CORPORATE GOVERNANCE AND INVESTMENT

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ABSTRACT

This paper contributes at least threefold to the investment-cash flow literature. First, it finds that the corporate governance environment of a firm affects the relationship between investment and cash flow. Second, we allow for both asymmetric information and managerial discretion explanations for positive investment-cash flow coefficients, thereby overcoming most of the ambiguities in this interpretation. Finally, by using a GMM estimator we avoid most of the problems with traditional OLS models. We find that family-controlled firms appear to suffer from cash constraints as evidenced by a positive and robust relationship of investment to cash flow. State-controlled firms also exhibit a positive and significant cash flow sensitivity, which we explain by managerial discretion.

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I. INTRODUCTION

Since the seminal article of Fazzari, Hubbard, and Petersen (FHP, 1988), there is a growing literature interpreting a positive cash-flow coefficient in an investment-cash flow regression as evidence of cash constraints of the firm.[1] This literature was criticized for a number of reasons, most notably by Kaplan and Zingales (1997, 2000) on the grounds that cash flow merely proxies for future investment opportunities, and thus a positive investment-cash flow coefficient does not say anything about cash constraints. This paper addresses this ambiguity in the interpretation of investment-cash flow coefficients by utilizing information on the corporate governance structure of the firm. We argue that the ownership and control structure of the firm affects the efficiency of corporate investment, and thus this interpretation. In particular, cash constraints are not the *only* possible interpretation of a positive investment-cash flow coefficient, since such a coefficient is also expected by the managerial discretion hypothesis.[2]

Our strategy is to *a priori* sample firms into subsamples where the one or the other theory is more likely to be the primary explanation for a positive investment-cash flow coefficient. We do this sampling on the basis of the ownership and control structure of the firm. We find significant and robust differences of the investment-cash flow relation across different control categories. In particular, we find positive investment-cash flow sensitivities for family-controlled firms indicating cash constraints and underinvestment. Family control is likely to induce information asymmetries between inside controlling shareholders and outside financiers concerning the quality and riskiness of investment driving a wedge between the costs of external and internal financing. State control also induces informational asymmetries between (ultimate) "shareholders" (i.e. the citizens) and firm managers. However, the positive investment-cash flow elasticities we find for these firms suggest managerial discretion and overinvestment. Banks as large controlling shareholders appear to reduce both asymmetric

information and managerial discretion. Rates of return calculations corroborate these conclusions.

We interpret this evidence as being consistent with corporate governance features affecting both the discretion managers have to use available funds, and their ability to acquire additional funds for investment. Thus, corporate governance features of "bank-based" (Edwards and Fischer, 1994) or "insider" (Franks and Mayer, 1997)[3] systems of finance must not be neglected when testing hypotheses about capital market efficiency. Much of the literature that tests for the effects of financial constraints on investment uses data from the US or the UK. The specific hypotheses in this paper could not be tested with data from these countries, since firm ownership is widely dispersed in these countries or there are legal restrictions on ownership.[4] Thus, in these countries a division into bank, state or family control is not feasible.

The paper is organized as follows. Section II gives a short description of our two main hypotheses, the cash constraints hypothesis (CCH) and the managerial discretion hypothesis (MDH), and links them to the ownership and control structure of firms. Section III describes the data. Section IV presents the main results, while section V concludes.

II. CASH CONSTRAINTS, MANAGERIAL DISCRETION, AND CORPORATE GOVERNANCE

Figure 1 presents the two main hypotheses. With perfect capital markets the supply of funds, S, is a horizontal line at r, the risk-adjusted market rate of interest. Internal and external funds are perfect substitutes. The demand for capital investment, D, is assumed downward sloping. In the neoclassical theory a firm's investment depends only on this demand and its cost of capital, and is independent of the size of its cash flow. A neoclassical firm invests up to I^*, where the expected marginal profitability of investment equals its marginal cost. In this Modigliani/Miller (1958) world, financial factors are irrelevant.

[Figure 1 about here]

In contrast to the neoclassical theory, the **Cash Constraints Hypothesis (CCH)** posits a rising cost of capital schedule once a firm enters the external capital market due to asymmetric information causing adverse selection.[5] With rising costs of external capital the supply of capital, *S*, is dependent on the level of cash flows. At cash flow CF^a the firm is *constrained* to invest I^a. It underinvests. If cash flow increases from CF^a to CF^b the cost of funds schedule shifts from $S(CF^a)$ to $S(CF^b)$ and the firm invests I^b. Thus, the CCH implies a positive sensitivity of investment to cash flow.[6] Other empirical predictions are (1) dividends should (essentially) be zero, (2) the marginal return on investment should exceed the firm's cost of capital.

A positive investment cash flow sensitivity is also expected according to the **Managerial Discretion Hypothesis (MDH)**.[7] Following Marris (1964, 1998), managers' utility $U = U(g(I), p(d))$ is an increasing function of growth g, which rises with investment, and a decreasing function of the probability of corporate governance intervention, p. This probability is assumed to be zero at the optimal investment I^*, where the value of the firm is at its maximum, $V^* = D^* / r$, equal to the discounted present value of optimum dividends. As I increases beyond I^* the value of the firm falls and p rises with the difference between optimum and actual dividends, $d = V^* - V = (D^* - D)/r$. In Anglo-Saxon "market-based" systems external controls like hostile takeovers may be triggered by such overinvestment. In "insider"-systems as in Continental Europe dominant shareholders may step in. Managerial investment, I^m in Figure 1, and dividends, $CF^m - I^m$, are chosen to maximize managerial utility by equating the marginal gain in utility derived from increasing growth by increasing investment to the marginal decline in utility from the increase in the probability of corporate governance intervention caused by the corresponding reduction in dividends. That is, the

optimization problem of the manager is $\max U = U[g(I), p((D^* - D)/r))] \quad s.t.\ CF = D + I$ with respect to I.[8] I^m is determined by the intersection of the manager's indirect marginal utility of investment schedule and the indirect marginal (dis-)utility schedule, $MU_I = (\delta U/\delta g)(dg/dI) = MD_I = -(\delta U/\delta p)(dp/dI)$. A cash flow increase from CF^m to $CF^{m'}$ shifts MD_I to MD_I' in Figure 1: The decline in managerial utility from incremental investment is now lower at every investment level, because the threat of governance intervention is lower when dividends are higher. The optimal investment for managers increases from I^m to $I^{m'}$ and dividends increase from $CF^m - I^m$ to $CF^{m'} - I^{m'}$. A cash flow increase is like a shift in the managerial budget constraint, and allows managers to increase both investment and dividends. Control failure leads to "cheap" internal finance and managers overinvest. The MDH implies that (1) the investment-cash flow coefficient is positive (but less than one), (2) dividends are positive, and (3) the marginal return on investment is below the cost of capital.[9]

In what follows we discuss the dependency of the CCH and the MDH on the ownership and control structure of the firm. The classic principal agent problem arises between outside dispersed shareholders and an (owner-)manager because incentives become misaligned after the issuance of common shares (Jensen and Meckling, 1976). Concentration of equity holdings in the hands of a few investors can provide them with an incentive to monitor management and sufficient ability to exert control (Grossman and Hart, 1980). High ownership concentration is observed in most non-Anglo Saxon countries (see LaPorta et al., 1999). Therefore, insufficient monitoring *due* to dispersed financial holdings is not a serious problem in these countries. Nevertheless, corporate governance may fail. This paper asserts that these failures depend on the identity of the controlling shareholders. In what follows, we discuss the four most important categories of controlling shareholders in Austria, i.e. banks, the state, families, and foreign firms.[10]

Potentially, bank equity holdings reduce the asymmetry of information between shareholders and financiers and/or managers. Banks can gain an informational advantage from equity holdings in commercial firms via ownership disclosure rights, representation on the supervisory board, nominating managers, or information acquisition through bank lending. When a bank owns a large stake in a firm to which it lends, its residual control rights lead it to monitor the firm's investments more closely (Gertner et al., 1994). Therefore, we hypothesize that bank-controlled firms do not exhibit positive investment-cash flow sensitivities.

The government is a large controlling shareholder in many corporations worldwide.[11] The MDH is expected to hold for state-controlled firms, because citizens can be viewed as very *dispersed ultimate* owners (the "principals") with insufficient incentives and ability to monitor the state (the first "agent"), which in turn has mixed incentives to monitor managers (the ultimate agents). The de facto control rights belong to managers, bureaucrats, or politicians who typically have goals very different from firm value maximization (Shleifer and Vishny, 1997, Mueller, 1998). Overspending, short-run employment gains (and thereby "buying" votes) are likely incentives in state-controlled firms. On the other hand, cash constraints are not expected, if the state is a major shareholder because the incentive alignment between controlling managers and citizens (as ultimate owners) is weak. There is no reason for managers of state-controlled firms to favor existing over new shareholders and not issue equity, as hypothesized in the asymmetric information hypothesis of Myers and Majluf (1984). Nor does credit rationing seem likely, since the risk of bankruptcy is low and there is no adverse selection of loan applicants.[12] Therefore, any positive investment-cash flow coefficient for state-controlled firms must be attributed to the managerial discretion hypothesis.

Cash constraints should be most severe for family-controlled firms, where owner-managers maximize existing shareholder wealth. Hadlock (1998), extending Myers and

Majluf (1984), demonstrates that investment-cash flow sensitivities rise with managerial incentive alignment for firms with good investment opportunities. Almost by definition, managerial incentive alignment is very high in family-controlled firms. Furthermore, information transfer to the capital market is most difficult in these closely held firms. This increases asymmetry of information and security mispricing. Thus, family owner-managers are expected to forego an investment rather than sell an underpriced security.[13]

Managerial discretion, on the other hand, is not expected in family-controlled firms. 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 (incentive alignment), or, the large shareholder has the incentive and ability to monitor the managers. Therefore, any positive investment-cash flow sensitivity for family-controlled firms can be attributed to the cash constraints hypothesis.[14]

Ultimate owners of foreign firms may be banks, a foreign state or families, and so no clearcut a priori expectations are formed.[15] Since foreign-controlled firms are very important in Austria we leave them in the analysis. Table 1 summarizes our predictions about cash flow coefficients.

[Table 1 about here]

III. THE DATA AND OWNERSHIP AND CONTROL CONCEPTS

Two unbalanced panels of firms are assembled to test these hypotheses. Sample A includes 214 Austrian non-financial companies and spans the period 1991 to 1999. Sample B consists of 94 Austrian non-financial companies over the 1975-1999 period. Seventy-five of these 94 firms are also in Sample A. The two samples are drawn from the 600 largest corporations in Austria (the criterion for inclusion is data availability). Balance sheet data sources are the "Wirtschafts-Trend-Zeitschriftenverlagsgesellschaft m.b.H", the "Arbeiterkammer Österreich" and "Compass Verlag". Ownership data were gathered from "Der

Finanzcompass" and Hoppenstedt's "Großunternehmen in Österreich" (several annual editions). Sample A covers around 10% of Austrian private sector employment.

Ultimate ownership categories are bank, state, family, and foreign firms. State ownership includes central, federal, and local levels of government. Bank ownership includes equity-holdings of corporations operating in the financial sector (mostly banks). Foreign firm ownership are holdings of non-financial foreign firms. The criterion for nationality is the location of the headquarters. Family ownership includes ownership stakes of families and individuals. Equity-holdings smaller than 5 % are defined as "dispersed". The degree of *control* is likely to follow a step function, therefore, we attribute full *control* over a company to the largest ultimate shareholder (LUS) who is either the state, a bank, a family, or a foreign firm.[16]

Figure 2 helps clarify the concepts. OMV AG is the largest Austrian corporation as measured by turnover. It is located at the third layer of the pyramid ("Hierarchy" = 3). The ownership structure of OMV AG is simple but representative for the whole sample. *Direct* ownership by ÖIAG (Österreichische Industrieholding Aktiengesellschaft, classified as a non-bank domestic firm) is 49.9%. IPIC, a company from Abu Dhabi, holds 19.6% directly. The rest, 30.5%, is freely circulating on the Vienna stock exchange and classified as direct dispersed ownership. The Republic of Austria does not hold equity directly, however, the state *ultimately* holds 49.9% of OMV AG since it wholly owns ÖIAG. A foreign firm ultimately holds 19.6% of the cash flow rights, and the 30.5% freely circulating also translates into the same amount of ultimate ownership. Banks and families have neither direct nor indirect holdings. OMV AG is ultimately *controlled* by the Republic of Austria (the LUS) and therefore classified as a state-controlled company, since all stakes in the controlling chain are larger than 25%.

[Figure 2 about here]

Table 2 exhibits summary statistics about direct and ultimate ownership and who ultimately controls Austrian firms. The two most important ownership categories are non-bank domestic firms with 37.2% of the equity and foreign firms. In 100 out of the 214 firms of sample A another non-bank domestic firm has a large stake. In sample A foreign firms own 32.8% of the equity directly, 35.6 % ultimately, and are the largest ultimate shareholders in 80 firms (37.4%) and in sample B in 50%. The largest difference between ultimate and direct ownership arise with family-owned firms. While families hold only 8.9 % of the shares directly, their holdings increase to 24.6 % once indirect shareholdings are included. Families ultimately control 27.1 % of the firms in sample A and 24.5% in B.

[Table 2 about here]

Ownership concentration is very high in Austria (see Table 3). The largest shareholder holds on average 78.5 % of equity (median 90 %). Only 9.8 % of sample A firms are *not* majority-controlled. Ownership concentration remains high across owner categories. Pyramid structures tend to be simple with one or two large owners at each level. The average pyramid consists of 4.6 levels of companies including the top level (see "Pyr.layers"). The average sample firm is located at the 3.1st layer (see "Hierarchy"). Only one quarter of firms are listed on a stock exchange. This makes the sample ideal for testing for cash constraints, since asymmetry of information may be large for unlisted companies.

[Table 3 about here]

Table 4 exhibits means and medians of important balance sheet variables for sample A. (Statistics are very similar for sample B). State-controlled firms have significantly smaller cash flow to capital stock ratios, are significantly larger, have lower dividend payout ratios,

and lower indebtedness than other firms. Family-owned firms are the smallest. Their high bank-debt-to-total-debt and total-debt-to-total-asset ratios suggest that they fully exploit their credit limits. One indicator for the importance of internal capital markets is group debt, defined as debt owed to other corporations in the same group.[17] Internal capital markets allocate much more resources in foreign-controlled than in family-controlled firms. The mean (median) group-debt-to-total-debt ratios for foreign-controlled firms are 13.0 (9.5) percentage points higher and significantly different from those of the rest of the sample.

[Table 4 about here]

IV. REGRESSION ANALYSIS

IV(i) *An econometric model of investment*

If the firm maximizes the discounted flow of profits over an infinite horizon absent delivery lags, adjustment costs, and vintage effects, capital depreciates at a geometric rate and assuming a *CES* production function with σ the constant elasticity of substitution between capital and variable inputs, the relationship between the desired (optimal) capital stock K^*, the level of output Y, and the cost of capital C can be written as

$$K_t^* = \alpha C_t^{-\sigma} Y_t \qquad (1)$$

where C is a function of the purchase price of new capital relative to the price of output (see Chirinko (1993) and Caballero, Engel and Haltiwanger, 1995).

If total gross investment in physical capital, I_t^g, is broken up into net investment, I_t^n, plus replacement investment, I_t^r, i.e. $I_t^g = I_t^n + I_t^r$, and under the assumptions that net investment is only a fraction of new desired capital due to delivery lags extending for $J+1$ periods, that capital depreciates at a constant mechanistic rate δ, and that replacement

investment adjusts instantaneously to the new desired capital stock, we obtain the neoclassical model of investment

$$I_t^g = \delta K_{t-1} + \sum_{j=0}^{J} \alpha\beta_j \Delta(C_{t-j}^{-\sigma} Y_{t-j}) + u_t \qquad (2)$$

where u_t is a stochastic error term proxying for autonomous shocks, e.g. technology shocks. Equation (2) highlights the dependence of net investment on quantity and (relative) price variables. When $\sigma = 0$ (no substitution between variable factors of production), (2) reduces to the flexible accelerator model of investment and, if also delivery lags are absent ($J=0$, $\beta=1$) to the simple accelerator model.

Dividing (2) by K_{t-1}, assuming $J=1$, and (2) to hold for every firm and indexing firms by i, we obtain our basic estimating equation

$$\frac{I_{it}^g}{K_{i,t-1}} = \eta_i + \lambda_t + \upsilon_0 \frac{\Delta S_{it}}{K_{i,t-1}} + \upsilon_1 \frac{\Delta S_{i,t-1}}{K_{i,t-1}} + \gamma_0 \frac{P_{i,t-1}}{K_{i,t-1}} + \gamma_1 \frac{Dep_{i,t-1}}{K_{i,t-1}} + u_{it} \qquad (3)$$

where I^g and K are (gross) investment in physical capital and the capital stock, respectively. The capital stock is calculated by applying a perpetual inventory method along the lines of Salinger and Summers (1983) with a depreciation rate of 8% per annum.[18] P denotes profits before dividends net of interest and taxes, and Dep depreciation. These variables are included to test the predictions in Table 1 on the CCH and MDH. Equation (3) additionally assumes that the variation in the user cost of capital can be controlled for by including additive year-specific effects (λ_t) and firm-specific effects (η_i) and that sales S capture output Y.

Equation (3) suffices to test our hypotheses on cash flow sensitivities as presented in Table 1 provided the lag length on the sales growth terms is chosen sufficiently large and cash flow does not merely proxy for future investment profitability. Some authors, however, have argued that net investment is related to a distributed lag on changes in the optimal capital stock to recognize the complexity of the adjustment process.[19] One may also introduce error correcting behavior of investment, i.e. investment is likely to be higher if the firm is further away from the desired capital stock and investment spending may be less, ceteris paribus, if the installed capital is viewed as being above the desired level. Since from (1) it is reasonable to assume that *K* and *Y* are co-integrated in the long run while adjustment costs may prevent the firm to attain the target level in the short-run, we will follow that approach next.

Taking logs of (1), denoting logarithms with lower case letters and $a = \ln \alpha$, we get

$$k_t^* = a - \sigma c_t + y_t \tag{4}$$

If there are no adjustment costs, k_t^* would be the optimal capital stock for a profit maximizing firm with a constant returns to scale *CES* production function. Adjustment processes may be complex, and one way to arrive at a tractable model *and* account for adjustment costs is to nest (4) within an autoregressive-distributed lag model, for example an ADL (1,1) model of the form

$$k_t = \alpha_0 + \alpha_1 k_{t-1} + \beta_0 y_t + \beta_1 y_{t-1} - \varphi_0 c_t - \varphi_1 c_{t-1} + u_t \tag{5}$$

If we further assume that the change in the capital stock can be described by a simple partial adjustment process of the form

$$\Delta k_t = \theta(k_t^* - k_{t-1}) + \varepsilon_t \tag{6}$$

where some constant fraction θ of the gap between the actual and the desired levels of the capital stock is closed in each period, we get the error correction specification as

$$\begin{aligned}\Delta k_t = {} & \theta\alpha_0 - \theta(1-\alpha_1)\Delta k_{t-1} + \theta\beta_0\Delta y_t + \theta(\beta_0+\beta_1)\Delta y_{t-1} - \theta\varphi_0\Delta c_t - \theta(\varphi_0+\varphi_1)\Delta c_{t-1} \\ & - \theta(\varphi_0+\varphi_1)c_{t-2} - \theta(1-\theta\alpha_1)(k_{t-2}-y_{t-2}) + [\theta(\beta_0+\beta_1-(1-\theta\alpha_1)]y_{t-2} + \psi_t\end{aligned} \tag{7}$$

with $\psi_t = \theta u_t + \varepsilon_t - \alpha_1\varepsilon_{t-1}$. Assuming again that (7) holds for every firm, that the variation in the user cost of capital can be controlled for by including additive year-specific effects (λ_t) and firm-specific effects (η_i), that *s* captures *y*, that the cash flow terms enter additively, and finally using the approximation that $\Delta k_{it} \approx I_{it}/K_{i,t-1} - \delta_i$, we get the dynamic investment equation

$$\begin{aligned}\frac{I_{it}^g}{K_{i,t-1}} = {} & \eta_i + \lambda_t + \rho\frac{I_{i,t-1}^g}{K_{i,t-2}} + \upsilon_0\Delta s_{it} + \upsilon_1\Delta s_{i,t-1} + \omega(k-s)_{i,t-2} + \phi s_{i,t-2} \\ & + \gamma_0\frac{P_{i,t-1}}{K_{i,t-1}} + \gamma_1\frac{Dep_{i,t-1}}{K_{i,t-1}} + \psi_{it}\end{aligned} \tag{8}$$

If $\omega < 0$ error correction leads to more future investment in case of the capital stock being below the desired level, and $\phi = 0$ is consistent with long-run constant returns to scale.

Profits and depreciation, the components of cash flow, are supposed to test our predictions as presented in Table 1. The main critique of investment-cash flow regressions is that current cash flow may proxy for future investment opportunities and not availability of internal funds (Kaplan and Zingales, 1997).[20] To accommodate that critique, we apply a

number of controls in our estimation strategy: Depreciation and profits enter the regression models individually and lagged one period. Depreciation seems less likely to proxy for future investment opportunities. If cash constraints are present it should not matter whether additional funds come from profits or depreciation, and their coefficients should be equal. With capital stock as a deflator, the firm-specific intercept terms can be interpreted as the constant rates of depreciation. Therefore, if replacement needs are picked up by these fixed firm effects, depreciation is left to serve as a cash flow variable.[21] Moreover, fixed firm effects subtract firm-specific means from all variables removing all time invariant determinants of firm level investment from (3) and (8). Thus, fixed firm effects control for investment opportunities differing systematically across firms, leaving the cash flow terms to pick up the effects of within firm variation in internal funds on investment.

Additionally, equations (3) and (8) are estimated separately for bank-, state-, family-, and foreign-controlled firms. Thus we stress the *differences* in cash flow coefficients across control categories, which are unbiased estimates of the true differences. This holds true even if the within firm variation in cash flow (partially) proxies for future investment opportunities *if* our cash flow measures are *equally* correlated with expected future profits across control categories. We shall present evidence that this is indeed the case in Section IV(iv).

Since equation (3) contains no lagged dependent variables, and past sales growth and the cash flow terms are predetermined, and under the assumption that current sales growth is not endogenously determined with current investment, OLS is consistent. We relax the assumption of exogeneity of current sales growth and estimate (3) also by 2SLS in Section IV(iii). Equation (8) contains a lagged dependent variable and OLS would be inconsistent in the presence of unobserved firm-specific effects. Therefore, we estimate (8) by a systems GMM estimator developed by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). This estimator eliminates firm effects by first-differencing as well as controls for possible endogeneity of current explanatory variables. Endogenous variables

lagged two or more periods will be valid instruments provided there is no second-order autocorrelation in the first-differenced idiosyncratic error terms. We present tests for autocorrelations and the Sargan test of over-identifying restrictions in the tables that follow.

IV(i) *Basic results*

We start by reporting the fixed effects results for equation (3) in Table 5 and then discuss the *GMM* results for equation (8) in Table 6. For the full sample A, all four explanatory variables are significant at the one percent level (Table 5, column 2). The positive and significant coefficients on lagged profits and depreciation allowances are inconsistent with the neoclassical hypothesis of a zero cash flow sensitivity. The estimated marginal impacts of profits and depreciation on investment are both around 0.1, and each is significant at the 1 % level. This is also the case when we substitute the individual cash flow variables with the sum of profits and depreciation as a single explanatory variable. The cash flow coefficients are jointly significant [F (1, 1,186) = 10.22]. The equation explains around 49% of total variation in investment spending.

[Table 5 about here]

Columns 3 to 6 present the results for equation (3) for the different subsamples. The investment of bank-controlled firms is not sensitive to cash flow. Moreover, the accelerator terms included to capture the attractiveness of a company's investment opportunities are significant in spite of the small number of observations for this subsample. Bank-controlled firms seem to invest efficiently.[22]

In contrast, the accelerator terms are insignificant for state-controlled firms. What drives their investments is not the level of their investment opportunities, but their resources and discretion to pursue additional investment. Both cash flow coefficients are positive and significant, and they are jointly significant as well. Given our prior reasoning on the

relationship between ownership and control and cash flow-investment sensitivity, the MDH is likely to explain this finding. The last row of Table 5 presents differences in cash flow influence from bank-controlled firms, our base category.[23] Cash flow is not only more important for state-controlled firms, the difference of 0.1 from bank-controlled firms is significant at the 10% level.

Family-controlled firms are most likely to suffer from cash constraints. The marginal impacts of profits and depreciation are 0.17 and 0.21, respectively. Both coefficients are statistically significant, and they are the highest estimated sensitivities across controlling owners' categories. The difference in cash flow influence from bank-controlled firms is 0.20, which is significant at the 5% level and economically important. These estimates imply that increases in the mean *P/K* and *Dep/K* ratios by 10% lead to an increase in the average *I/K* ratio of family-controlled firms by 3.3%. This is evidence that cash constraints prevent family-controlled firms from attaining optimal investment levels. More than three-fourths of the family-controlled firms in Sample A are unlisted, and it appears that they would rather stay private and forego investment opportunities than make an underpriced IPO or sacrifice control by making an IPO.

While the individual cash flow effects for foreign-controlled firms are only marginally significant and economically small (0.061 for profits and 0.060 for depreciation), their joint effect is statistically different from zero ($p = 0.02$).

Table 6 presents our estimation results for equation (8), which includes a lagged dependent variable and assumes error correcting behavior, using the Arellano/Bond one step *GMM* estimator. The error correction term is correctly signed except for state-controlled companies which do not display error correcting behavior. There is no evidence of a significant deviation from a constant returns to scale technology, since the two period lagged sales terms are all insignificant. The Sargan tests do not suggest rejection of the overidentifying restrictions at conventional levels for either control category. Finally, while

there is evidence of first order serial correlation in the residuals, the AR(2) test statistics reveal absence of second order serial correlation in the first differenced errors and thus that the instruments are valid.

[Table 6 about here]

In general, including a lagged dependent variable and error correction as a way to account for the complexity of the adjustment process of corporate investment *increases* the evidence in favor of our hypotheses as outlined in Table 1. The cash flow related coefficients of family- and state-controlled firms remain significant at the 5% level or better. The cash flow terms for bank-controlled firms do not attain significance. Now, all control categories display statistically significantly different cash flow sensitivities from bank-controlled firms. The largest differences in the effect of cash flow on investment are obtained for family-controlled firms.

The results of Tables 5 and 6 suggest that the corporate governance structure of the firm has an important effect on the sensitivity of investment to cash flow. Cash flow sensitivities consistently vary across control categories. In particular, both family- and state-controlled firms exhibit positive and different sensitivities from bank-controlled firms. Agency theory suggests that cash constraints are responsible for the findings for family-controlled firms, while managerial discretionary spending may explain the investment-cash flow sensitivity for state-controlled firms. After presenting additional robustness checks in the next section, we shall explore these possibilities in greater detail in Section IV(iii).

IV(ii) *Robustness for basic results*

Endogeneity of sales growth, cash flow and investment

One of the main drawbacks using equation (3) and OLS is the possible endogeneity of sales growth, cash flow, and investment spending: supply shocks by improving productivity may increase profitability, investment and output simultaneously, and no causal effects could be attributed to the sales or cash flow variables. If technology shocks are captured by the disturbance terms, the endogenous regressors are contemporaneously correlated with these error terms, and the OLS estimator is biased even asymptotically.

Several arguments defend the results obtained so far: first, we found consistent results using a systems *GMM* technique; second, the cash flow terms were lagged one period so that a supply shock in period *t* should not change cash flow in period *t - 1*. Furthermore, Hausman specification tests[24] with alternative instruments show no signs of misspecification: If the one period lagged cash flow terms are instrumented by the two period lagged variables, the test of the difference between the coefficient vectors displays a chi-squared statistic of 2.15 (with 5 degrees of freedom) not rejecting the null hypothesis of equality of coefficients at any standard significance levels. If the sales accelerator terms are instrumented by their respective lagged values, the chi-squared statistic is 2.87 again not rejecting the null hypothesis of correct specification (the marginal significance level is 43%). Finally, we estimate equation (3) excluding current sales growth. While the cash flow coefficients rise for bank-controlled firms, all of the inferences regarding the other categories of control remain unchanged.

Measurement error and outliers

There may be the concern that measurement error is present. Again several arguments defend the robustness of our results. First, all firms are subject to the same legal requirements concerning their annual statement of accounts irrespective of the control structure. If measurement errors are distributed equally across control categories, estimated *differences* in cash flow sensitivities across categories should not be affected. Further, if family-controlled firms suffer most from measurement error, and profit is the badly measured variable (which

seem to be the most plausible assumptions), one would expect a larger negative bias for *family*-controlled firms.[25] We find a significantly larger impact of profits on investment for family-controlled firms than for bank-controlled firms in spite of the possible bias. Finally, the *GMM* techniques used to estimate equation (8) should not only correct for simultaneity and firm effects biases but also for measurement error.

Outliers may drive the results given the small number of observations in some subsamples. We therefore repeat the regressions using the Minimum Absolute Deviation (MAD) estimator, which is not as sensitive to outliers as OLS. Estimated differences in cash flow sensitivities from bank-controlled firms become even more pronounced and significant using MAD. The results are nearly identical when gross outliers are eliminated based on Cook's distance > 1 (see Cook, 1977). These robust estimation results are available from the author upon request.

Autocorrelation within panels

The estimates for equation (3) assumed zero serial correlation within panels conditional on the individual effects. We relax this assumption and allow for a first order autoregressive process of the within-group residuals. The serial correlation coefficient is lowest for bank-controlled firms (0.37) and highest for state-controlled firms (0.51). While serial correlation is not trivial, the basic results regarding our inferences on the CCH and the MDH are not changed.

IV(iii) *Additional firm characteristics*

Dividend payout policy

Dividends are a strategic managerial device to "buy" safety from corporate governance intervention. Thus, the MDH implies positive dividend payments. On the other hand, high dividend payments are at odds with the CCH. Firms that pay high dividends could cut them and finance incremental investment (see Section II). Thus, if some family-controlled

firms do not suffer from financing constraints, this could manifest itself in positive dividend payouts. Zero or low dividend payout family-controlled firms are then all the more likely to suffer from cash constraints if a positive and significant investment-cash flow coefficient is observed for them. Thus, an obvious additional discrimination device is dividend payout behavior.[26] In what follows we present the regression results using equation (3) and OLS, it should be noted, however, that the results using equation (8) and *GMM* are consistent and available upon request.

We define high dividend payout firms -similar to FHP (1988) - as those with a dividend to cash flow ratio over the whole sample period of more than 0.15, and low payout firms as those with ratios less than 0.15. As can be seen from Panel A in Table 7, 106 firms (49.5% of Sample A) are classified as high dividend paying. For these firms, the profits coefficient is 0.075 (t = 4.04) and the depreciation cofficient is 0.088 (t = 4.13). These coefficients are individually and jointly significant beyond the one percent level. It is hard to argue that cash constraints are responsible for this finding, since these firms on average paid out 25% of their cash flows as dividends over the 1991 to 1999 period. What then accounts for the positive and significant investment-cash flow sensitivity for high dividend payout firms? Joint significance of profits and depreciation is only attained by state-controlled firms, despite the fact that there are more family-controlled firms. This is additional evidence in favor of the MDH in state-controlled firms.

[Table 7 about here]

Panel B in Table 7 exhibits the results for the complementary 108 low dividend payout firms. Most of the positive influence of cash flow on investment is attributable to family-controlled firms, consistent with the CCH. These exhibit the largest and most significant investment-cash flow sensitivities with 0.28 for profits, t = 4.11, and 0.36 for

depreciation, t = 2.32. The difference of the cash flow coefficients from bank-controlled firms is 0.33 and significant at the 5% level.

Internal rates of return

The internal rate of return (RoR) is crucial in assessing investment decisions. In Section II, it was argued that cash-constrained firms should have internal rates of return higher than their costs of capital, but that overinvesting firms have RoRs lower than their costs of capital. RoRs are therefore an obvious discrimination device between under- and overinvesting companies.

Rather few studies have tried to measure RoRs. Exceptions in this respect are Baumol, Heim, Malkiel and Quandt (BHMQ, 1970), Shinnar, Dressler, Feng and Avidan (SDFA, 1989), and Mueller and Reardon (1993). The choice of procedure in the present study is based on data availability and theoretical considerations. Since only few Austrian firms are listed on the stock exchange, the Mueller and Reardon (1993) procedure, which relies on the capital market's evaluation of the firm, cannot sensibly be used.[27] The comparative advantage of the SDFA vis a' vis the BHMQ method is that SDFA works with the total cash flow in each period, while BHMQ utilize only the limited information about the increments in profits. In this study, therefore, we use the SDFA procedure to calculate rates of return for the years 1985 through 1999 for the companies in Sample B, which has enough time series observations to perform this calculation. Details of the calculations are discussed in the appendix.

Table 8 presents summary statistics on real RoRs and the variance of profits to total assets ratios, a proxy for risk.[28] Foreign-controlled firms have significantly higher RoRs (mean of 16.1%, median of 10.5%) than domestically-controlled firms (mean of 5.9%, median of 6.0%). State-controlled firms' mean RoR of 2.0% as well as their median RoR of -3.8% are significantly lower than for other firms. Bank- and family-controlled firms' mean

and median RoRs lie between those of state- and foreign-controlled firms. Risk does not seem to explain these RoR differences, since the variance of the profits to total asset ratio (VPA) is not significantly different across control categories. This is also confirmed by a simple regression of RoR on VPA and dummies for our four ultimate control categories. The relationship between RoR and control categories is also present when we include 2-digit industry dummies in the regression. Thus, our ownership and control categories achieve a significant discrimination between low and high return firms.

[Table 8 about here]

Table 9 exhibits the estimation results for equation (3) for the subsamples low- and high- RoR firms in Sample B for the period 1985 to 1999.[29] The discrimination value is a RoR of 5%, neighboring discrimination values do not alter the results. The cash flow coefficients remain positive and significant for the 37 firms with RoRs smaller than 5% (see Panel A). State-controlled firms exhibit the largest and most significant point estimates of cash flow coefficients. This is evidence that control failures in state-controlled firms lead to a positive investment-cash flow relationship. Ex post, these firms earned an average RoR of minus 4.3% and are significantly more often classified as low-RoR firms than other firms. Overinvestment out of cash flows seems to have led to low RoRs.

[Table 9 about here]

Panel B presents the results for the 57 firms with RoRs larger than five percent. The positive and significant cash flow coefficients as well as the significant difference from bank-controlled firms support the CCH in family- and possibly in some foreign-controlled firms.

IV (iv) *Does cash flow proxy for differential investment profitability?*

This paper has already applied several ways of circumventing the major criticism of using cash flow as a proxy for the internal availability of funds: (1) cash flow was divided into its components depreciation and profits, and the individual coefficient estimates compared, (2) the components were lagged one period to account for availability and time needed for managerial information processing, (3) fixed firm effects were included to capture firm specific depreciation rates and investment opportunities, and (4) *differences* in cash flow coefficients from the base category bank-controlled firms are more likely to be invariant to future returns on investment.

This section explores this last argument in greater detail. Similar in spirit to Bond et al. (1999), we ask whether cash flow is a *differently* informative predictor of future sales or cash flows across control categories. In particular, our conclusion that family-controlled firms are more likely to be cash-constrained than bank-controlled firms would be undermined if family-controlled firms' cash flows merely better predict future values of sales or cash flow and thus investment. We perform this exercise by estimating a sales and a cash flow equation. The independent variables in the sales equation include lagged sales and cash flow terms up to period *t-2*. Thus a joint test of significance of the cash flow coefficients in the sales equation can be interpreted as a conventional Granger-causality test (see recently Hall et al., 1999). The time series properties of cash flow are explored using an AR(2) process.

Table 10 presents the results for Sample A. Since both equations contain lagged dependent variables and firm-specific effects, we estimate by the Arellano/Bond one step *GMM* estimator. We allow all coefficients to differ across control categories by interacting all explanatory variables with dummies indicating the identity of controlling owner. In the sales equation, the sum of the cash flow terms of family-controlled firms is *smaller* than the sum of the cash flow terms of bank-controlled firms. In the cash flow equation, cash flow does not predict future cash flow differently across control categories. These findings contradict the

hypothesis that cash flow better proxies for demand expectations or future profitability of investment for family-controlled firms than for other firms.

[Table 10 about here]

V. CONCLUSIONS

This paper presents evidence supporting both the managerial discretion and cash constraints hypotheses. The support for each hypothesis is directly related to the governance structure of the firm. Many family-controlled firms appear to suffer from cash constraints. Family owners seem to be unwilling to issue underpriced equity and give up control over the companies they founded to finance investment. In contrast, agents of the state have incentives for short-term asset and employment maximization. They appear to invest their "free cash flow" rather than paying it out to shareholders or citizens. From agency theory this comes as no surprise, since ultimate owners of state-controlled firms (i.e. the citizens) are very weak monitors. Banks as providers of equity appear to improve the governance of companies, since we do not find cash-flow-induced investment for bank-controlled firms.

Our results have implications for the ongoing discussion about how to interpret investment-cash flow sensitivities. Kaplan and Zingales (1997) find higher sensitivities for financially *un*constrained firms. These authors postulate that investment-cash flow sensitivities cannot be interpreted as an accurate measure of capital market access. We opt for a more cautious interpretation. This sensitivity *can* be interpreted as an accurate measure of cash constraints for some companies when a fuller picture of the firm is taken into account. Specifically, the corporate governance structure of the firm co-determines the existence of managerial agency costs *and/or* cash constraints. The discrimination among optimal-, over-, and under-investing companies can be more precisely made, when corporate governance characteristics are taken into account.

APPENDIX

SDFA (1989) CALCULATION METHOD FOR RATES OF RETURN (ROR)

Shinnar, Dressler, Feng and Avidan (SDFA, 1989) calculate the internal RoR, *r,* for a company from the formula

$$\sum_{j=1}^{n} \frac{B_j}{(1+r)^j} = 1 \qquad \text{(A1)}$$

where B_j is the net cash flow received in year j for each unit invested in year zero and n is the project life. Each years' cash flow is decomposed into components attributable to past investments by $B_j = fb_j$, where f is the total capital recovery ratio – the total amount of money recovered for each unit invested – and the sequence of b_j's is the cash flow profile of the investment or a (known) depreciation profile. By allocating the yearly total cash flows to previous investments, one can compute a yearly f_j as

$$f_j = \frac{CF_j}{\sum_{k=j-n}^{j-1} I_k b_{j-k}} \qquad \text{(A2)}$$

where CF_j is the net cash flow, I_j is investment in year j. f_j is simply equal to the cash flow per unit of capital invested, which is the weighted sum of past investment with weights being some defined depreciation profile b_j. One can then resubstitute into equation (A1) to obtain

$$\sum_{j=i+1}^{i+n} \frac{f_j b_{j-1}}{(1+r)^{j-1}} = 1 \qquad \text{(A3)}$$

to compute the economic rate of return r. In the present study the cash flow profile is assumed constant over the n years ($b_j = 1/n$) and n is 10 years. SDFA (1989) discuss various assumptions about the cash flow profile besides the uniform distribution, e.g. a uniform distribution with a d period lag, a uniform distribution with a step in the middle, etc. When we apply these different cash flow profiles results are not substantially changed. With the assumed depreciation rate of 10% one needs 10 years of data to obtain the first yearly f_j's.

Sample B (94 firms, 1975 to 1999) contains (at most) 25 yearly time series observations, enough for this sort of calculation. The f_j's are then averaged to get a mean capital recovery ratio over the 1985 to 1999 period. The resulting single r per firm can then be interpreted as the average real internal rate of return over the period 1985 to 1999. Variables are deflated by the Consumer Price Index.

From the calculation method it becomes clear that endogeneity between RoRs and investment cannot be completely ruled out. However, a given firm RoR is obtained by utilizing (at most) 25 years of data, and skipping the first ten years when estimating the investment-cash flow regressions in Table 9 should considerably reduce possible endogeneity between RoR and investment.

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FIGURE 1

CASH CONSTRAINTS AND MANAGERIAL DISCRETION

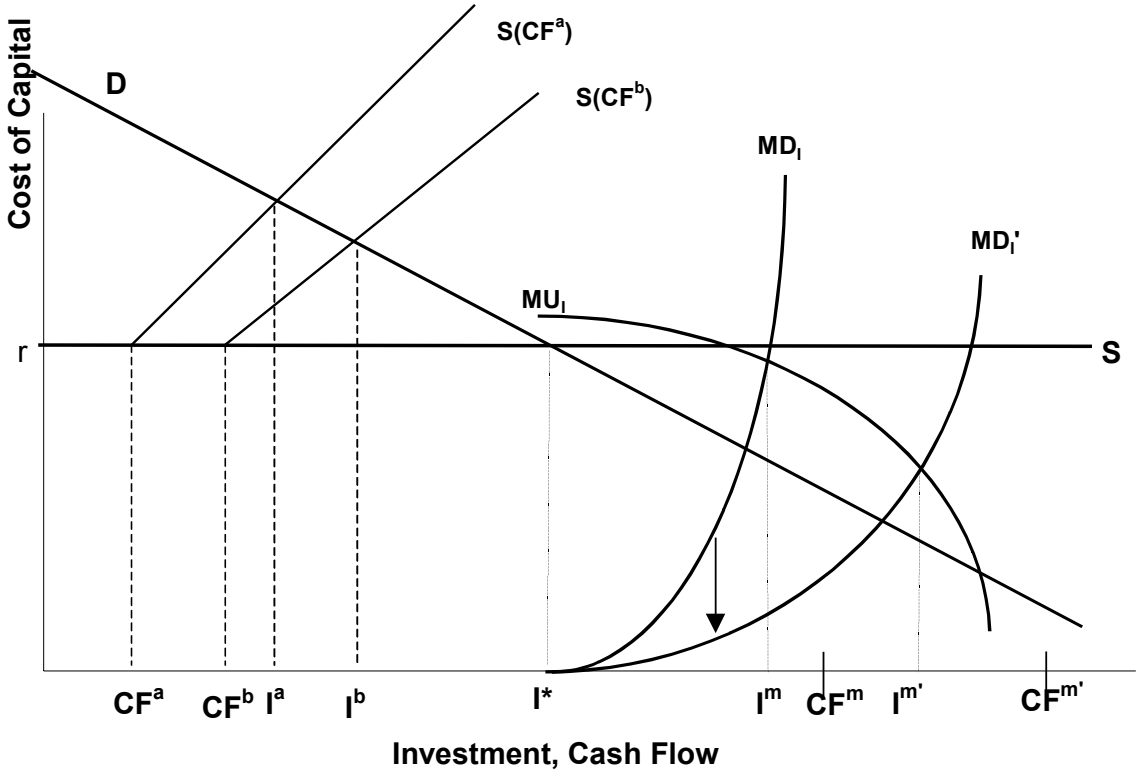

FIGURE 2

OWNERSHIP AND CONTROL STRUCTURE OF OMV AG

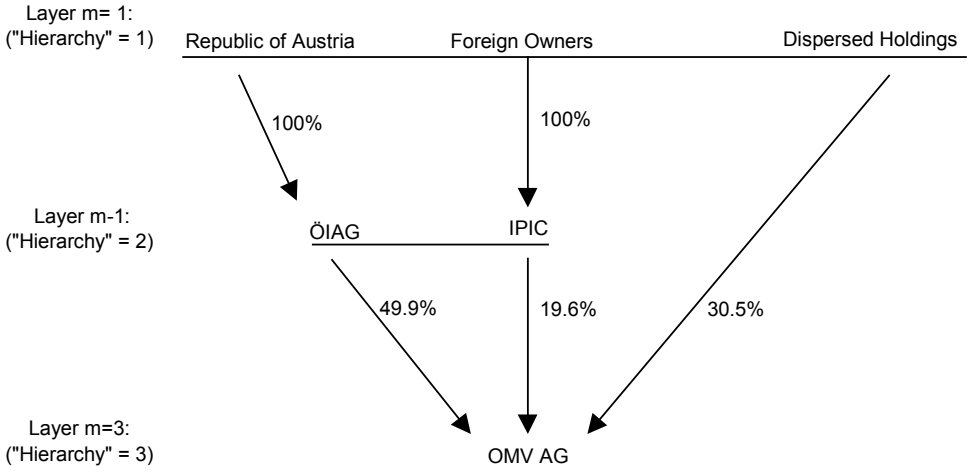

TABLE 1

PREDICTIONS ABOUT CASH FLOW COEFFICIENTS

Identity of Large and Controlling Owner	The Cash Constraints Hypothesis	The Managerial Discretion Hypothesis
BANKS	0	0
STATE	0	+
FAMILY	+	0
FOREIGN firms	?	?

Note: A "0" means that we predict a zero cash flow coefficient and, therefore, that the hypothesis is not valid for the respective subsample of firms, a "+" means that the prediction is a positive and significant cash flow coefficient and that the hypothesis is valid for the respective subsample of firms, and a "?" means an indeterminate prediction.

TABLE 2

WHO CONTROLS AUSTRIA?
(Number of firms where stake of respective category is positive in parentheses)

	BANKS	STATE	FAMILY	FOREIGN FIRMS	NON-BANK DOMESTIC FIRMS	DISPERSED OWNERS
Direct Ownership[1]	5.2	8.7	8.9	32.8	37.2	7.4
(Percent of total equity)	(23)	(23)	(33)	(90)	(100)	(58)
Ultimate Ownership[1]	8.7	17.6	24.6	35.6	—	13.3
(Percent of total equity)	(40)	(55)	(68)	(98)		(80)
Largest Ultimate Shareholder[1]	14.5	21.0	27.1	37.4	—	—
(Percent of firms)	(31)	(45)	(58)	(80)		
Largest Ultimate Shareholder (1991)[2]	7.4	18.1	24.5	50.0	—	—
(Percent of firms)	(7)	(17)	(23)	(47)		

[1] Sample A: 214 firms
[2] Sample B: 94 firms

TABLE 3

OWNERSHIP CONCENTRATION AND PYRAMIDING
(Sample A)

	Ownership concentration			Pyramiding		Percent listed
	Stake 1 (%)	Stake 2 (%)	Stake 3 (%)	Pyr.layers	Hierarchy	
ALL (214)	78.5	11.3	1.6	4.6	3.1	24.6
BANK-controlled firms (31)	63.4	20.2	3.6	5.3	3.0	35.5
STATE-controlled firms (45)	77.7	9.3	0.6	4.7	3.1	17.8
FAMILY-controlled firms (58)	74.3	12.1	3.2	4.0	3.1	24.1
FOREIGN-controlled firms (80)	87.8	8.5	0.9	3.4	2.5	11.3

Note: "Pyr.layers" and "Hierarchy" for foreign-controlled firms are not literally comparable to the other categories since we do not know the ultimate owners of these foreign firms. Stake 1, 2, 3 ... Largest second, third average stake. Pyr.layers ... Average of total number of layers in the pyramid. Hierarchy ... Average of hierarchical layers of the sample firm.

TABLE 4

MEANS AND MEDIANS OF ANNUAL VALUES
(Sample A)

Control:	ALL[1]	BANKS	STATE	FAMILY	FOREIGN
No. of firms	214	31	45	58	80
			Total Sales in Mill ATS		
Mean	2,680	2,007 (a)	4,638 (a)	1,467 (a)	2,720 ( )
Median	1,325	1,281 ( )	2,776 (b)	1,103 (b)	1,245 ( )
			Number of Employees		
Mean	1,050	1,113 ( )	1,480 (a)	766 (a)	990 ( )
Median	673	689 ( )	1,075 (b)	570 (b)	571 (b)
			Sales Growth Rate (%)		
Mean	4.0	2.2 ( )	4.8 ( )	5.0 ( )	3.5 ( )
Median	2.1	1.6 ( )	3.1 ( )	1.8 ( )	1.9 ( )
			I/K (%)		
Mean	21.5	23.7 (a)	13.0 (a)	21.0 ( )	25.9 (a)
Median	19.1	23.0 (b)	10.6 (b)	19.1 ( )	23.1 (b)
			CF/K (%)		
Mean	34.8	27.2 (a)	25.5 (a)	29.7 (a)	46.8 (a)
Median	27.8	26.7 ( )	11.1 (b)	27.3 ( )	36.9 (b)
			Div/CF (%)		
Mean	16.2	17.4 ( )	12.9 (a)	10.4 (a)	21.9 (a)
Median	12.5	14.1 ( )	10.0 (b)	9.2 (b)	17.6 (b)
			Bank Debt/Total Debt (%)		
Mean	41.8	36.5 (a)	52.2 (a)	53.0 (a)	29.8 (a)
Median	44.8	29.6 (b)	61.5 (b)	59.5 (b)	26.8 (b)
			GroupDebt/Total Debt (%)		
Mean	13.8	12.6 ( )	12.5 ( )	6.9 (a)	19.9 (a)
Median	5.5	6.0 ( )	2.0 (b)	2.4 (b)	11.9 (b)
			Total Debt/Total Assets (%)		
Mean	45.6	47.5 ( )	42.1 (a)	51.3 (a)	42.8 (a)
Median	46.4	47.1 ( )	42.0 (b)	52.1 (b)	44.2 (b)

[1] 214 firms 1991 to 1999.

Variables: *Total Sales* ... annual total sales, *Number of Employees* ... annual average of total number of employees, *Sales Growth Rate* ... annual growth rates of total sales; *I* ... investment in physical capital; *K* ... capital stock obtained by applying a perpetual inventory method; *CF* ... cash flow; *Div* ... dividend payments; *Bank Debt* ... debt owed to banks irrespective of term at the date of balance, *Group Debt* ... debt owed to other corporations in the same group irrespective of term at the date of balance, *Total Debt* ... total debt of the firm irrespective of term at the date of balance, *Total Assets* ... total assets at the date of balance.

Comparison tests: (a) ... Mean of respective subsample is significantly different (at least at the 5% level) to the mean of the other firms, respectively. (b) ... Sample is from population with a significantly different (at least at the 5% level) distribution than the sample of the other firms, respectively (Wilcoxon rank sum test). () No significant difference.

TABLE 5

BASIC RESULTS
OLS ESTIMATES FOR EQUATION 3 FOR SAMPLE A (1991 TO 1999)
(*t*-values in parentheses)

Control/ Independent Variables	ALL	BANKS	STATE	FAMILY	FOREIGN
$\Delta S_{it} / K_{i,t-1}$	0.011	0.018	0.001	0.013	0.004
	(3.19)***	(2.26)**	(0.26)	(2.01)**	(1.41)
$\Delta S_{i,t-1} / K_{i,t-1}$	0.013	0.016	0.001	0.013	0.019
	(3.14)***	(2.60)***	(0.47)	(1.58)	(5.69)***
$P_{i,t-1} / K_{i,t-1}$	0.092	0.011	0.093	0.167	0.061
	(3.14)***	(0.19)	(4.47)***	(4.21)***	(1.93)*
$Dep_{i,t-1} / K_{i,t-1}$	0.110	0.004	0.113	0.210	0.060
	(3.19)***	(0.06)	(4.90)***	(2.56)**	(1.35)
R^2-bar	0.49	0.44	0.45	0.46	0.51
No. Firms	214	31	45	58	80
No. Obs.	1,422	206	296	389	320
F-test of joint significance of CF coefficients	F(1, 1,186) = 10.22***	F(1, 165) = 1.27	F(1, 241) = 22.25***	F(1, 321) = 14.38***	F(1, 531) = 5.86**
Difference of CF coefficient(s) from bank-controlled firms[1]	—	—	0.10*	0.20**	0.06

[1] Estimated differences and F-tests in this row are from the pooled regression with interaction terms for all explanatory variables with all control categories, and constraining the profits and depreciation coefficient to be equal for each control category.

Note: All regressions include firm and time fixed effects for which the F-test statistic (pooled regression) is 5.48 (p=0.00). The estimation method is OLS with White (1980) corrected standard errors. This estimator produces consistent standard errors even if the residuals are not identically distributed.

* significant at 10% level, ** significant at 5% level, *** significant at 1% level

TABLE 6

GMM ESTIMATES FOR EQUATION 8 FOR SAMPLE A
(*z*-values in parentheses)

Control/ Independent Variables	ALL	BANKS	STATE	FAMILY	FOREIGN
$I^{g}_{i,t-1} / K_{i,t-2}$	0.206	-0.14	0.16	0.122	0.249
	(4.24)***	(0.73)	(1.63)	(1.17)	(2.94)***
Δs_{it}	0.054	0.080	0.060	0.090	0.055
	(3.25)***	(0.92)	(2.15)**	(2.49)**	(2.96)***
$\Delta s_{i,t-1}$	0.036	0.150	0.008	0.014	0.057
	(1.25)	(1.99)**	(0.55)	(1.68)*	(2.07)**
$(k-s)_{i,t-2}$	-0.013	-0.080	0.014	-0.060	-0.095
	(2.18)**	(1.88)*	(0.66)	(1.83)*	(2.47)**
$s_{i,t-2}$	-0.000	-0.07	0.061	-0.028	-0.038
	(0.01)	(0.80)	(1.55)	(0.67)	(0.90)
$P_{i,t-1} / K_{i,t-1}$	0.054	-0.051	0.071	0.195	0.020
	(2.38)**	(0.70)	(2.56)**	(4.64)***	(1.10)
$Dep_{i,t-1} / K_{i,t-1}$	0.060	-0.034	0.090	0.226	0.180
	(3.43)***	(0.42)	(3.95)***	(2.85)***	(3.24)***
No. Firms	214	31	45	58	80
No. Obs.	1,208	176	246	331	455
Wald-test of joint significance of CF coefficients	$\chi^2(1)$ = 11.75***	$\chi^2(1)$ = 0.28	$\chi^2(1)$ = 23.70***	$\chi^2(1)$ = 14.31***	$\chi^2(1)$ = 3.95**
Difference of CF coefficient(s) from bank-controlled firms[1]	—	—	0.12***	0.25***	0.11***
Sargan test	0.20	0.45	0.32	0.24	0.22
AR(1)	0.00	0.00	0.00	0.00	0.00
AR(2)	0.77	0.79	0.11	0.68	0.58

[1] Estimated differences and Wald-tests in this row are from the pooled regression with interaction terms for all explanatory variables with all control categories, and constraining the profits and depreciation coefficient to be equal for each control category.

Note: All regressions include a full set of time dummies. The estimation method is one-step GMM. This method eliminates firm fixed effects by first differencing. "Sargan test" is the p-value of a Sargan-Hansen test of overidentifying restrictions; AR(k) is the p-value of a test that the average autocovariance in residuals of order k is zero. Instruments include lagged levels of the dependent and the predetermined variables dated *t-2* or earlier, i.e. instruments begin with $I^{g}_{i,t-2}/K_{i,t-3}$, $\Delta s_{i,t-2}$, $s_{i,t-2}$, $(k-s)_{i,t-3}$, $P_{i,t-2}/K_{i,t-2}$, $Dep_{i,t-2}/K_{i,t-2}$.

* significant at 10% level, ** significant at 5% level, *** significant at 1% level

TABLE 7

HIGH-DIVIDEND PAYING VERSUS LOW-DIVIDEND PAYING FIRMS
OLS ESTIMATES FOR EQUATION 3 FOR SAMPLE A (1991 TO 1999)
(*t*-values in parentheses)

Panel A: High Dividend Payout Firms

Control/ Independent Variables	ALL	BANKS	STATE	FAMILY	FOREIGN
$\Delta S_{it} / K_{i,t-1}$	0.011 (2.59)**	0.031 (2.26)**	-0.001 (0.45)	0.014 (2.17)**	0.005 (2.10)**
$\Delta S_{i,t-1} / K_{i,t-1}$	0.009 (1.64)	0.023 (2.41)**	-0.005 (1.65)	0.007 (0.94)	0.013 (1.58)
$P_{i,t-1} / K_{i,t-1}$	0.075 (4.04)***	0.036 (0.52)	0.091 (4.47)***	0.103 (3.36)***	0.039 (0.35)
$Dep_{i,t-1} / K_{i,t-1}$	0.088 (4.13)***	0.019 (0.27)	0.091 (2.18)**	0.093 (0.93)	0.064 (1.44)
R²-bar	0.62	0.55	0.64	0.51	0.62
No. Firms	106	16	18	24	48
No. Obs.	717	108	113	166	330
Mean Div/CF Ratio	0.25	0.24	0.20	0.22	0.32
F-test of joint significance of CF coefficients	F(1, 601) = 7.22***	F(1, 82) = 1.24	F(1, 85) = 7.64***	F(1, 132) = 2.50	F(1, 272) = 0.83
Difference of CF coefficient(s) from bank-controlled firms[1]	—	—	0.09	0.10	0.03

Panel B: Low Dividend Payout Firms

Control/ Independent Variables	ALL	BANKS	STATE	FAMILY	FOREIGN
$\Delta S_{it} / K_{i,t-1}$	0.024 (2.93)***	-0.067 (1.56)	0.035 (2.11)**	-0.005 (0.58)	0.007 (1.10)
$\Delta S_{i,t-1} / K_{i,t-1}$	0.014 (2.19)**	0.067 (2.23)**	0.058 (3.18)***	0.004 (0.39)	0.010 (1.93)*
$P_{i,t-1} / K_{i,t-1}$	0.085 (2.80)**	-0.006 (-0.04)	0.230 (3.17)***	0.275 (4.11)***	0.037 (1.21)
$Dep_{i,t-1} / K_{i,t-1}$	0.188 (3.57)***	-0.093 (-0.47)	0.120 (0.93)	0.356 (2.32)**	0.163 (3.45)***
R²-bar	0.67	0.40	0.47	0.62	0.63
No. Firms	108	15	27	34	32
No. Obs.	705	98	183	223	201
Mean Div/CF Ratio	0.03	0.05	0.02	0.03	0.02
F-test of joint significance of CF coefficients	F(1, 587) = 25.80**	F(1, 73) = 0.21	F(1, 146) = 4.19**	F(1, 179) = 9.21***	F(1, 74) = 4.56**
Difference of CF coefficient(s) from bank-controlled firms[1]	—	—	0.20	0.33**	0.14

[1] Estimated differences and F-tests in this row are from the pooled regression with interaction terms for all explanatory variables with all control categories, and constraining the profits and depreciation coefficient to be equal for each control category.

Note: High dividend payout firms are those with a dividend to cash flow ratio over the 1991 to 1999 period of more than 0.15, low payout firms have ratios less than 0.15. All regressions include firm and time fixed effects. The estimation method is OLS with White (1980) corrected standard errors.

* significant at 10% level, ** significant at 5% level, *** significant at 1% level

TABLE 8

REAL INTERNAL RATES OF RETURN (ROR)
(Sample B)

Control	ALL	BANKS	STATE	FAMILY	FOREIGN
No. Firms	94	7	17	23	47
Mean RoR	11.0%	7.8% ()	2.0% (a)	8.3% ()	16.1% (a)
Median RoR	8.4%	4.8% ()	-3.8% (b)	8.6% ()	10.5% (b)
Mean VPA	0.35	0.52 ()	0.16 ()	0.39 ()	0.37 ()

Note: Real internal RoRs are calculated using the methodology of SDFA (1989) under the assumptions of a uniform distribution of the cash flow profile and a project life of 10 years. Variables are deflated by the CPI. RoRs can be interpreted as average internal real rates of return over the period 1985 to 1999. For more details please see the appendix. VPA is the variance of the firm profits to total asset ratio over the 1985 to 1999 period as a proxy for risk. (a) ... Mean RoR or VPA of respective subsample is significantly different (at least at the 5% level) to the mean RoR or VPA of the other firms, respectively. (b) ... Sample is from population with a significantly different (at least at the 5% level) distribution than the sample of the other firms, respectively (Wilcoxon rank sum test). () No significant difference.

TABLE 9

HIGH-ROR VERSUS LOW-ROR FIRMS: OLS ESTIMATES FOR EQUATION 3
(Sample B, estimation period: 1985-1999, *t*-values in parentheses)

Panel A: Low RoR Firms

Independent Variables Control:	ALL	BANKS	STATE	FAMILY	FOREIGN
$\Delta S_{it} / K_{i,t-1}$	0.029	0.035	-0.003	0.065	0.008
	(2.19)**	(2.90)***	(-0.62)	(1.97)*	(1.03)
$\Delta S_{i,t-1} / K_{i,t-1}$	0.021	0.004	-0.008	0.064	0.007
	(1.71)*	(0.62)	(0.66)	(1.84)*	(1.05)
$P_{i,t-1} / K_{i,t-1}$	0.158	0.143	0.223	0.144	0.133
	(5.06)***	(1.92)*	(3.02)***	(1.36)	(2.22)**
$Dep_{i,t-1} / K_{i,t-1}$	0.300	0.188	0.427	0.178	0.311
	(5.21)***	(2.13)**	(2.67)***	(1.65)*	(1.92)*
R^2 bar	0.50	0.79	0.38	0.21	0.41
No. Firms in estimation[1]	37	5	14	10	14
No. Obs.	515	70	201	138	208
F-test of joint significance of CF coefficients	F(1, 452) = 43.15***	F(1, 39) = 4.80**	F(1, 145) = 14.04***	F(1, 102) = 11.01***	F(1, 168) = 7.91***
Difference of CF coefficient(s) from bank-controlled firms[2]	—	—	0.02	-0.05	-0.03
Mean RoR	-2.8%	-1.3% ()	-4.3% ()	-3.7% ()	-1.3% ()
Median RoR	-3.1%	-1.5% ()	-4.9% (b)	-3.1% ()	-1.2% ()
Mean VPA	0.36	0.73 ()	0.19 ()	0.46 ()	0.36 ()

[1] The row sum of the number of firms across control categories does not sum to 37 but to 43 due to 6 control changes in the estimation period.

Panel B: High RoR Firms

Independent Variables Control:	ALL	BANKS	STATE	FAMILY	FOREIGN
$\Delta S_{it} / K_{i,t-1}$	0.021	0.044	0.004	0.013	0.021
	(2.95)***	(1.87)*	(0.28)	(3.32)***	(3.74)***
$\Delta S_{i,t-1} / K_{i,t-1}$	0.015	0.051	0.023	0.017	0.016
	(3.71)***	(1.51)	(1.56)	(2.59)**	(3.74)***
$P_{i,t-1} / K_{i,t-1}$	0.077	-0.056	0.029	0.243	0.051
	(3.39)***	(-0.86)	(0.40)	(5.81)***	(3.25)***
$Dep_{i,t-1} / K_{i,t-1}$	0.320	0.101	0.120	0.288	0.387
	(4.46)***	(1.55)	(1.17)	(2.97)***	(4.01)***
R^2 bar	0.42	0.47	0.76	0.49	0.41
No. Firms in estimation[1]	57	7	6	18	35
No. Obs.	855	101	83	260	505
F-test of joint significance of CF coefficients	F(1, 774) = 58.93***	F(1, 68) = 1.19	F(1, 52) = 1.03	F(1, 217) = 13.38***	F(1, 445) = 19.09***
Difference of CF coefficient(s) from bank-controlled firms[2]	—	—	0.03	0.27**	0.22**
Mean RoR	20.3%	19.9% ()	22.7% ()	13.9% ()	22.9% ()
Median RoR	14.6%	25.0% ()	20.0% ()	10.0% ()	15.3% ()
Mean VPA	0.34	0.24 ()	0.07 ()	0.36 ()	0.38 ()

[1] The row sum of the number of firms across control categories does not sum to 57 but to 66 due to 9 control changes in the estimation period.

[2] Estimated differences and F-tests in this row are from the pooled regression with interaction terms for all explanatory variables with all control categories, and constraining the profits and depreciation coefficient to be equal for each control category.

Note: High RoR firms are those which have a RoR>5%, low RoR firms have RoRs<5%. All regressions include firm and time fixed effects. The estimation method is OLS with White (1980) corrected standard errors.

Comparison tests: (a) ... Mean RoR or VPA of respective subsample is significantly different (at least at the 5% level) to the mean RoR or VPA of the other firms, respectively. (b) ... Sample is from population with a significantly different (at least at the 5% level) distribution than the sample of the other firms, respectively (Wilcoxon rank sum test). () No significant difference. * significant at 10% level, ** significant at 5% level, *** significant at 1% level

TABLE 10

DOES CASH FLOW PROXY *DIFFERENTLY* FOR THE FUTURE PROFITABILITY OF INVESTMENT?
(Sample A)

Dependent variable	s_{it}		$(CF/K)_{it}$	
Independent Variables:	Coefficient	z-value	Coefficient	z-value
$s_{i,t-1} * DBA$	0.752	5.85		
$s_{i,t-2} * DBA$	-0.201	-2.33		
$s_{i,t-1} * DST$	0.581	4.53		
$s_{i,t-2} * DST$	-0.037	-0.32		
$s_{i,t-1} * DFAM$	0.674	6.55		
$s_{i,t-2} * DFAM$	-0.139	-1.48		
$s_{i,t-1} * DFF$	0.447	2.84		
$s_{i,t-2} * DFF$	0.149	1.41		
$(CF/K)_{i,t-1} * DBA$	0.109	1.70	0.256	2.11
$(CF/K)_{i,t-2} * DBA$	0.044	0.61	-0.020	-0.20
$(CF/K)_{i,t-1} * DST$	0.141	2.08	0.115	0.51
$(CF/K)_{i,t-2} * DST$	0.027	0.37	0.286	1.85
$(CF/K)_{i,t-1} * DFAM$	0.079	1.79	0.507	2.39
$(CF/K)_{i,t-2} * DFAM$	-0.026	-0.46	-0.092	-0.61
$(CF/K)_{i,t-1} * DFF$	-0.009	-0.28	-0.474	-0.99
$(CF/K)_{i,t-2} * DFF$	-0.061	-1.29	0.289	1.25
No. Firms	214		214	
No. Obs.	1,208		1,208	
Wald- test of joint significance of CF coefficients:				
BANK-control	2.40		3.13*	
STATE-control	5.29**		5.99**	
FAMILY-control	0.88		4.04**	
FOREIGN-control	1.14		0.13	
Wald- test of difference of CF coefficients from bank-controlled firms:				
STATE-control	0.01		0.64	
FAMILY-control	0.79		0.55	
FOREIGN-control	3.49*		1.04	

Note: The dependent variables are the logarithm of sales and the cash flow to capital stock ratio, respectively. *DBA, DST, DFAM* and *DFF* are dummies equal to one, if a bank, the state, a family or a foreign firm is the largest ultimate shareholder, zero else. All regressions include a full set of time dummies. The estimation method is one-step *GMM*. This method eliminates firm fixed effects by first differencing. Sargan tests do not reject overidentifying restrictions and autocorrelation tests do not detect second order serial correlation in the first differenced residuals. Instruments include lagged levels of the right hand side variables dated *t-3* or earlier.
* significant at 10% level, ** significant at 5% level, *** significant at 1% level

NOTES

[1] For example, Oliner and Rudebusch (1992), Bond and Meghir (1994), Himmelberg and Petersen (1994), Gilchrist and Himmelberg (1995), and Guariglia (1999). For a recent survey of cash constraints, see Hubbard (1998).

[2] There is now a small body of literature, which analyses both the asymmetric-information and the managerial-discretion hypothesis, see Cho (1998), Goergen and Renneboog (2001), Kathuria and Mueller (1995), and Vogt (1994).

[3] Franks and Mayer (1997) characterize an "insider system" of corporate governance as one with (1) few listed companies, (2) a large number of substantial share stakes and (3) large intercorporate equityholdings. The Austrian system is characterized by all of these features (see Gugler (2003) and Gugler et al., 2001).

[4] Until recently, in the US banks were generally prohibited from holding common stock in non-financial corporations according to the now repealed Banking Act of 1933 ("Glass-Steagall Act").

[5] Myers and Majluf (1984) posit that firms may be cash-constrained because outside investors have less information than the owner-managers about the true value of assets or investment opportunities. Cash-constrained managers maximize incumbent shareholder wealth by foregoing some positive NPV projects rather than issue equity which is currently undervalued due to asymmetric information. Adverse selection can also lead to credit rationing (Stiglitz and Weiss, 1981). Uncollateralized credit could be denied to firms if adverse selection of loan applicants leads banks to choose an interest rate at which the market does not clear.

[6] Indeed, if none of the companies could raise any external capital, S would be a vertical line at the firms' cash flow. Their investments should exactly equal their cash flows, and the coefficient on cash flow in an investment equation would equal 1.0.

[7] Managerialist theories of the firm (Baumol, 1959; Williamson, 1963; Marris, 1963, 1964; Grabowski and Mueller, 1972) and the principal agent literature (Jensen and Meckling, 1976; Jensen, 1986) question the profit maximization assumption. For a recent survey of the influence of asymmetric information and agency on the efficiency of corporate investment, see Stein (2001).

[8] This managerial budget constraint assumes for simplicity that internal cash flow is the only source of funds, i.e. that new debt and new equity issues are zero.

[9] The CCH and the MDH are also in line with a "life-cycle" model of the firm (Mueller (1972) and Grabowski and Mueller, 1975) according to which young, fast growing firms use internal finance to mitigate transaction costs of external finance, and large, mature firms use internal finance to maximize growth at the expense of shareholder wealth. See also Kathuria and Mueller (1995) and Carpenter (1995).

[10] Institutional investors, such as pension funds, are unimportant in Austria. It is possible to form pension funds only since 1990 (see Jud, 1993). Very similar ownership patterns are observed especially in Germany (see Boehmer, 1998) but also many other countries worldwide (see LaPorta et al., 1997, 1999, and Barca and Becht, 2001).

[11] LaPorta et al. (1999) report that the state on average controls 20 % of the twenty largest corporations in 27 countries in 1995. Italy 40%, Germany 25%, France 15%, Japan 5%, US 0%, UK 0%.

[12] In Austria historically, banks converted debt to equity and took over control in state-influenced companies in case of financial distress (Mathis, 1990).

[13] Gugler (2001) shows that Austria has the smallest stock exchange as measured by the market capitalization to GDP ratio in a sample of OECD countries.

[14] Family owned/managed firms may, however, suffer from a lack of professionalism (see Chandler (1990) particularly for the UK).

[15] Unfortunately, we lack the data about these ultimate owners.

[16] For more details please see the working paper version of this article available from http://mailbox.univie.ac.at/klaus.gugler/public.htm.

[17] According to §§224 and 225 HGB (*Handelsgesetzbuch*) and §224 RLG (*Rechnungslegungsgesetz*), i.e. the two main laws governing annual financial statements in Austria, companies are obliged to provide this information. Corporations in the same group are defined as either connected corporations (e.g. subsidiaries) or corporations to which a substantial equity participation exists.

[18] We also ran all regressions estimating the capital stock by the book value of tangible fixed capital assets. The results are virtually identical to the one obtained using the perpetual inventory method, since the correlation coefficient between the two measures of the capital stock is 0.98. We also tried longer lags J, however they were never significant.

[19] E.g. Bean (1981), Bond et al. (1999), but see Anderson (1981). For a comparison of different investment models, see Mairesse et al. (1999).

[20] See also the discussion in Fazzari et al. (2000) and Kaplan and Zingales (2000).

[21] Tests for fixed effects are highly significant. A Hausman test indicates that a random effects model would be inappropriate. Our basic results are not changed if we introduce 2-digit ISIC industry dummies instead of fixed firm effects. These results are available upon request.

[22] The findings for bank control are consistent with the international evidence. 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. Prowse's findings (1990, 1992, 1994) indicate that agency costs are reduced in these "keiretsu" firms. Elston's (1993) German bank influenced firms are less liquidity-constrained than independent firms. For an interesting treatment of investment bankers' influence on firm performance in the US in the pre-WWI period, see De Long (1990).

[23] Estimated differences in the cash flow coefficients and F-test statistics in this row are from the pooled regression with interaction terms for all explanatory variables with all control categories. Additionally, by constraining the profits and depreciation coefficient to be equal for each control category, we can measure the influence of cash flow as a single explanatory variable (and the difference from bank-controlled firms).

[24] A Hausman (1978) test compares two estimates of the coefficient vector, one making use of all the assumptions, the other using more limited information. If the model is correctly specified, the difference between the two estimated coefficient vectors should not be significantly different from zero. In the present case, the more efficient estimator is the OLS estimator with the assumption of no contemporaneous correlation of the regressors and the errors, the other estimator is the 2SLS estimator with instruments as described in the main text.

[25] If more than one variable is measured with error, there is very little that can be said about the direction of the biases (see Greene, 1997, p. 440).

[26] For a critique of taking dividends as a discriminatory device – predominantly centering around its endogenous nature - see the Comments and Discussion section of FHP (1988). Here, we only use dividends as an additional splitting device and compare estimates across control categories. Again, estimated differences across control categories should be affected less by endogeneity bias.

[27] See Gugler, Mueller and Yurtoglu (1999) using this procedure.

[28] We do not apply covariance measures of risk since these are only appropriate in a world in which capital owners hold diversified portfolios of assets. The variance in the returns on a single asset is the appropriate measure of risk when only this asset is held (see Mueller, 1986). Given the enormous ownership concentration in Austria, the appropriate measure of risk in the present setting is a variance measure.

[29] The results using equation (8) and *GMM* are consistent and available upon request.