Corporate Governance and the Determinants of Investment

by

KLAUS GUGLER, DENNIS C. MUELLER, AND B. BURCIN YURTOGLU*

We use investment–cash flow regressions to show that both asymmetric-information and agency problems are more severe in Continental Europe than in the Anglo-Saxon countries leading to too little investment by firms with attractive investment opportunities and too much by those with poor investment opportunities. Legal systems, accounting standards, and ownership structure systematically affect the investment–cash flow sensitivity. Cash flow coefficients are largest for family-controlled firms in Europe. (JEL: G 31, G 32, O 16)

1 Introduction

A huge literature on the determinants of investment exists. Much of it is "institution free" in that firms are placed in a neoclassical world where only the heights of investment opportunities and costs of capital determine the levels of their investment. When institutions are introduced, they have (often implicitly) what are generally regarded as the characteristics of Anglo-Saxon countries. Firms are joint-stock companies with widely dispersed shareholdings. Managers are isolated both from the owners of the firm, and from its sources of external capital. These institutional features of Anglo-Saxon countries have been shown to have important theoretical and empirical consequences for the determinants of investment.

In this article we extend the institutional horizon by examining an alternative institutional structure – namely that found in Continental Europe. Here shareholdings are generally much more concentrated than in Anglo-Saxon countries, and banks often play a more important role in supplying capital to companies and monitoring their managers. These institutional differences produce different predictions about the determinants of investment, and present evidence that some of these differences exist. We note, however, that we concentrate upon only a few differences in corporate governance institutions that are likely to be particularly relevant for investment decisions, and not on all of the institutional differences that fall under the heading of "corporate governance."

* The research in this article was supported by the Austrian National Bank's Jubiläumsfonds, Project 11782.

Journal of Institutional and Theoretical Economics
JITE 163 (2007), 598–626 © 2007 Mohr Siebeck – ISSN 0932-4569

Beginning with MEYER AND KUH [1957] numerous studies have found cash flows to have a positive coefficient in investment equations, even though no such relationship is predicted by the neoclassical theory of investment. MYERS AND MAJLUF [1984] offered a theoretical explanation for this finding that builds on an institutional feature of Anglo-Saxon systems. The distance between firms and equity market creates an *asymmetric-information problem* that may lead managers to pass up attractive investment opportunities *unless* they have sufficient cash flows to finance them. FAZZARI, HUBBARD, AND PETERSEN [1988] provided the first empirical test of the *asymmetric-information* theory (hereafter the AIT), and precipitated a large literature some of which is supportive of the AIT,[1] some of which is not.[2]

One difficulty with the AIT is that the empirical literature that motivated it typically estimated cash flow/investment equations with samples of very large, mature corporations – not the kinds of companies for which asymmetric information problems are likely to exist. Asymmetric information problems seem most likely for young, small firms and many of the empirical tests of the AIT have used samples of these types of firms. If we assume that this literature does explain the investment/cash flows relationship for these sorts of companies, we still need to explain why the investment of large, mature companies, which do not appear to be cash constrained, is nevertheless positively associated with their cash flows.

GRABOWSKI AND MUELLER [1972] offered an explanation that also builds on an institutional feature of Anglo-Saxon countries – the *separation of ownership and control*, which gives rise to a *principal–agent problem* between a firm's managers and its shareholders. The separation of ownership and control provides managers with the discretion to pursue their own goals, even when they conflict with those of the shareholders. Among these goals is the growth of the firm. Since managers have more discretion in their use of the firm's internal cash flows to pursue this goal than they do over external capital, this *managerial-discretion* theory (hereafter the MDT) also predicts a positive relationship between cash flows and investment for the types of firms subject to agency problems.

We test these two theories using a procedure to identify companies that are likely to have asymmetric information or agency problems, which we believe is superior to those used in much of the literature.[3] We do not run tests of the standard neoclassical theory of investment, the q-theory or any recently proposed theories that try to account for a positive relationship between investment and cash flows, while maintaining the main assumptions of neoclassical theory (managers maxi-

[1] See FAZZARI, HUBBARD, AND PETERSEN [1988], HOSHI, KASHYAP, AND SCHARFSTEIN [1991], OLINER AND RUDEBUSCH [1992], CARPENTER [1995], CARPENTER, FAZZARI, AND PETERSEN [1994], [1998], and AUDRETSCH AND ELSTON [2002]. For a critique, see KAPLAN AND ZINGALES. [1997], [2000]

[2] See KAPLAN AND ZINGALES [1997], [2000], GOMES [2001], ALTI [2003], MOYEN [2004], and ALMEIDA, CAMPELLO, AND WEISBACH [2004].

[3] GUGLER, MUELLER, AND YURTOGLU [2004a] tested these theories with US data.

mize shareholder wealth, capital market efficiency, *etc.*).[4] Some of these theories are formulated quite differently than the ones we test, and it would take us too far a field to reformulate and test them all. Being neoclassical theories, they are largely institution free, and thus there is no reason to expect different results in one country than in another. Since much of the focus of this article is precisely on such differences, our findings to some extent contradict the predictions of these various neoclassical theories.

Two recent studies have also tested for differences across countries in cash flow/investment relationships. Our results are consistent with those of LOVE [2003], but differ from those of BOND *et al.* [2003]. We comment on these similarities and differences when we discuss our results.

In the next section we discuss the two theories of investment, and models to test each. The modifications to the AIT and MDT needed in countries with concentrated ownership structures are discussed in section 2. The data used to test these predictions and empirical findings are presented in section 3. The last section draws the implications of our results.

2 *Modeling the Determinants of Investment in an Anglo-Saxon World*

2.1 *The Asymmetric Information Theory of Investment*

The AIT rests on several, rather extreme assumptions.[5] (1) A firm has insufficient cash flows to finance an attractive investment (one with a return greater than its cost of capital), and cannot finance this investment by either issuing debt (it is debt constrained), or cutting dividends (they already are zero). (2) The managers are aware of both the returns on this attractive investment, *and* that the firm's existing assets are worth more than the market perceives. (3) Because of the latter, the firm's shares are currently underpriced. If it issued shares to finance the investment, its current shareholders would be harmed because the market undervalues its shares. (4) The managers maximize the wealth of only the current shareholders, and ignore those who would become shareholders if they issued equity to finance the investment, and who would benefit greatly from such an action. Under these assumptions a firm may fail to undertake an investment with an expected return greater than its cost of capital. Given sufficient cash flows it can invest without issuing equity. This benefits its existing shareholders who would be harmed by the sale of its undervalued shares. Hence arises the relationship between cash flows and investment. In a sample of firms with attractive investment opportunities, if the capital market is unaware of these investment opportunities, only the firms with ample cash flows undertake the investments.

[4] See ERICKSON AND WHITED [2000], COOPER AND EJARQUE [2003], GOMES [2001], and ALTI [2003].

[5] We list only the most important ones, for the full list and discussion see MYERS AND MAJLUF [1984].

To test the AIT most studies have included both cash flows and q in the equation:

$$I_t = a + bq_{a\,t-1} + cCF_{t-1} + \mu_t \,. \tag{1}$$

Both right-hand-side variables are lagged to avoid endogeneity problems.

The logic for including q_{at-1} in (1) is similar to that underlying the q-theory – q captures investment opportunity differences across firms. The use of Tobin's q for this purpose is, however, a bit problematic. Tobin's q is the ratio of a firm's market value to its assets. This also equals the ratio of its return on these assets, r_a, to its cost of capital.[6] Since total assets are involved in the measurement of Tobin's q, r_a is the *average* return over *all* of the firm's capital, Tobin's q is a measure of average performance (hence the subscript a in (1)). A profit-maximizing firm invests to the point where the *marginal* return on investment equals the cost of capital, and thus an estimate of marginal q is needed to predict investment. Under certain, rather restrictive assumptions, average q is equal to marginal q, and thus to the return on *investment* relative to the cost of capital (see HAYASHI [1982]). The literature testing the q-theory assumes that these conditions hold, and regresses investment on lagged q_a. Our work improves upon the existing literature in part by employing an estimate of *marginal q* that does not require the strong assumptions needed to make average q equal marginal q.[7]

All firms in an economy do not suffer from asymmetric-information problems, of course. Thus, an important aspect of testing the AIT is to identify which firms are *likely* to be subject to this problem. Here one confronts a logical difficulty. If a researcher can identify firms having AI problems, then presumably the market can too and they disappear. The existing literature essentially ignores this conundrum, and tries to identify the firms subject to AI problems using the assumptions underlying the AIT. Thus, samples of companies have been divided according to size, age and level of dividends under the assumption that small (young, low dividend) firms are more likely to fit the AIT.[8] One of the contributions that we make to this literature is to offer a better criterion for identifying potential AI firms.

2.2 The Managerial Discretion Theory of Investment

The MDT drops an assumption common to all neoclassical theories and the AIT – that managers maximize their shareholders' wealth. Managers have their own goals, as for example increasing or maintaining the firm's growth, and pursue these even

[6] Let the firm have a capital stock of K, which earns a permanent return on these assets of r_a. Thus, the profits of the firm are $\pi = r_a K$. With a discount rate of i the market value of the firm becomes $M = \pi/i$. By definition, $q = M/K$, and by substitution $q = [\pi/i]/K = [r_a K/i]/K = r_a/i$.

[7] ERICKSON AND WHITED [2000] show that the weakness of measures of average q in investment equations may be due to measurement errors in using it to proxy marginal q. They do not estimate marginal q as we do, however.

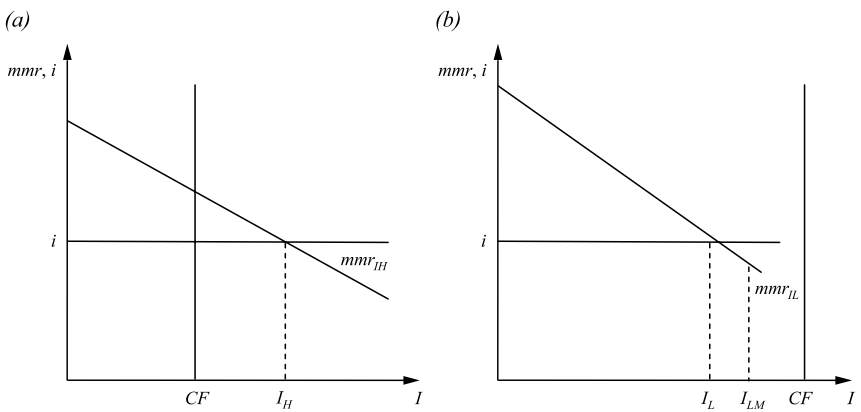
[8] See FAZZARI, HUBBARD, AND PETERSEN [1988], HOSHI, KASHYAP, AND SCHARFSTEIN [1991], and AUDRETSCH AND ELSTON [2002]. SCHIANTARELLI [1996] and HUBBARD [1998] offer a survey of this empirical literature.

when they harm the shareholders. The discretion managers have to allocate internal cash flows leads them to favor this source of finance over say bank borrowing or the issuance of debt and equity. Thus, variants on equation (1) could and have been used to test the MDT with q_{at-1} again capturing the investment opportunities of the firm, CF_{t-1} the cost (availability) of finance.[9]

2.3 Discriminating between the AIT and MDT in an Anglo-Saxon World

Although both the AIT and MDT predict a positive relationship between cash flows and investment, in all other respects they make totally opposite predictions. Indeed, each theory is essentially a mirror image of the other. To see this, consider first Figure 1(a). The cost of capital, i, and marginal returns on investment, mrr_{IH}, are depicted for a firm with high investment opportunities relative to cash flows, CF. The optimal investment, I_H, exceeds the firm's cash flow, and to invest I_H it has to raise capital externally. If it faces an AI problem, it may not be able to do so and still maximize the existing shareholders' wealth. If the firm then invests only the amount CF, its marginal return on investment *exceeds* its cost of capital.

Figure 1
Investments with High (a) and Low (b) Investment Opportunities



Now consider Figure 1(b). This firm has much lower investment opportunities relative to cash flows. The investment that maximizes its shareholders' wealth, I_L, falls short of cash flows, and it maximizes shareholders' wealth by investing I_L and paying $CF - I_L$ in dividends. If, however, its managers pursue their own goals,

[9] A popular alternative to q as a proxy for investment opportunities has been changes in sales. See GRABOWSKI AND MUELLER [1972], VOGT [1994], KATHURIA AND MUELLER [1995], LAMONT [1997].

and these include more rapid growth than implied by I_L, then they will invest more than this level. As they do so their share price falls, and the threat of takeover and replacement increases. Thus, growth-maximizing managers can be expected to choose investment levels that equate the marginal gains from increased investment and growth to their marginal cost from an increase in the threat of takeover.[10] This is likely to be an investment like I_{LM}, which exceeds the shareholders' optimal, I_L, but falls short of the firm's entire cash flows. That is to say, a growth-maximizing firm is likely to want to pay *some* dividends to keep its share price from falling so low that it is taken over.[11]

Both theories predict an increase in investment with an increase in cash flows, and thus a positive relationship between cash flows and investment. The increase in investment for the firm in Figure 1(a) occurs, because its cash constraint is eased and it can move closer to or reach its optimal investment, I_H. The increase occurs for the firm in Figure 1(b), because a shift in CF to the right allows it to increase investment *and* dividends, thus allowing it to pursue more growth without a greater risk of takeover. Under the AIT marginal returns on investment *exceed* the cost of capital, and dividends should be zero. Under the AIT managers would wish, if they could, to share the information that they have with the external capital market. Under the MDT marginal returns on investment are *lower* than the cost of capital, and dividends are positive. Moreover, growth-maximizing managers will, if anything, wish to *conceal* information about their returns on investment from their shareholders.

As noted above, a *necessary* condition for an AI problem to arise is for the external capital market to *underestimate* not only the returns on a firm's investment, but also the returns on its existing capital stock. The AI problem prevents a firm from undertaking profitable investments, because its share price is low, and the managers do not wish to issue shares at this price. The higher q_a is, the less likely it is that the shares are underpriced and the firm must rely on cash to finance investment. Thus, the sensitivity of investment to cash flows should decrease with q_a. We test this prediction by including q_a in eq. (1) and adding an interaction term between q_a and CF. Thus, although q_a appears in our model testing the AIT, as in others, its rationale is quite different. It is not assumed to measure the height of a firm's investment opportunities, but rather (inversely) the severity of its AI problem.

To measure investment opportunities we use an estimate of the theoretically more appropriate marginal q, $q_{mt} = r_t/i_t$, where r_t is the return on investment in t, and i_t is the cost of capital. (The methodology for calculating q_{mt} was introduced by MUELLER AND REARDON [1993], and is described in the appendix.) Adding these variables to (1) and again lagging all right-hand-side variables to avoid endogeneity,

[10] Both these marginal gains and marginal costs can be expressed as marginal utilities of the managers. For a rigorous derivation, see KATHURIA AND MUELLER [1995] and GUGLER, MUELLER, AND YURTOGLU [2006].

[11] Indeed, if the firm never paid a dividend, the value of its shares as a flow of income would be zero, and a hostile takeover would be almost ensured.

gives the following equation to test the AIT:

$$I_t = a + bq_{a\,t-1} + cCF_{t-1} + dq_{mt-1} + eq_{a\,t-1}CF_{t-1} + \mu_t \,. \tag{2}$$

Following the arguments given above we expect $b > 0, c > 0, d > 0, e < 0$.

The same equation is used to test the MDT, but the logic underlying some variables and one key prediction are different. The constraint on managers under the MDT is the threat of takeover should the firm's share price fall too low. This threat should be smaller, the higher q_a is. Thus, average q should have a positive coefficient as under the AIT, but for a quite different reason. It is somewhat unusual for a variable to play one role in one model, and a completely different role in a second model. Average q plays these different roles in the AIT and MDT, because, as noted before, the two models have completely different underpinning logics. Under the AIT managers maximize shareholders' wealth and a low share price constrains them from issuing equity to finance profitable investments. Under the MDT managers maximize their own utilities, and a low share price, and the threat of takeover that accompanies it, constrain them from using their cash flows to finance unprofitable investments. These differences between the two theories lead to different predictions for the coefficient on the interaction term between cash flows and q_a. Under the MDT it should be *positive.* A high q_a implies a lower probability of takeover, more discretion for managers to pursue their own goals, and thus a *greate*r use of cash flows in this pursuit.[12]

Marginal q again measures the attractiveness of investment opportunities, and again carries a predicted positive sign, as does cash flow, although as explained above, the rationale for including cash flow in the equation is quite different from that of the AIT.

To test the AIT and MDT separately, we need to identify companies likely to fit each theory. Previous tests of the AIT have focused on firms that are small or young, or do not pay dividends, firms which *a priori* seem likely to face AI problems. We take a different approach. Any firm which underinvests should have a return on investment *above* its cost of capital, while any firm which overinvests should have a return on investment *below* its cost of capital. This difference is used to select the samples for testing the two theories. Weighted averages of annual marginal qs using annual investments as weights, which we call $\overline{q_m}$, are calculated for each firm (see Appendix). All firms with $\overline{q_m}$ equal to or greater than 1.0 are used to test the AIT. Firms with $\overline{q_m}$ less than 1.0 are used to test the MDT. Of course, all firms with a $\overline{q_m} \geq 1$ do not necessarily suffer from AI problems, just as all firms with $\overline{q_m} < 1$ do not necessarily conform to the MDT. Some firms may land in each group because their managers mistakenly under- or overinvested. If the theories deserve to be taken seriously, however, the behavior of a substantial fraction of companies

[12] This argument assumes that the takeover market disciplines managers. For a discussion and evidence that this has been the case in the United States, see HOLMSTROM AND KAPLAN [2001].

falling into each sample should conform to their respective predictions. In testing them, we assume that this is the case.[13]

3 Modifications of the Model Due to Differences in Corporate Governance

3.1 The Effects of Ownership Concentration

The stereotype company in an Anglo-Saxon country has managers owning very small fractions of its shares, and with no outsider owning a large enough block to exercise effective control over the managers, while in the Continental European stereotype large blockholders exist either inside or outside the firm. Like most stereotypes each has an important element of truth to it, but is not totally accurate. Table 1 presents the mean (col. 3) and median (col. 5) shareholdings of the largest shareholder in each country for firms in our sample for which these data are available (number of firms in col. 2). The averages for each group support the stereotypes. The median largest shareholding for the Anglo-Saxon countries is 24 percent, while for the Continental European countries it is nearly double, 42 percent. A closer look at the figures, however, reveals that not all countries correspond to the stereotypes, or perhaps better, some conform more closely than others. The median largest shareholding in South Africa, for example, is 50 percent, and in New Zealand over 40 percent. Median largest shareholdings in Denmark, Finland, the Netherlands and Sweden, on the other hand, are all around 20 percent. Some of the figures are based on quite small samples, but figures for larger samples of companies listed on the stock exchanges in each country are similar (GUGLER, MUELLER, AND YURTOGLU [2004b, Table 2]). (Note that the samples we use in all regressions that do not require ownership information contain many more firms than the numbers in Table 1, see Table 2). Thus, although the overall picture of ownership concentration painted in Table 1 fits the stereotypes for Anglo-Saxon and Continental European countries, there is some degree of heterogeneity within the two groups.

SHLEIFER *et al.* [1997] argue that differences in ownership concentration between Continental European and Anglo-Saxon countries are due to differences in legal institutions. Anglo-Saxon legal systems protect shareholders with small stakes from exploitation by managers better than civil law systems in Continental Europe do. Weaker protection shifts both the demand and supply schedules for new equity issues to the left resulting in thinner equity markets and more concentrated ownership structures in civil law countries. Column 6 of Table 3 reproduces figures from SHLEIFER *et al.* [1997] showing that external capital markets are indeed thinner in Continental than in Anglo-Saxon countries.[14] ROE [2003] explains the differences

[13] DEGRYSE AND DE JONG [2006] use average q to separate Dutch companies into samples for testing the AIT and MDT. Since the two theories give different predictions for returns on investment and not total assets, we think that marginal q is a better discriminator between firms fitting the two hypotheses.

[14] For theoretical arguments and evidence linking shareholder protection to equity market size, see MODIGLIANI AND PEROTTI [1997].

Table 1
Ownership Concentration and Identities (cut off: 20%)

Country	No. firms	Mean largest holder	St. Dev. largest holder	Median largest holder	External capital/ GDP	Family holdings	Financial holdings	Non-financial holdings	State holdings	Dispersed holdings
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Australia	61	20.14	16.23	13.48	0.49	0.066	0.115	0.131	0.000	0.689
Canada	207	40.85	26.34	35.75	0.39	0.206	0.081	0.407	0.005	0.301
Great Britain	439	16.23	13.85	11.99	1.00	0.086	0.082	0.109	0.000	0.723
Ireland	19	18.07	14.06	13.20	0.27	0.250	0.000	0.100	0.000	0.650
New Zealand	4	42.19	8.91	42.78	0.28	0.000	0.250	0.750	0.000	0.000
South Africa	8	50.04	11.45	51.86	1.45	0.125	0.125	0.750	0.000	0.000
Anglo Saxon	*738*	*24.01*	*21.51*	*15.04*	*0.65*	*0.123*	*0.084*	*0.205*	*0.001*	*0.588*
Austria	24	58.87	21.24	55.10	0.06	0.083	0.125	0.583	0.167	0.042
Belgium	26	43.34	18.98	43.35	0.17	0.077	0.308	0.577	0.000	0.038
Switzerland	43	45.55	27.66	47.80	0.62	0.302	0.070	0.395	0.047	0.186
Germany	180	51.97	23.26	50.98	0.13	0.256	0.250	0.422	0.039	0.033
Denmark	26	20.60	18.15	13.00	0.21	0.154	0.000	0.231	0.000	0.615
Spain	42	40.66	28.70	33.37	0.17	0.024	0.095	0.548	0.048	0.286
Finland	20	21.10	14.29	15.64	0.25	0.048	0.048	0.190	0.190	0.524
France	102	46.69	24.87	49.14	0.23	0.176	0.108	0.559	0.010	0.147
Italy	24	42.45	18.22	44.29	0.08	0.042	0.375	0.500	0.000	0.083
Luxem-bourg	2	36.90	10.19	36.90	–	0.000	0.000	0.500	0.500	0.000
Netherlands	52	20.66	19.41	11.31	0.52	0.019	0.058	0.231	0.019	0.673
Norway	27	30.88	18.93	26.11	0.22	0.071	0.143	0.357	0.036	0.393
Portugal	3	49.85	2.68	50.71	0.08	0.000	0.250	0.500	0.000	0.250
Sweden	23	23.72	17.45	16.60	0.51	0.000	0.261	0.217	0.000	0.522
Continental Europe	*594*	*42.05*	*25.41*	*40.74*	*0.25*	*0.152*	*0.164*	*0.425*	*0.039*	*0.219*
All	*1,332*	*32.05*	*19.65*	*28.55*	*0.375*	*0.135*	*0.119*	*0.303*	*0.017*	*0.423*

Source: The sample of firms consists of *Global Vantage*, which are listed on a stock exchange. The sources of ownership data include *Amadeus* for European countries, various issues of *Wer gehört zu wem?* for Germany, various issues of *PricewaterhouseCoopers Corporate Register* for the UK, various issues of *Survey of Industrials and Survey of Mines and Energy Resources* for Canada. We use several other country level publications for the remaining countries and check their consistency with ownership data from *Worldscope*. The details are available from the authors upon request.

in ownership concentration between the United States and Continental Europe by differences in their political ideologies.

These differences affect the predictions of both the AIT and MDT. One way legal systems can protect shareholders is by forcing managers to reveal more information about themselves and their firm, as for example, their shareholdings and transactions, their compensation, research and development outlays, and the like. This information makes it easier for the capital market to evaluate the performance of companies and their investment opportunities, thus mitigating asymmetric-information problems.

HYPOTHESIS 1 *Among the firms most likely to be subject to asymmetric-information problems, the relationship between investment and cash flows is stronger in Continental Europe than in Anglo-Saxon countries.*

Table 2
Summary Statistics and Correlation Matrix for Anglo-Saxon and Continental European Countries

Panel A: Summary Statistics for Anglo-Saxon Sample

	All			$\overline{q_m} \geq 1$			$\overline{q_m} < 1$		
Variables	Mean	S.d.	Med	Mean	S.d.	Med	Mean	S.d.	Med
Total assets (mn. $)	1563.4	5192.1	286.9	2328.9	9157.9	526.3	1401.6	3845.3	259.8
K_{t-1}	827.45	2712.7	113.4	1153.3	4510.3	207.3	761.1	2165.7	101.8
I_t/K_{t-1}	0.228	0.210	0.173	0.247	0.233	0.182	0.224	0.205	0.172
CF_t/K_t	0.260	0.544	0.214	0.296	0.632	0.231	0.252	0.524	0.212
q_{at-1}	1.219	0.786	0.997	1.484	0.925	1.215	1.164	0.741	0.959
q_{mt-1}	0.854	4.866	0.771	1.620	5.189	1.277	0.692	4.782	0.687
Number of Firms		1,166			206			960	
Number of Obs.		12,822			2,243			10,579	

Panel B: Summary Statistics for Continental European Sample

	All			$\overline{q_m} \geq 1$			$\overline{q_m} < 1$		
Variables	Mean	S.d.	Med	Mean	S.d.	Med	Mean	S.d.	Med
Total assets (mn. $)	3459.9	9512.1	695.7	5703.2	8759.7	2399.6	3288.7	9546.0	644.2
K_{t-1}	1229.6	3613.1	207.1	2285.4	4385.8	792.8	1152.6	3538.1	188.6
I_t/K_{t-1}	0.245	0.199	0.200	0.242	0.171	0.205	0.245	0.201	0.199
CF_t/K_t	0.345	0.406	0.283	0.363	0.487	0.274	0.344	0.400	0.283
q_{at-1}	0.949	0.631	0.782	1.297	0.894	1.042	0.923	0.598	0.768
q_{mt-1}	0.778	3.630	0.638	1.674	4.169	1.224	0.709	3.575	0.599
Number of Firms		679			47			632	
Number of Obs.		7,655			546			7,109	

Panel C: Matrix of Correlation Coefficients: All Firms

	TA	K_{t-1}	I_t/K_{t-1}	CF_t/K_t	q_{at-1}	q_{mt-1}
Total assets (mn. $)	1.000					
K_{t-1}	0.870	1.000				
I_t/K_{t-1}	−0.037	−0.058	1.000			
CF_t/K_t	−0.009	−0.051	0.244	1.000		
q_{at-1}	−0.031	−0.055	0.301	0.180	1.000	
q_{mt-1}	0.010	0.004	0.074	0.030	0.187	1.000

Note: Panels A–C report summary statistics and the correlation coefficients of the variables used in our regression analysis. K is the capital stock measured by net fixed assets. I is capital expenditures (investments in new (tangible) assets). CF is the sum of after tax profits and depreciation minus total dividends. We adjust cash flow by adding the portion of R&D that is expensed for tax purposes. q_a is Tobin's (average) q and is the ratio of the market value of the firm to the replacement cost of its assets (see the appendix, section A.3). q_m is the marginal q (its derivation is detailed in the appendix, section A.1, eq. (5)).

An additional important difference between Continental European and Anglo-Saxon countries besides concentrated ownership is the greater importance of bank financing in Continental Europe. This could lead Continental European companies to require less cash to finance attractive investments and thus call Hypothesis 1 into question. STIGLITZ AND WEISS [1981] present a model, however, in which asymmetric information between banks and firms leads to credit rationing and thus again makes investment sensitive to cash flows. Thus, we assume that Hypothesis 1 holds even where firms make heavy use of bank financing.

The MDT as formulated above must be reinterpreted and modified to take into account the institutional environment in Continental Europe. First of all, the conflict over investment arises not between managers owning small fractions of their company's shares and a large group of dispersed shareholders, but between a large controlling shareholder and the minority shareholders. As with managers in Anglo-Saxon countries, the large, dominant shareholder in Continental Europe can have incentives to pay out too little in dividends, and to invest a larger than optimal fraction of cash flows. This might occur because dividends are paid *pro rata*, implying that a large shareholder gets proportionally only the same amount as minority holders. Thus, one euro retained and invested could generate more pecuniary gains and utility to the large shareholder than if it is paid out.[15] A second reason that might occur is that many large shareholders are the founders of the firms or second or third generation offspring.[16] Their utility function may be dictated not solely by shareholder wealth maximization, but also by the goal of preserving the corporate empire that they control.

In Anglo-Saxon countries the constraint on managers pursuing growth is the threat of displacement through a proxy contest or a hostile takeover should their company's share price fall too low. In Continental Europe, where shareholdings are highly concentrated, such proxy contests and hostile takeovers are rare, and managers have little to fear. Thus, managers and/or manager owners in civil-law-system countries should have more discretion to use company cash flows to pursue their own goals.

As mentioned above, bank financing is more important in Continental Europe than in the Anglo-Saxon countries. This difference provides an additional reason to expect investment to be more sensitive to cash flow levels for MDT companies in Continental Europe. Banks might simply refuse to lend money to firms with poor investment projects making them more dependent on their internal cash flows to finance these projects.

HYPOTHESIS 2 *Among the firms most likely to fit the MDT, the relationship between investment and cash flows is stronger in Continental Europe than in Anglo-Saxon countries.*

[15] See GUGLER AND YURTOGLU [2003] for evidence that more concentrated ownership firms pay out less in dividends than less concentrated firms.

[16] Examples include the Siemens family and the Quandt family (BMW) in Germany or the Wallenberg family in Sweden.

Hypothesis 2 rests on the assumptions that some Continental European firms are managed by empire-builders and that concentrated ownership gives them more discretion to pursue their own goals than in Anglo-Saxon countries. An alternative hypothesis would be that concentrated ownership solves the agency problem between managers and owners, thus *reducing* managerial discretion. If this were the case, marginal and average *qs* should be *higher* in Continental Europe than in the Anglo-Saxon countries, which is not the case.[17]

The rationale for q_a in the test of the MDT is that the takeover threat falls as q_a rises. This rationale also underlies the prediction of a positive coefficient on the q_a–CF interaction term. This logic collapses, however, where ownership is highly concentrated and hostile takeovers are rare. One might still justify leaving q_a in the equation, however, under the logic of the AIT. The higher a firm's share price is, the cheaper it is to raise capital by issuing shares, even in countries with thin equity markets, and the less need there is to use own cash flows. Thus, q_a might still be expected to have a positive coefficient in Continental European countries, while the q_a–CF interaction term could even become negative. We are thus lead to

HYPOTHESIS 3 *Among the firms most likely to fit the MDT in Continental European countries, the relationship between q_a and investment is expected to be positive, while the coefficient on the q_a–CF interaction term might be either zero or negative.*

3.2 The Effects of Owner Identities

A second dimension of corporate governance that might affect investment is the identity of the dominant shareowner. We identify five ownership categories: (1) family controlled, (2) finance controlled, (3) firm controlled, (4) state controlled, and (5) widely dispersed. When the largest shareholder holds 20 percent or more of outstanding shares a firm is categorized as controlled by this shareholder.[18] Firms controlled by a bank or insurance company are considered finance controlled. When a firm other than a bank or insurance company controls another firm, it is categorized as firm controlled. If no shareholder holds as much as 20 percent of outstanding shares, it falls into the widely dispersed category. Columns 7 through 11 in Table 1 give the percentages of each country's sample in the five categories.

A firm controlled by another firm, a financial institution or the state, can turn to them for funds, if it has attractive investment opportunities, which it cannot finance itself. Firms controlled by other firms are usually parts of corporate pyramids, which, because of their size, have good access to external capital markets. In addition, those in control of a pyramid may be able to shift funds across it to finance attractive

[17] See figures in Table 4 and GUGLER, MUELLER, AND YURTOGLU [2004c].

[18] All studies, which identify controlling shareholders, use either a 10 or 20 percent criterion. The results we obtain for the test of Hypothesis 4 are very similar for both cut-offs.

investment opportunities. Banks and other financial institutions have ample funds and companies controlled by these institutions should have little trouble in turning to them for funds for good investments. The same seems likely to be true for the state. Thus, we expect AI problems to be mitigated for firms that are controlled by financial institutions, other corporations or the state, and put forward

HYPOTHESIS 4 *Within the samples that fit the AIT* ($\overline{q_m} \geq 1$)*, firms controlled by another firm, a financial institution or the state exhibit a weaker relationship between investment and cash flows than do family-controlled or dispersed-ownership firms.*[19]

It is more difficult to formulate hypotheses about the relationship between ownership identity and the extent of agency problems. For example, since everyone prefers more money to less, other firms, financial institutions and the state might all want firms under their control to maximize profits and pay large dividends. On the other hand, controlling firms and financial institutions may both be subject to agency problems and be managed by empire-builders who get psychological or financial benefits from seeing their own firms and those that they control grow. The state too may be interested in achieving growth (avoiding decline) in firms it controls to save jobs and win votes.[20] We have previously found the effects of ownership identities on investment performance as measured by q_m to be modest (GUGLER, MUELLER, AND YURTOGLU [2004c]). Thus, we formulate no hypotheses with respect to the effects of ownership identities on the results for firms with $\overline{q_m} < 1$.

3.3 The Effects of Accounting Standards

The Enron and Parmalat scandals highlighted the importance of accounting conventions. Previous studies document significantly higher returns on investments out of cash flows and new equity in countries with strong accounting standards.[21] Strong accounting standards provide capital markets with more and higher quality information and should, therefore, mitigate both managerial-discretion and asymmetric-information problems.

HYPOTHESIS 5 *The relationship between investment and cash flows is stronger for all firms in countries with weak accounting standards than in countries with strong standards.*

[19] Evidence in support of this hypothesis for Japan was presented by HOSHI, KASHYAP, AND SCHARFSTEIN [1991].

[20] This is an important part of ROE's [2003] thesis.

[21] GUGLER, MUELLER, AND YURTOGLU [2003]. We use the CIFAR index to define strong and weak accounting standards [see Appendix]. RAJAN AND ZINGALES [1998] report a positive relationship between industry demand for external financing and accounting standards using the CIFAR index. CARLIN AND MAYER [2003] find R&D spending higher in industries with a high demand for equity financing in countries with better accounting standards.

4 Data and Results for Anglo-Saxon and Continental European Countries

4.1 Data

The data are for 1985 through 2002, and are from the 1996–2004 versions of *Global Vantage*. These contain balance sheet, income statement, and stock market information. We exclude banks and financial companies (SICs 6000 through 6999) and some service industries (SICs above 8100), because the nature of their capital and investment is not comparable to that of non-financial companies. The construction of all variables is detailed in the appendix.

Table 2 presents summary statistics and a correlation matrix for the main variables for the full sample of Anglo-Saxon and Continental European firms, and for sub-samples with $\overline{q_m} \geq 1$ and $\overline{q_m} < 1$. The Anglo-Saxon sample contains all of the major Anglo-Saxon countries except the United States. Were the United States included, it would swamp the other countries' samples, and so it is left out. Previously, we found support for both the AIT and MDT using US data (GUGLER, MUELLER, AND YURTOGLU [2004a]). Less than 10% of Continental European firms consistently earn their costs of capital and exhibit a $\overline{q_m} \geq 1$. Yearly average marginal *qs* for Continental Europe are similar to those of the Anglo-Saxon countries (0.78), however, the distribution of $q_{mt}s$ is skewed to the left with a median of only 0.64.

4.2 Results

Table 3 presents the results for the tests of the five hypotheses. Industry and time dummies were included in each equation, but are omitted from the table. Hypothesis 1 predicts for firms fitting the AIT that the coefficient on cash flows is greater for Continental European than for Anglo-Saxon countries, because of the greater amounts of information generally available about companies in countries with strong corporate governance systems. This hypothesis is strongly confirmed. The coefficient on cash flow by itself is roughly four times larger in the Continental European (col. 2) than in the Anglo-Saxon countries (col. 1), and the partial derivative of investment to cash flow presented at the bottom of the table is two and one half times larger in the Continental European countries. (Partial derivatives are calculated using the coefficient estimates from the table and evaluating the variable held constant at its sample mean.) The $<$ signs separating two sets of estimates indicate that the differences are significant at the 5 percent level. Some coefficients are insignificant, and the coefficient of q_m is of the wrong sign (although insignificant) for Continental Europe, but the coefficients involved in the test provide strong support for the hypothesis.

Hypothesis 2 makes the same prediction as Hypothesis 1, but for firms with $\overline{q_m}s < 1$. It too is strongly supported. Both the coefficient on cash flow by itself and the partial derivative of investment to cash flow are significantly larger for the Continental European (col. 4) than for Anglo-Saxon countries (col. 3). Interesting

also are the differences in the partial derivatives of investment to q_a. Investment is more than twice as sensitive to an increase in q_a in the Anglo-Saxon countries (col. 3) than in Continental Europe (col. 4), which is consistent with the threat of takeover – reduced for higher q_a*s* – being a more powerful constraint on managerial discretion in Anglo-Saxon countries.

Hypothesis 3 predicts a positive coefficient on q_a, and this prediction is confirmed. Also as predicted, the coefficient on the q_a–CF interaction term is not positive for Continental European countries (col. 5), being negative and significant.

Hypothesis 4 predicts a smaller coefficient on cash flows for firms fitting the AIT and controlled by another company, financial institution or the state, than for family-controlled or dispersed-ownership firms, because the former are able to borrow from the institution that controls them. This hypothesis is partially confirmed. The coefficient on cash flow and the partial derivative of investment to cash flow are both larger for family-controlled and dispersed-ownership firms (col. 7), but only the partial derivatives are significantly different.

Hypothesis 5 claims that strong accounting standards protect shareholders better and thus constrain managers' discretion more than weak standards. Larger coefficients on cash flows are thus predicted for countries with weak accounting standards and this prediction is confirmed. Both the coefficient on cash flow and the partial derivative of investment to cash flow are significantly larger for countries with weak accounting standards (col. 9).

Thus, all five hypotheses concerning the impact of corporative governance institutions on the determinants of investment have been largely confirmed. Our results, particularly with respect to the effects of accounting standards, are also quite consistent with those of LOVE [2003] who found that the coefficient on cash flow in an investment equation is smaller in countries with highly developed financial systems. On the other hand, we do not confirm the findings of BOND *et al.* [2003]. They found *greater* investment sensitivity to cash flows in the UK than in Belgium, Germany, and France, where we find just the reverse, for our samples of Anglo-Saxon and Continental European countries.

A look at some of the coefficients in Table 3 for variables that are not involved in the tests reveals some inconsistencies with previous findings for the United States (GUGLER, MUELLER, AND YURTOGLU [2004a]). Not all of these inconsistencies are detrimental to the AIT and MDT, however. For example, one should not be surprised to find an insignificant coefficient on q_m for samples for which agency problems are expected. Managers of these firms are assumed to be pursuing their own goals and overinvesting. That their investment levels would not be positively related to q_m is not surprising. A comparison of the coefficients on q_m in the equations used to test Hypotheses 2 and 5, reveals a positive and significant coefficient for both samples where corporate governance institutions are strong – Anglo-Saxon countries and countries with strong accounting standards – and negative coefficients (both insignificant at the 5% level) where corporate governance institutions are weak.

Table 3
Tests of Hypotheses Regarding Corporate Governance and Investment

	Hypothesis 1 $\overline{q_m} \geq 1$			Hypothesis 2 $\overline{q_m} < 1$			Hypothesis 3 $\overline{q_m} < 1$	Hypothesis 4 $\overline{q_m} \geq 1$ Ownership identity			Hypothesis 5 All firms Accounting standards		
Country/Ownership group	AS (1)		CE (2)	AS (3)		CE (4)	CE (5)	CFS (6)		FamDis (7)	Strong (8)		Weak (9)
CF	0.057	$<$	0.200	0.092	$<$	0.127	0.127	0.049	$\approx$	0.084	0.084	$<$	0.105
t-value	4.38		6.12	15.33		13.10	13.10	2.51		4.23	19.77		13.78
q_a	0.062	$\approx$	0.075	0.074	$>$	0.034	0.034	0.044	$\approx$	0.050	0.075	$>$	0.044
t-value	10.45		6.26	25.50		6.13	6.13	5.49		6.75	37.07		10.63
q_m	0.002	$>$	−0.001	0.001	$>$	−0.000	−0.000	0.001	$\approx$	0.001	0.001	$>$	−0.001
t-value	2.64		−0.33	2.83		−0.55	−0.55	0.92		1.21	3.92		−1.84
$q_a CF$	−0.002	$<$	−0.058	−0.020	$\approx$	−0.012	−0.012	−0.013	$\approx$	−0.011	−0.013	$\approx$	−0.018
t-value	−0.51		−4.67	−7.34		−2.06	−2.06	−1.81		−1.47	−6.77		−4.23
Observations	2,232		543	10,561		7,117	7,117	1,164		1,306	23,005		8,369
Adj. R^2	0.225		0.316	0.157		0.125	0.125	0.152		0.178	0.140		0.105
$\delta I/\delta CF$	0.054	$<$	0.126	0.069	$<$	0.116	0.116	0.039	$<$	0.071	0.068	$<$	0.088
t-value	6.45		6.33	17.16		17.95	17.95	4.11		7.15	24.91		17.38
$\delta I/\delta q_a$	0.061	$\approx$	0.054	0.069	$>$	0.030	0.030	0.040	$\approx$	0.046	0.072	$>$	0.039
t-value	10.62		5.57	25.07		6.66	6.66	5.37		6.89	37.10		10.96

Note: The table presents the estimated coefficients of eq. (2) to test the Hypotheses 1–5 stated in the main text. AS refers to the set of Anglo-Saxon countries (excluding the USA), and CE to the Continental European countries. We also look at two types of firms concerning their ownership structure. The companies in the first group are controlled by an industrial or financial company, or the state (CFS), while the companies in the second group are controlled by a family or have dispersed-shareholding structures (FamDis). All equations are estimated with OLS and contain two-digit industry and annual time dummies. The t-statistics (below the coefficients) are computed using heteroskedasticity consistent standard errors. $\delta I/\delta CF$ and $\delta I/\delta q_a$ are the first derivatives with the interaction term $q_a CF$ evaluated at the mean value of the respectively other variable. $>$ or $<$ implies a significant difference in coefficients at the 5 percent level; $\approx$ implies an insignificant difference.

Finally, it is worth pointing out that the differences in coefficients are economically as well as statistically significant. From Table 2 we can calculate that the average firm in Continental Europe in the $\overline{q_m} < 1$ sample has a bit more than $200 million in cash flows more than the average Anglo-Saxon firm each year. The coefficients in Table 3 imply that this leads to about $10 million of additional investment each year by companies that overinvest. For the entire sample period this adds up to nearly $70 billion of overinvestment in Continental Europe, because of the greater discretion managers have over their cash flows.

5 Further Tests

The results in section 4 provide fairly strong support for both the AIT and MDT, and for the importance of corporate governance institutions in influencing investment decisions. In this section we test four variants of the hypotheses put forward in section 3 for subsamples of our original samples. These tests thus involve far fewer observations than for the previous tests, but we nevertheless feel that these additional results further strengthen the conclusions from the previous tests.

Hypothesis 1 predicts more severe AI problems in Continental Europe, because weaker corporate governance creates thinner external capital markets, and makes it harder for firms with attractive investment opportunities to raise money. Such AI problems are likely to be particularly acute for family-controlled firms as opposed, for example, to a firm controlled by a financial institution, which could approach this institution for a loan. We thus propose

HYPOTHESIS 1a *The relationship between investment and cash flows is stronger in Continental Europe than in Anglo-Saxon countries for the family-controlled firms that are most likely to be subject to asymmetric-information problems. The difference in the importance of cash flows for investment should be stronger for family-controlled firms than for the full samples of firms used to test Hypothesis 1.*

The first two sets of regressions in Table 4 test Hypothesis 1a. Cash flows' coefficient is ten times larger in the Continental European (col. 2) than in the Anglo-Saxon countries (col. 1), and the partial derivative of investment to cash flow is eleven times larger. Neither the coefficient on cash flow nor the partial derivative of investment to cash flow is statistically significant for the Anglo-Saxon countries. Family-controlled firms with attractive investment opportunities appear to face significantly greater asymmetric-information problems in Continental Europe than in Anglo-Saxon countries. Hypothesis 1a is strongly confirmed.

Managers in civil law countries should have more discretion to use company cash flows to pursue their own goals when they own a controlling interest in their firm than when another company or financial institution does. We thus retest Hypothesis 2 restricting our sample again to family-controlled firms (in the vast majority of cases a controlling family or individual is part of management or the supervisory board).

Table 4
Tests of Further Hypotheses Regarding Corporate Governance and Investment

	Hypothesis 1a Family controlled $\overline{q_m} \geq 1$			Hypothesis 2a Family controlled $\overline{q_m} < 1$			Hypothesis 4a CE $\overline{q_m} \geq 1$ Ownership identity			Hypothesis 5a Accounting standards $\overline{q_m} < 1$		
Country/Ownership group	AS (1)		CE (2)	AS (3)		CE (4)	CFS (5)		FamDis (6)	Strong (7)		Weak (8)
CF	0.046	$<$	0.474	0.095	$\approx$	0.124	0.188	$\approx$	0.346	0.106	$<$	0.161
t-value	0.90		4.75	4.57		5.09	5.21		2.69	18.31		13.77
q_a	0.087	$>$	0.025	0.078	$>$	0.017	0.055	$\approx$	0.010	0.069	$>$	0.039
t-value	3.60		1.34	7.84		1.18	3.72		0.40	25.35		6.13
q_m	0.006	$\approx$	0.000	0.002	$>$	−0.002	0.001	$\approx$	0.000	0.001	$>$	−0.001
t-value	2.08		0.26	1.68		−1.15	0.30		0.18	2.51		−1.82
$q_a\,CF$	−0.004	$\approx$	−0.020	−0.034	$<$	0.029	−0.059	$\approx$	0.023	−0.022	$\approx$	−0.018
t-value	−0.19		−0.54	−3.27		1.91	−4.34		0.42	−8.42		−2.01
Observations	200		78	971		1,142	340		162	14,055		5,375
R^2	0.328		0.672	0.202		0.252	0.383		0.442	0.130		0.132
$\delta I/\Delta cf$	0.040	$<$	0.444	0.057	$<$	0.151	0.110	$<$	0.378	0.076	$<$	0.135
t-value	1.44		4.95	4.07		9.56	5.18		3.59	21.79		17.36
$\delta I/\delta q_a$	0.086	$>$	0.019	0.068	$>$	0.028	0.031	$\approx$	0.018	0.063	$>$	0.031
t-value	3.99		1.49	7.34		2.58	2.57		1.00	24.83		5.81

Note: The table presents the estimated coefficients of equation (2) to test the Hypotheses 1a–5a stated in the main text. AS refers to the set of Anglo-Saxon countries (excluding the USA), and CE to the Continental European countries. We also look at two types of firms concerning their ownership structure. The companies in the first group are controlled by an industrial or financial company, or the state (CFS), while the companies in the second group are controlled by a family or have dispersed-shareholding structures (FamDis). All equations are estimated with OLS and contain two-digit industry and time dummies. The t-statistics (below the coefficients) are computed using heteroskedasticity consistent standard errors. $\delta I/\delta CF$ and $\delta I/\delta q_a$ are the first derivatives with the interaction term $q_a\,CF$ evaluated at the mean value of the respectively other variable. $>$ or $<$ implies a significant difference in coefficients at the 5 percent level; $\approx$ implies an insignificant difference.

HYPOTHESIS 2a *The relationship between investment and cash flows is stronger in Continental Europe than in Anglo-Saxon countries for family-controlled firms that are most likely to fit the MDT. The difference in the importance of cash flows for investment should be stronger for family-controlled firms than for the full samples used to test Hypothesis 2.*

The second two sets of regression results in Table 4 test Hypothesis 2a. The hypothesis again receives strong support with the coefficient on cash flow being somewhat larger in the Continental European countries (col. 4), and the partial derivative of investment to cash flow being three times larger, although only the latter comparison is statistically significant. The second difference is greater than that reported for Hypothesis 2 in Table 3. Agency problems in the form of a large–small shareholder conflict are relatively more severe for family-controlled firms in Continental Europe than in Anglo-Saxon countries.

Hypothesis 4 was tested for the combined sample of Anglo-Saxon and Continental European countries. Arguably, however, control by a financial institution or another company means something different in Continental Europe than in an Anglo-Saxon country, where financial institutions and other firms play less active monitoring roles. We thus expect more significant AI problems for family-controlled and dispersed-ownership firms in Continental Europe than for other companies. We thus retest Hypothesis 4 for just the Continental European countries.

HYPOTHESIS 4a *Among the firms most likely to fit the AIT, the relationship between investment and cash flows is weaker, when the firms are controlled by another firm, a financial institution or the state than when they are family-controlled or have dispersed ownership. This difference is greater for the Continental European countries than for a combined sample including Anglo-Saxon countries.*

When the test is restricted to the Continental European countries both differences in cash flows impact between the two ownership groups are much larger than when Anglo-Saxon firms are included (col. 5 and col. 6), and both differences are now statistically significant (see Table 4). In Table 3, where the Anglo-Saxon and Continental European countries are combined, an increase in cash flow has a 58 percent larger impact on investment for firms with family control or dispersed ownership, than for firms controlled by other firms, financial institutions, or the state. When the sample is restricted to companies in Continental Europe with $\overline{q_m s} \geq 1$, the predicted effect of an increase in cash flow on investment is more than three times larger for family-controlled or dispersed-ownership firms. These results support Hypothesis 4a and along with those for Hypothesis 1a imply that AI problems appear to be particularly severe for family-controlled firms in Continental Europe.

Strong accounting standards provide more information to the market and should mitigate both AI and MD problems. Thus, in testing Hypothesis 5 we used the full sample of companies ignoring mean marginal *qs*. Asymmetric-information problems should, however, be more ephemeral than agency problems. Time passes and the market learns what a firm's returns on total assets and investment are. Moreover, under the AIT managers with attractive investment opportunities have an

incentive to eliminate the AI problem. Managers with the discretion to overinvest, and are doing so, have no incentive to eliminate this discretion. If they are entrenched, such overinvestment may persist indefinitely. Thus, we expect agency problems to be more pervasive and serious among firms with $\overline{q_m}s < 1$, than AI problems are among firms with $\overline{q_m}s \geq 1$. Strong accounting standards are thus expected to have a greater effect on limiting managerial-discretion in the subsample of firms fitting the MDT.

HYPOTHESIS 5a *The relationship between investment and cash flows is stronger in countries with weak accounting standards than in countries with strong standards, and stronger for firms with* $\overline{q_m} < 1$*, than for all firms.*

The results in Table 4 confirm Hypothesis 5a. Although both Hypotheses 5 and 5a are supported, the absolute differences in the coefficients on cash flows and for the partial derivatives of investment to cash flows are greater for firms with $\overline{q_m} < 1$, than for all firms in the Anglo-Saxon and Continental European countries (cols. 7 and 8).

We test the robustness of our regression results in Tables 3 and 4 by using a fixed effects estimator, which controls for unobserved but stable firm characteristics. Fixed effects are to be preferred to random effects estimators, if the fixed firm-effect in the error term is correlated with an exogenous variable, which seems likely in our sample (*e.g.*, some firms have consistently higher qs).[22] Table 5 presents the results of this exercise. To save space, we only report the implied partial derivatives of investment, $\delta I/\delta CF$ and $\delta I/\delta q_a$ for each equation. The explanatory power of the fixed effects regressions is generally higher than the OLS regressions. The first panel in Table 5 presents the results from the fixed effects model for Hypotheses 1–5. Concentrating on the impact of CF, we confirm all of the differences observed in the OLS results. While the magnitudes of the differences change slightly, they are still statistically significant and comparable to those in Table 3. However, we obtain a slightly different pattern for q_a's impact on investment. While before we observed statistically insignificant differences for Hypotheses 1 and 5, we now find q_a having a significantly greater effect on investment, which produces statistically significant differences in implied partial derivatives (see tests of Hypotheses 1 and 4 in Table 5).

The second panel in Table 5 reports fixed effects results for Hypotheses 1a–5a. All predictions are confirmed with respect to the roles of cash flow and q_a. Overall, the fixed effects results confirm the conclusions from the OLS regressions. They indicate that the reported differences in Tables 3 and 4 are not specific to the estimation technique and confirm the important role played by the different corporate governance institutions.

6 Discussion

This article's results reconfirm the well-established proposition that "institutions matter," and in particular that corporate governance institutions matter. We found

[22] See JOHNSTON AND DINARDO [1997, pp. 390–399].

Table 5
Robustness Tests of Hypotheses Regarding Corporate Governance and Investment

Panel A: Robustness of Hypotheses 1, 2, 4, and 5

	Hypothesis 1 $\overline{q_m} \geq 1$			Hypothesis 2 $\overline{q_m} < 1$			Hypothesis 4 $\overline{q_m} \geq 1$			Hypothesis 5 All		
	AS (1)		CE (2)	AS (3)		CE (4)	CFS (5)		FamDis (6)	Strong (7)		Weak (8)
$\delta I/\delta CF$	0.061	<	0.128	0.074	<	0.104	0.068	<	0.082	0.065	<	0.101
t-value	6.16		5.53	14.72		13.32	8.16		16.53	40.58		12.39
$\delta I/\delta q_a$	0.053	>	0.023	0.067	>	0.032	0.033	<	0.049	0.071	>	0.043
t-value	6.97		1.847	16.80		4.73	5.17		5.80	47.89		6.90

Note: Panel A presents the tests of Hypotheses 1, 2, 4, and 5 using a fixed effects estimator. See the explanations in Table 3.

Panel B: Robustness of Hypotheses 1a, 2a, 4a, and 5a

	Hypothesis 1a Family controlled $\overline{q_m} \geq 1$			Hypothesis 2a Family controlled $\overline{q_m} < 1$			Hypothesis 4a CE $\overline{q_m} \geq 1$			Hypothesis 5a Accounting standards $\overline{q_m} < 1$		
	AS (1)		CE (2)	AS (3)		CE (4)	CFS (5)		FamDis (6)	Strong (7)		Weak (8)
$\delta I/\delta CF$	0.033	<	0.401	0.118	<	0.160	0.108	<	0.374	0.072	<	0.137
t-value	1.16		3.97	6.54		7.53	4.55		3.07	18.24		10.75
$\delta I/\delta q_a$	0.065	>	0.014	0.053	>	0.041	0.018	$\approx$	0.015	0.057	>	0.043
t-value	2.21		1.13	4.53		2.64	1.05		0.83	17.64		5.80

Note: Panel B presents the tests of hypotheses 1a, 2a, 4a, and 5a using a fixed effects estimator. See the explanations in Table 4.

evidence of asymmetric-information problems for firms with attractive investment opportunities and limited cash flows, and managerial-discretion problems. These problems are more severe in Continental European than in Anglo-Saxon countries, in countries with weak accounting standards, and, in particular, for family-controlled firms in Continental Europe.

These findings have important economic and policy implications. In a country without capital market imperfections and agency problems, one would expect the following scenarios for firms over their life cycles.[23] Firms are born through an innovation or by imitating an innovation. Although most die soon after birth, some grow to be quite large. In the early stages of a firm's life cycle, its major difficulty is to raise enough capital to fund the investment opportunities that its founders foresaw, and that brought it into existence. It is at this stage in a firm's life cycle that asymmetric-information problems are likely to be most acute, and result in the firm's foregoing attractive investments.

A firm that grows large someday has cash flows that greatly exceed what can be reinvested at returns equal to or above its cost of capital. If it maximized shareholders' wealth, it would make large dividend payments or purchases of its shares. As it matures, it would return greater quantities of cash to its shareholders, invest relatively less and less, and grow ever more slowly. Thus, in a world without agency problems, capital would be "recycled" from mature firms through the capital market to young firms with attractive investment opportunities, and in a world without asymmetric-information problems, this capital would find its way to the young firms that needed it. The existence of AI and MD problems interrupts this flow of capital from mature to young firms, and reduces the growth of the economy. Too much gets invested by firms with low returns on investment, too little by firms with high returns.

Several studies have established the existence of a positive relationship between country growth rates and the size of external capital markets.[24] SHLEIFER *et al.* [1997] established a link between the strength of corporate governance institutions and the size of external capital markets (see again col. 6 in Table 1). This article adds further support for these findings. Both asymmetric-information and agency problems are more severe in Continental Europe than in the Anglo-Saxon countries leading to too little investment by firms with attractive investment opportunities and too much by those with poor investment opportunities. Our results thus extend the findings of KATHURIA AND MUELLER [1995] and GUGLER, MUELLER, AND YURTOGLU [2004a] for the United States to other Anglo-Saxon countries, and of DEGRYSE AND DE JONG [2006] for the Netherlands to a larger sample drawn from across Continental Europe.

Although we have found support for both the AIT and MDT in both sets of countries, the misallocation of resources implied by each is much more severe

[23] See MUELLER [1972].

[24] See, *e.g.*, KING AND LEVINE [1993], RAJAN AND ZINGALES [1998], LEVINE AND ZERVOS [1998], and DEMIRGÜC-KUNT AND LEVINE [2001].

for the firms with agency problems than for the firms with AI problems and, of course, more severe in Continental Europe than in the Anglo-Saxon countries. In Continental Europe 632 companies in our sample appear to suffer from agency problems, while at most 47 face AI problems. The 632 companies with $\overline{q_m} < 1$ invested on average \$282 million a year. Their $\overline{q_m}$ of 0.709 implies that roughly \$82 of the \$282 million was essentially wasted through overinvestment. Totaled for all companies over the full sample period, \$584 *billion* were destroyed through bad investments in Continental Europe.

We cannot make a similar calculation for the 47 companies with $\overline{q_m}s \geq 1$, since we do not know by how much they underinvested, but the misallocation of resources was presumably much smaller given the smaller number of firms involved. On the other hand, more firms are listed in Anglo Saxon countries than in Continental European countries, and the underinvestment of unlisted firms might be substantial.

The hostile takeover activity in the United States during the 1980s had a big impact upon managerial behavior. Unrelated and underperforming assets were spun off, cash flows were used to buy back shares rather than to make bad investments, and the overall investment performance of American countries improved.[25] A proposal by the EU Commission to liberalize the market for corporate control a couple of years ago was significantly weakened, because of opposition from France and Germany. Our results suggest that such a reform could significantly improve the investment performance of Continental European companies.

Improvements can also be expected in some countries from strengthening accounting standards.

Appendix

A.1 The Calculation of Marginal q

The arguments for putting Tobin's q in an investment equation rest on the assumptions of perfect competition, constant-returns-to-scale and that firms are price takers, which imply that the marginal and average returns on capital are equal, and equal a firm's cost of capital. When firms are not price takers and markets are imperfectly competitive, however, marginal and average returns on capital do not coincide and equilibria may exist in which a firm's average return on capital differs from its marginal return. The same level of investment may be optimal for a monopolist as for a competitive firm even though the monopolist's profits on existing assets, and hence q_a, are much larger than for the competitive firm. To predict the investments of these two companies more accurately, we need a measure

[25] MUELLER AND REARDON [1993] report mean marginal q estimates of 0.71 for the USA over the 1969–1988 period, while GUGLER, MUELLER, AND YURTOGLU [2004c] report a figure of 1.02 for the 1985–2000 period. See also HOLMSTROM AND KAPLAN [2001].

of their *marginal* returns on capital relative to their costs of capital, which we now derive.

Let I_t be a firm's investment in period t, CF_{t+j} the cash flow this investment generates in $t + j$, and i_t the firm's cost of capital in t, then the present value of this investment is

$$PV_t \equiv \sum_{j=1}^{\infty} \frac{CF_{t+j}}{(1+i_t)^j} . \tag{A1}$$

We shall assume capital market efficiency and, thus, that the capital market makes an unbiased estimate of the present value, PV_t, of any investment, I_t in t. We can then take the market's estimate of PV_t and the investment I_t that created it, and calculate the ratio of a pseudo-permanent return r_t on I_t to i_t:

$$PV_t = \frac{I_t r_t}{i_t} = q_{mt} I_t . \tag{A2}$$

If the firm had invested the same amount I_t in a project that produced a permanent return r_t, this project would have yielded the exact same present value as the one actually undertaken. The ratio of r_t to i_t is the key statistic in our analysis. If a firm maximizes shareholder wealth, then it undertakes no investments for which $q_{mt} < 1$. That q_m is a marginal q can easily be seen from (A2) by contrasting it with q_a. Average q is the market value of a firm divided by its capital stock. *Marginal q* is the *change* in the market value of the firm, PV_t, divided by the change in its capital stock (I_t) that caused it.

The market value of the firm at the end of period t can be defined as,

$$M_t \equiv M_{t-1} + PV_t - \delta_t M_{t-1} + \mu_t , \tag{A3}$$

where δ_t is the depreciation rate for the firm's total capital, and μ_t the market's error in evaluating M_t. Substituting from (A2) into (A3) and rearranging yields

$$M_t - M_{t-1} = q_{mt} I_t - \delta_t M_{t-1} + \mu_t . \tag{A4}$$

The assumption of capital market efficiency implies that the expected value of μ_t is zero. Setting $\mu_t = 0$ and rearranging (A4) yields

$$q_{mt} = \frac{M_t - (1-\delta) M_{t-1}}{I_t} . \tag{A5}$$

Eqs. (A4) and (A5) illustrate the logic underlying our calculation of q_m. Assume, for example, that a firm's cost of capital, i_t, is 0.10, $\delta_t = 0$, and it invests 100 at a return $r_t = 0.12$. The predicted increase in its market value using (A4) is then 120, and $q_{mt} = r_t/i_t = 1.2$. More generally, a firm's market value rises by more than the amount invested whenever $r_t > i_t$, and falls short of the value of I_t when $r_t < i_t$, abstracting from depreciation. Imagine now that $M_{t-1} = 1000$ and $\delta_t = 0.10$. Then the firm must invest 100 at an $r_t = i_t$ for its market value to remain unchanged.

It should be noted that because we calculate the *ratio* of r_t to i_t and not r_t alone, there is no need to calculate a firm's cost of capital to determine whether it is over- or underinvesting. Moreover, the methodology automatically allows for differences in

risk across firms. If firm A's investments involve greater risk than B's, it has a higher cost of capital i_t than B. Any investment I_t by A must then produce a greater expected stream of profits (possess a higher r_t) than the equivalent investment by B to produce the same change in market value.

Eqs. (A3), (A4), and (A5) incorporate the assumption that the market value of a firm at the end of year $t-1$ is the present discounted value of the expected profit stream from the assets in place at $t-1$. Changes in market value are due to changes in assets in place as a result of investment and depreciation. To calculate q_{mt}, one needs an estimate of the depreciation rate of a firm's total capital, δ_t, where the value of this capital is measured by the market value of the firm. The depreciation rate depends on the composition of tangible and intangible assets in total market value, and these will differ across industries. We assume that industry depreciation rates are constant over time, and use a variant of eq. (A4) to estimate a separate δ_D for each industry D.

Eq. (A5) defines q_m in year t. For the purpose of classifying firms into subsamples that fit each hypothesis, we shall calculate a weighted average q_m. Using (A3) to replace the first right-hand term in successive periods, and assuming again industry specific depreciation rates yields a generalized, multi-period version of (A3),

$$M_{t+n} = M_{t-1} + \sum_{j=0}^{n} PV_{t+j} - \sum_{j=0}^{n} \delta_{D\,t+j} M_{t+j-1} + \sum_{j=0}^{n} \mu_{t+j}\,. \tag{A6}$$

Using equation (A2), we can calculate a weighted average q_m with each year's investment as weights

$$\overline{q_m} = \frac{\sum_{j=0}^{n} q_{mt+j} I_{t+j}}{\sum_{j=0}^{n} I_{t+j}} = \frac{\sum_{j=0}^{n} PV_{t+j}}{\sum_{j=0}^{n} I_{t+j}}\,. \tag{A7}$$

Dividing (A6) by $\sum_{j=0}^{n} I_{t+j}$, substituting from (A7) and rearranging yields

$$\overline{q_m} = \frac{M_{t+n} - M_{t-1}}{\sum_{j=0}^{n} I_{t+j}} + \frac{\sum_{j=0}^{n} \delta_{D\,t+j} M_{t+j-1}}{\sum_{j=0}^{n} I_{t+j}} - \frac{\sum_{j=0}^{n} \mu_{t+j}}{\sum_{j=0}^{n} I_{t+j}}\,. \tag{A8}$$

Stock market efficiency implies $E(\mu_{t+j}) = 0$ for all j, and thus that the last term on the right in (A8) becomes small relative to the other two terms as n grows large. The market values and investments of the firm are observable. Therefore, $\overline{q_m}$ can be calculated to a close approximation using (A8) for any assumed set of δ_Ds when n is large. We make these calculations using our estimates of δ_D from eq. (A4). This $\overline{q_m}$, the weighted average of the ratio of returns on investment to the cost of capital, is used to discriminate between the different hypotheses regarding investment behavior.

Before describing how we use estimates of $\overline{q_m}$ to test the different hypotheses about investment determinants, we must point out a possible bias in these estimates.

We assume that the capital market at time t correctly values a firm's existing assets at that time and that the change in its market value between t and $t+1$ reflects the combined effects of the depreciation of its existing assets and the investments made in that period. It is also possible, however, that the market can anticipate future investments. If, for example, the market correctly anticipates at $t-1$ the stream of investments I_{t+j}, $j = 1, K, n$ and the return r on these investments, then M_{t-1} will be higher (lower) than we assume in equation (A8), if $r > i (r < i)$. Our calculated $\overline{q_m}s$ are thus biased toward 1.0 to the extent that the market can predict returns on future investments. Nevertheless, as we shall see, we estimate substantial differences in $\overline{q_m}s$ across firms, and they seem to perform as our hypotheses predict.

A firm's market value at the end of year t, M_t, is defined as the market value of its outstanding shares at the end of t plus the value of its outstanding debt. Since this number reflects the market's evaluation of the firm's total assets, we wish to use an equally comprehensive measure of investment. Accordingly we define investment for the marginal q calculation as (investment in the investment-cash flow regressions is defined as capital expenditures)

$$I = \text{After-tax profits} + \text{Depreciation} - \text{Dividends} + \Delta D + \Delta E + \text{R\&D} + \text{ADV}\,.$$

ΔD and ΔE are funds raised using new debt and equity issues. Since R&D and advertising expenditures (ADV) are also forms of investment that can produce "intangible capital" which contributes to a company's market value, we add them to investment to obtain a measure of the firm's additions to its total capital.

A.2 Definitions of Strong and Weak Accounting Standards

The Center for International Financial Analysis and Research (BAVISHI (ed.) [1993]) examines the accounting practices in a large sample of countries and ranks them according to the number of desirable pieces of information each country's standards require to be published. The index is based on the examination of 1990 annual reports on the inclusion or omission of 90 items. These fall into seven categories: general information, income statements, balance sheets, funds flow statement, accounting standards, stock data, and special items.

The scale of this index for the countries in our study runs from a low of 36 for Portugal to a high of 83 for Sweden with a median of 64. We have classified any country with a score of 64 or more as having a strong set of accounting standards, with a score of 63 or less as having weak accounting standards.

A.3 Definition of Variables

Tobin's q is defined as the ratio of the market value of a firm to its total assets (COMPUSTAT item number 6, we use the corresponding variables from the Global Vantage data base) where the market value of the firm equals the market value of common equity (items 199 (share price at the end of the fiscal year) times item 25

(common shares outstanding)) plus the book value of preferred stock (items 56, 10, 130) plus the book value of total debt (the sum of total short-term debt (item 9) and total long-term debt (item 34)). Cash flow (CF) is the sum of after tax profits (item 18) and depreciation (item 14) minus total dividends (item 21 plus item 19 if available). We adjust cash flow by adding the portion of R&D that is expensed for tax purposes. Capital stock is measured as net fixed assets (item 8). Capital expenditures are reported in the statement of cash flows (item 128). All variables are in real 1995 U.S. dollars.

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Klaus Gugler
Dennis C. Mueller
B. Burcin Yurtoglu
BWZ
Department of Economics
University of Vienna
Brünnerstr. 72
1210 Vienna
Austria
E-mail:
klaus.gugler@univie.ac.at
dennis.mueller@univie.ac.at
burcin.yurtoglu@univie.ac.at