash flows. [25]

Before we turn to the dividends equation and thus Hypothesis 1 in depth, some words about the exogenous variables are in order. Most coefficients on the liquidity variables are highly (statistically and economically) significant. While profits can proxy for future investment opportunities (see Kaplan and Zingales, 1997) and depreciation for replacement needs in the I equation (see Mueller, 1967), the separate significant influence of the stock of liquidity, LIQU_{it}, in both the I and R equations definitely points to a flow of funds interpretation. Within industries, R&D spending is positively related to firm size, however, R&D intensities decline with size (see Panel B of Table 2). This is consistent with many empirical studies of R&D and firm size (Scherer, 1965; Bound et al., 1984). Past productivity of R&D effort and/or appropriability conditions as measured by patents applied for have a strong positive effect on the current marginal rate of return to R&D and therefore R&D activity. The 2-digit industry dummies are highly significant suggesting that differences in "technological opportunities" across industries are important.

Table 3 summarizes our findings about dividend policy. Columns (1) and (3) are taken from Table 2 and correspond to the lagged dividends and current profits coefficients across control categories, columns (2) and (4) report differences from state-controlled firms, columns (5) and (6) show Wald tests, and column (7) computes target payout ratios. Panel A is again for all firms, while Panel B presents the results for R&D doing firms.

The dividends equation supports Hypothesis 1. State-controlled firms choose a dividend policy "bundle" that can be described by significant smoothing $(1-\alpha)$ and a high target payout ratio (τ). The coefficient of 0.58 $(t = 9.03)$ for all firms and 0.49 $(t = 9.13)$ for R&D doing firms indicate that an economically and statistically significant weight is put on lagged dividends as a determinant of current div-

[25] However, the coefficient on dividends in the R&D equation although negative is not statistically different from zero. Therefore, the competition for funds appears to be much stronger between dividends and investment in the physical capital stock than between dividends and R&D. This is consistent with the fact that R&D has a large fixed cost element and that R&D spending cannot be changed rapidly on an annual basis (see Himmelberg and Petersen, 1994).

idends for state-controlled firms. This coefficient is significantly different from that for family-controlled firms for R&D doing firms (see column 2 of Panel B in Table 3). Family firms with good investment opportunities choose a dividend payout policy that is significantly different from state-controlled firms (Wald statistic of 6.23, see column 6 of Panel B). Family-owned firms move to (lower) long run targets immediately as asymmetry of information between owners and managers is low. Accordingly, large target payout ratios are not needed for agency cost reasons. State-controlled firms adjust only 42% of the gap between last years dividends and the target payout level, while this adjustment is immediate for family-owned firms. These results are strikingly different from Dewenter and Warther's (1998) finding of a median speed of adjustment of only 5.5% for US and 9.4% for Japanese firms.

Lagged dividends only marginally significantly determine this year's dividends in bank- and foreign-controlled firms. This seems to reflect the competing incentives of banks holding the debt and the equity of a company simultaneously, and good corporate governance in foreign-owned firms.

Estimated target payout ratios are (for R&D doing firms in parentheses) 42.9% (33.3%) for state controlled firms, 34.7% (13.9%) for foreign controlled firms, 34.4% (19.1%) for bank controlled firms, and 25.0% (13.0%) for family-controlled firms. This ordering is in line with dividend payments being part of the firm's optimal monitoring package, and substitution between control devices. Direct shareholder monitoring reduces the need to pay high and stable dividends. On the contrary, a *double* principal agent problem in state-controlled companies makes dividends a necessary tool to reduce managerial agency costs.

Our results are particularly strong for R&D spending firms where we expect investment opportunities to be favorable, however are at least qualitatively also present for all firms. Nevertheless, there are some interesting differences between Panels A and B of Table 3. When considering *all* family-controlled firms irrespective of whether they spend resources on R&D or not, the target payout ratio is 25.0%, much larger than the 13.0% when including only R&D spending firms. All other control categories also display higher target payout ratios. Likewise, the smoothing coefficient for *all* family-controlled firms is marginally significant. [26] It appears therefore that dividends are particularly demanded by minority shareholders in firms where investment opportunities are lacking so to solve moral hazard problems. This is consistent with the findings of La Porta et al. (2000) that shareholders are willing to delay dividends in firms with good growth prospects but demand payouts in firms with worse prospects. Our findings additionally suggest that the corporate governance structure of the firm co-determines dividend pay out policy.

[26] These results are confirmed when we estimate an I and D equation simultaneously for the subsample of firms that do *not* spend resources on R&D. Target payout ratios (smoothing coefficients) in this estimation are 54% (0.61) for state-controlled firms, 49% (0.55) for bank-controlled firms, 41% (0.44) for foreign-controlled firms, and 38% (0.55) for family-controlled firms. The smoothing coefficients are all significant at the 5% level.

Table 3
Summary of dividend payout policy

Control category	Smoothing		Impact effect		Wald test (χ^2)		Target payout ratio (%)
	(1) $(1-\alpha)$	(2) Difference to state	(3) $\alpha\tau$	(4) Difference to state	(5) H_0: $(1)+(3)=0$	(6) H_0: $(2)+(4)=0$	(7) τ
Panel A: All firms							
State	0.58	(Reference category)	0.18	(Reference category)	166.81***	(Reference category)	42.9
Banks	0.36	−0.12	0.22	0.04	5.56**	0.33	34.4
		(−0.32)		(0.32)			
Family	0.28	−0.30	0.18	−0.00	4.33*	1.03	25.0
		(−1.03)		(−0.01)			
Foreign firms	0.25	−0.33	0.26	0.08	4.03*	1.23	34.7
		(1.62)		(0.89)			
Panel B: R&D doing firms							
State	0.49	(Reference category)	0.17	(Reference category)	183.42***	(Reference category)	33.3
Banks	0.32	−0.17	0.13	−0.04	1.41	0.54	19.1
		(−0.43)		(−0.74)			
Family	−0.23	−0.72***	0.16	−0.01	0.26	6.23**	13.0
		(−2.79)		(0.13)			
Foreign firms	0.28	−0.21	0.10	−0.07	1.53	0.89	13.9
		(1.44)		(0.94)			

"*t*-Values" defined as coefficient/asymptotic standard errror are in parentheses.
Note: This table presents a summary of dividend payout policy in Austria using the estimates of Table 2. Panel A includes a sample of 214 non-financial firms drawn from the 600 largest non-financials in Austria. Panel B includes a subsample of 137 R&D spending firms. The sample period is from 1991 to 1998. The estimates for "smoothing" $(1-\alpha)$ and the "impact" effect $\alpha\tau$ (columns 1 and 3) correspond to the lagged dividends and (current) profits coefficients across control categories of Table 2, columns (2) and (4) report estimated differences of these coefficients from state-controlled firms. Columns (5) and (6) report Wald tests of the hypotheses that the "smoothing" and "impact" coefficients are jointly significant, and whether there are significant differences from state-controlled firms. Column (7) computes target payout ratios, i.e. $\tau = \alpha\tau/(1-(1-\alpha))$.
*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

5.2. The decision to cut dividends

The foregoing section showed that it matters who controls the firm. State-controlled firms can be viewed as *ultimately* having a very dispersed ownership structure, and managerial discretion and rent seeking manifests itself in considerable dividend smoothing and target payout ratios. A final test of Hypothesis 1 is to look at divi-

dend cuts. Lintner (1956) suggested that managers are particularly wary of dividend cuts as this is a bad signal not only about firm long-run earnings but also about the quality of the managers themselves. Additional evidence for Hypothesis 1 would be obtained if managers of state-controlled firms show a lower willingness to cut dividends than managers of family-controlled firms. A logit model is estimated to assess the probability of a dividend cut conditioning on profits over the time period 1991–99.

Table 4 displays the results where the dependent variable equals one in period t if the firm cuts its dividend payments from period $t-1$ to period t and zero otherwise. Panel A again displays the results for all firms, while Panel B is only for the subsample of 137 R&D spending firms.

The explanatory variable in both panels is the profits-to-sales ratio. Model (1) constrains constant terms to be equal across control categories while allowing for different performance effects, model (2) allows for differences in the average likelihood of a dividend cut across control categories but postulates equal reactions to performance, and model (3) is the least restrictive allowing for different intercepts and slopes.

For all firms (Panel A) there are no differences across control categories with respect to the effect of performance on the decision to cut dividends. Holding performance constant there are, however, significant differences in the average likelihood of a dividend cut across control categories. Family- and foreign-controlled firms are significantly more likely to cut their dividends than state-controlled firms.

Panel B of Table 4 presents the results for R&D doing firms. Completely consistent with our findings so far, the predicted probability of a dividend cut is independent of current performance in state-controlled firms (the coefficient is even positive but insignificant) while all of the three other control categories respond to current performance in the expected direction. Holding performance constant, family-controlled firms are significantly more likely to cut dividends than state-controlled firms. Further, they respond significantly differently from state-controlled firms to current earnings (as do foreign-controlled firms).

For model (3) in Panel B, we have calculated marginal effects. Evaluated at the means of the respective profits-to-sales-ratios, a 50% drop in average performance leaves the probability of a dividend cut virtually the same for state-controlled firms (actually the probability of a cut *decreases* from 18.9% to 18.5%), while a 50% drop in average family-firm profitability increases the probability to cut dividends from 28.3% to 35.4%. The ranking of "flexibility" in cutting dividends is family $>$ foreign firm $>$ bank $>$ state control.

These results are also consistent with the findings of Dewenter and Warther (1998) for Japan. The authors find that *keiretsu*-member firms are subject to less information asymmetry and fewer agency conflicts than independent firms, as is also evidenced by a larger willingness to cut dividends. We find that the willingness to cut dividends varies consistently and negatively with likely managerial agency conflicts. State-controlled firms where agency conflicts are likely to be most severe are most reluctant to cut dividends. In contrast, family-controlled firms where managerial

Table 4
The decision to cut dividends

Independent variables	Model (1)	Model (2)	Model (3)
Panel A: All firms			
Constant	−1.08 (−18.80)***	−1.34 (−10.15)***	−1.34 (−10.13)
DBA	–	0.16 (0.82)	0.15 (0.76)
DFAM	–	0.32[a] (1.89)*	0.32[a] (1.86)*
DFF	–	0.39[a] (2.44)**	0.39[a] (2.39)**
Π_{it}	–	−0.54 (−1.72)*	–
DST × Π_{it}	−0.73 (−1.58)	–	−0.71 (−1.60)
DBA × Π_{it}	0.32 (0.26)	–	0.41 (0.75)
DFAM × Π_{it}	−0.35 (−0.39)	–	−0.43 (−0.48)
DFF × Π_{it}	−0.22 (−0.32)	–	−0.47 (−0.68)
Observations	1760	1760	1760
Panel B: R&D doing firms			
Constant	−1.04 (−13.69)***	−1.48 (−8.80)***	−1.47 (−8.80)
DBA	–	0.46 (1.78)*	0.46 (1.78)*
DFAM	–	0.58[a] (2.60)***	0.58[b] (2.57)***
DFF	–	0.59[a] (2.84)***	0.60[b] (2.89)***
Π_{it}	–	−0.96 (−2.29)**	–
DST × Π_{it}	0.22 (0.27)	–	1.07 (0.69)
DBA × Π_{it}	−1.28 (−0.64)	–	−1.34 (−0.66)
DFAM × Π_{it}	−10.95[b] (−2.64)***	–	−15.88[b] (−2.86)***
DFF × Π_{it}	−6.77 (−1.89)*	–	−6.97[b] (−2.39)**
Observations	1064	1064	1064

z-Values are in parentheses.

Note: This table presents logit estimations for the question whether the identity of controlling owners matters for the decision to cut dividends. Panel A includes a sample of 214 non-financial firms drawn from the 600 largest non-financials in Austria. Panel B includes a subsample of 137 R&D spending firms. The sample period is from 1991 to 1999. Due to missing observations on relevant variables the number of observations is not $9 \times 214 = 1926$ but only 1760 for Panel A and not $9 \times 137 = 1233$ but 1064 for Panel B. The estimation method is logit maximum-likelihood.

Models: Model (1) constrains constant terms to be equal across control categories while allowing for different performance effects, model (2) allows for differences in the average likelihood of a dividend cut across control categories but postulates equal reactions to performance, and model (3) is the least restrictive allowing for different intercepts and slopes.

Variable definitions: The dependent variable is a dummy equal to one in period t if the firm cuts its dividends from period $t-1$ to period t, zero elsewise. DST, DBA, DFAM, DFF are dummies equal to one when the state, a bank, a family or a foreign firm holds ultimately the largest stake in the firm, zero elsewise; Π_{it} denotes the profits-to-sales ratio where profits are measured after taxes and sales is annual turnover.

*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.
[a] Significantly different from state-controlled firms at the 5% level.
[b] Significantly different from state-controlled firms at the 1% level.

agency costs are absent almost by definition are least reluctant to cut dividends when cuts are warranted.

5.3. Robustness checks

Several robustness checks confirm the main results. First, when all variables in Eq. (2) are deflated by sales [27] to correct for heteroscedasticity the coefficient on the lagged dividends variable for R&D doing state-controlled firms rises to 0.54 ($t = 8.98$) while the coefficient for family-controlled firms is -0.20 ($t = 0.22$). The two coefficients are statistically different at the 1% level.

Second, to control for different managerial decision processes according to whether the firm is listed or not, (1) a dummy variable equal to one if the firm is listed, zero elsewise (i.e. different intercepts), and (2) interaction terms between this dummy and lagged dividends and current profits are included in the dividends equation. All three variables are insignificant and again state-firm managers set their dividends differently from family-firm managers.

Third, following Jensen (1986) leverage could also be used as a control device, however, when the debt/equity ratio is introduced into the dividends equation its coefficient is insignificant and the other results are not altered.

Fourth, we constructed a subsample of 50 firms over the 25 year period 1975–99. Unfortunately, for this longer time period R&D data at the firm level are not available so we can only estimate an I and a D equation simultaneously. The qualitative results concerning the smoothing of dividends phenomenon in state-controlled firms all carry over, however, and are available upon request.

Fifth, we test whether industry characteristics affect our results by including the 18 two-digit ISIC industry dummies in each of the three equations in Eq. (2) rather than just in the R equation as before. The χ^2 (17)-statistics are for the R equation 144.62 (p-value 0.00), for the I equation 46.20 (p-value 0.00), and for the D equation 25.53 (p-value 0.08). We conclude from this that fixed industry effects are important in only the R and I equation, and are not likely to explain our main results.

Sixth, 22 of the 45 state-controlled firms and 12 of the 34 R&D doing state-controlled firms are public utilities, which operated in a (still) heavily regulated market during the sample period. [28] It may be that dividend payout policy is driven by other things than by our ownership and control theory in heavily regulated markets. However, if we omit these firms, there is not much difference in the estimated coefficients. The coefficient on lagged dividends is 0.53 ($t = 5.65$) for all state-controlled and 0.56 ($t = 5.18$) for R&D doing state-controlled firms. The difference from R&D doing family-controlled firms is statistically significant. Moreover, target payout ratios are much larger for state-controlled than for family-controlled firms.

Finally, we pooled all firms to gain degrees of freedom and since we were interested in the variation of the smoothing coefficients and target payout ratios across control categories. It may however be that the whole system of equations is distinctly

[27] The main results are presented in level terms because the Lintner model emphasizes the *level* of dividends (or the change in the level) as the key managerial decision variable in response to earning changes.

[28] Complete deregulation and liberalization of the energy sector, in which most public utilities operate, is due in 2001 according to the transposition of the relevant EU-directives.

different for state-controlled firms as compared to e.g. family- or bank-controlled firms. When we estimate Eq. (2) for the different control categories separately, the main results stay the same in that the smoothing of dividends and target payout ratios are considerably higher for state-controlled firms than for family-controlled firms. Likewise, those family-controlled firms that do not spend resources on R&D show considerable smoothing and large target payout ratios. There are however differences in the parameter estimates of the exogenous variables in Eq. (2). For example, the liquidity related variables are not significant for bank-controlled firms. This is consistent with other findings in the literature that controlling equity stakes of banks reduce the asymmetry of information and liquidity constraints. [29]

6. Conclusions

This paper establishes that the ownership and control structure of the firm is a significant determinant of its dividend payout policy. In particular, state-controlled firms in Austria "smooth" dividends, have large target payout ratios, and are most reluctant to cut dividends, despite of the potential costs involved for shareholders. This is consistent with a managerial/agency cost explanation. In contrast, family-controlled firms pursue a significantly different dividend policy. These firms show no smoothing in dividends, have lower target payout ratios, and are least reluctant to cut dividends. Owner-managers of these firms can be reactive to investment opportunities and financing needs, and adjust dividend policy accordingly. Smoothing of dividends is only marginally important in bank- and foreign-controlled firms. Smooth and high dividend payouts are not necessarily optimal from a bank's perspective as these increase the risk of bankruptcy and reduce the security of interest payments. Banks have other means than dividends to reduce managerial agency costs, for example, interest payments on debt.

Dividends significantly negatively influence capital investment and (insignificantly) also R&D, which contradicts the premise of a perfect capital market. Dividends should not be regarded as a mere residual, but rather a decision variable that significantly affects other investment decisions in the light of capital market failures.

The above results hold for firms that spend resources on R&D and are thus expected to have good growth opportunities. Firms that do not have good growth prospects (i.e. firms that do not invest in R&D) smooth dividends and have larger target payout ratios irrespective of who controls the firm. Thus, our results are consistent with the "outcome model" of dividends as analyzed by La Porta et al. (2000), according to which corporate outsiders force corporate insiders to disgorge cash (if their legal rights allow them to do so).

[29] For example Hoshi et al. (1990, 1991) find less sensitivity of investment to liquidity for Japanese firms that have close financial ties to Japanese banks compared to other firms. Elston's (1993) German bank influenced firms are less liquidity-constrained than independent firms.

Finally, if corporate governance technologies have improved over the last two decades in the US (as some authors have argued), our results suggest a possible explanation for the recent findings of Fama and French (2001) that the propensity of US firms to payout cash has declined. The benefits of dividends in controlling agency problems between stockholders and managers become less the better other corporate governance mechanisms (such as stock options) align managerial and shareholder interests. Thus there is less need to "burn" cash as dividends.

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References

Amihud, Y., Murgia, M., 1997. Dividends, taxes, and signaling: evidence from Germany. The Journal of Finance LII (1), 397–408.

Allen, F., Michaely, R., 1995. Dividend policy. In: Jarrow, R. et al. (Eds.), Handbooks in OR & MS, vol. 9, pp. 793–837.

Barca, F., Becht, M. (Eds.), 2001. The Control of Corporate Europe. Oxford University Press, Oxford.

Beer, E., Ederer, B., Goldmann, W., Lang, R., Passweg, M., Reitzner, R.N., 1991. Wem gehört Österreichs Wirtschaft wirklich? Studie der Kammer für Arbeiter und Angestellte für Wien, Orac Verlag.

Berglöf, E., Perotti, E., 1994. The Governance structure of the Japanese financial Keiretsu. Journal of Financial Economics 36, 259–284.

Bernheim, B.D., Wantz, A., 1995. A tax based test of the dividend signaling hypothesis. American Economic Review 85, 532–551.

Black, F., 1976. The dividend puzzle. Journal of Portfolio Management 2, 5–8.

Boehmer, E., 1998. Who Controls Germany? An Exploratory Analysis, Institut für Handels und Wirtschaftsrecht, Universität Osnabrück, Arbeitspapier Nr. 71.

Bound, J., Cummins, C., Griliches, Z., Hall, B.H., Jaffe, A., 1984. Who does R&D and who patents? In: Griliches, Z. (Ed.), R&D, Patents, and Productivity. University of Chicago Press for the National Bureau of Economic Research, Chicago, pp. 21–54.

Charkham, J., 1994. Keeping Good Company. A Study of Corporate Governance in Five Countries. Clarendon Press, Oxford.

Dewenter, K.L., Warther, V.A., 1998. Dividends, asymmetric information and agency conflicts: Evidence from a comparison of the dividend policies of Japanese and US firms. The Journal of Finance, 879–904.

Dhyrmes, P., Kurz, M., 1967. Investment, dividends and external finance behavior of firms. In: Ferber, R. (Ed.), Determinants of Investment Behavior, New York.

Easterbrook, F.H., 1984. Two agency cost explanations of dividends. American Economic Review 74 (4), 650–659.

Eisner, R., 1964. Capital expenditures, profits, and the acceleration principle. In: Models of Income Determination, Studies in Income and Wealth 28. NBER, Princeton, NJ, pp. 137–165.

Eisner, R., 1967. A permanent theory for investment: some empirical explorations. American Economic Review 57, 363–390.

Elston, J., 1993. Firm Ownership Structure and Investment: Theory and Evidence from German Panel Data, Wissenschaftszentrum, Berlin.

Faccio, M., Lang, L.H.P., Young, L., 2001. Dividends and expropriation. American Economic Review 91 (1), 54–78.
Fama, E.F., 1974. The empirical relationship between the dividend and investment decisions of firms. American Economic Review 64 (3), 304–318.
Fama, E., Babiak, H., 1968. Dividend policy: An empirical analysis. Journal of the American Statistical Association, 1132–1161.
Fama, E., French, K., 2001. Disappearing dividends: changing firm characteristics or lower propensity to pay? Journal of Financial Economics 60, 3–43.
Fazzari, S.M., Hubbard, R.G., Petersen, B.C., 1988. Financing constraints and corporate investment. Brookings Papers on Economic Activity 141, 206.
Franks, J., Mayer, C., 1997. Ownership, Control and the Performance of German Corporations, London Business School and University of Oxford.
Fudenberg, D., Tirole, J., 1995. A theory of income and dividend smoothing based on incumbency rents. Journal of Political Economy 103 (1), 75–93.
Gaver, J.J., Gaver, K.M., 1993. Additional evidence on the association between the investment opportunity set and corporate financing, dividend, and compensation policies. Journal of Accounting and Economics 16, 125–160.
Grabowski, H.G., 1968. The determinants of R&D in three industries. Journal of Political Economy 76, 292–306.
Grabowski, H.G., Mueller, D.C., 1972. Managerial and stockholder welfare models of firm expenditures. The Review of Economics and Statistics 54 (1), 9–24.
Gugler, K., 1997. Corporate Governance and Investment, WP No. 9705, University of Vienna.
Gugler, K., 1998. Corporate ownership structure in Austria. Empirica 25, 285–307.
Gugler, K. (Ed.), 2001. Corporate Governance and Economic Performance. Oxford University Press, Oxford.
Gugler, K., Kalss, S., Stomper, A., Zechner, J., 2001. The separation of ownership and control: An Austrian perspective. In: Barca, F., Becht, M. (Eds.), The Control of Corporate Europe. Oxford University Press, Oxford.
Gugler, K., Mueller, D.C., Yurtoglu, B.B., 2000a. Marginal q, Average q, Cash Flow and Investment, WP 0002, University of Vienna.
Gugler, K., Stomper, A., Zechner, J., 2000b. Corporate Governance, Ownership, and Board Structure in Austria, Zeitschrift für Betriebswirtschaft, Ergänzungsheft 1/2000, pp. 23–43.
Hall, B., Liebman, J., 1998. Are CEOs really paid like Bureaucrats? Quarterly Journal of Economics 113 (3), 653–691.
Hansen, L., 1982. Large sample properties of generalized methods of moments estimators. Econometrica 50, 1029–1054.
Harhoff, D., 1996. Financing constraints in R&D—a panel data study of German firms 1987–1994, Discussion Paper, ZEW, Mannheim.
Hoshi, T., Kashyap, A., Scharfstein, D., 1990. The role of banks in reducing the costs of financial distress in Japan. Journal of Financial Economics 27, 67–88.
Hoshi, T., Kashyap, A., Scharfstein, D., 1991. Corporate structure, liquidity, and investment: Evidence from Japanese industrial groups. Quarterly Journal of Economics 106, 33–60.
Himmelberg, C.P., Petersen, B.C., 1994. R&D and internal finance: A panel study of small firms in high-tech industries. The Review of Economics and Statistics 76, 38–51.
Hopt, K.J., Kanda, H., Roe, M.J., Wymeersch, E., Prigge, S., 1998. Comparative Corporate Governance. The State of the Art and Emerging Research. Clarendon Press, Oxford.
Hubbard, R.G., 1998. Capital-market imperfections and investment. Journal of Economic Literature XXXVI, 193–225.
Jaffe, A.B., 1986. Technological opportunity and spillovers of R&D: Evidence from firms' patents, and market value. American Economic Review 76 (5), 984–1001.
Jensen, M.J., 1986. Agency costs of free cash flow, corporate finance, and takeovers. American Economic Review 76, 323–329.
Jensen, G.R., Solberg, D.P., Zorn, T.S., 1992. Simultaneous determination of insider ownership, debt, and dividend policies. Journal of Financial and Quantitative Analysis 27, 247–263.

Jud, W., 1993. Institutional investors and corporate governance: the Austrian view. In: Baums, T. (Ed.), Institutional Investors and Corporate Governance. deGruyter, Berlin, New York.
Kallapur, S., 1994. Dividend payout ratios as determinants of earnings response coefficients. Journal of Accounting and Economics 17 (3), 359–375.
Kaplan, S.N., Zingales, L., 1997. Do investment-cash flow sensitivities provide useful measures of financing constraints? Quarterly Journal of Economics CXII, 169–215.
Klepper, S., 1996. Entry, exit, growth, and innovation over the product life cycle. American Economic Review 86 (3), 562–583.
Kuh, E., 1963. Capital Stock Growth: A Micro-Econometric Approach. North-Holland Publishing Company, Amsterdam.
Kumar, P., 1988. Shareholder–manager conflict and the information content of dividends. Review of Financial Studies 1 (2), 111–136.
La Porta, R., Lopez-de-Silanes, F., Shleifer, A., 1999. Corporate ownership around the world. Journal of Finance 54 (2), 471–517.
La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R., 2000. Agency problems and dividend policies around the world. Journal of Finance 55 (1), 1–33.
Lintner, J., 1956. Distribution of incomes of corporations among dividends, retained earnings and taxes. American Economic Review 46 (2), 97–113.
Mathis, F., 1990. Big Business in Österreich II, Verlag für Geschichte und Politik, Oldenbourg.
Miller, M.H., Modigliani, F., 1961. Dividend policy, growth, and the valuation of shares. Journal of Business 34, 235–264.
Mueller, D.C., 1967. The firm decision process: An econometric investigation. Quarterly Journal of Economics 81, 58–87.
Myers, S.C., Majluf, N.S., 1984. Corporate financing and investment decisions when firms have information that investors do not have. Journal of Financial Economics 13, 187–221.
Noronha, G.M., Shome, D.K., Morgan, G.E., 1996. The monitoring rationale for dividends and the interaction of capital structure and dividend decisions. Journal of Banking and Finance 20, 439–454.
Pakes, A., Schankerman, M., 1984. An exploration into the determinants of research intensity. In: Griliches, Z. (Ed.), R&D, Patents, and Productivity. University of Chicago Press for the National Bureau of Economic Research, Chicago, pp. 209–232.
Prowse, S.D., 1992. The structure of corporate ownership in Japan. The Journal of Finance XLVII (3), 1121–1140.
Rozeff, M.S., 1982. Growth, beta and agency costs as determinants of dividend payout ratios. Journal of Financial Research 5, 249–259.
Scherer, F.M., 1965. Firm size, market structure, opportunity and the output of patented innovations. American Economic Review 55, 1097–1125.
Schmidt, F.A., 1997. Eigentümerstruktur, Agency-Kosten und Unternehmenserfolg: Empirische Evidenz für österreichische Genossenschaftsbanken, Mimeo.
Shaked, A., Sutton, J., 1987. Product differentiation and industrial structure. Journal of Industrial Economics 36 (2), 131–146.
Yoon, P.S., Starks, L.T., 1995. Signaling, investment opportunities, and dividend announcements. The Review of Financial Studies 8 (4), 995–1018.