RATES OF RETURN ON INVESTMENT: A CROSS NATIONAL COMPARISON

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Abstract

In a recent article Henk DeJong examined several measures of performance of the 100 largest European companies. He found that "Anglo-Saxon companies" performed significantly better than "Germanic companies" those based in Germany, Holland, Switzerland, and Austria. DeJong attributed these differences to differences in corporate governance between Great Britain and the Germanic countries, and conjectured that the threat of takeovers forced UK managers to be profit maximizers. Germanic company managers, on the other hand, were protected from takeovers by the large fractions of their shares in the hands of friendly banks, and thus were free to maximize the growth of their firms. This proposed explanation is somewhat ironic, given estimates of returns on investment that have been made for the United States in the 1970s and 1980s, and given that the hypothesis that managers maximize growth was put forward with Anglo-Saxon corporations in mind, and rested on the assumption that managerial discretion arose from the widespread diffusion of shares in these countries. This paper presents estimates of the ratios of returns on investment to costs of capital over the period 1985-96 for companies from around the world. These estimates are made using the technique developed by Mueller and Reardon. We confirm the existence of significant differences between the performance of Anglo-Saxon and Germanic companies, which DeJong identified. We find that U.S. companies performed much better over this more recent 10 year period, than over the 1970s and 1980s. Not surprisingly, perhaps, the best performance is observed for Asian companies.

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RATES OF RETURN ON INVESTMENT: A CROSS NATIONAL COMPARISON

During the 1970s and 1980s the United States's economy seemed to have entered a decline. Markets were lost to foreign competition, productivity declined, real incomes ceased to grow. Among the many reasons given for these developments was a form of "management failure." Dispersed ownership gave managers the discretion to pursue their own goals. Prominent among these would appear to have been the pursuit of growth. Managers were accused of using their "excess cash flows" in this pursuit (Mueller, 1969, 1972; Jensen, 1986). Mergers are a particularly attractive way to grow, and ex post analyses of the 1960s, 1970s and 1980s have revealed that many mergers were unsuccessful, lowered the efficiency of the merging firms, and seemed to be best explained in terms of their impact on the size of the firms.[1]

If managers pursue growth in excess of the levels that would maximize shareholder wealth, the marginal returns on their investments are less than their (neoclassical) costs of capital (opportunity costs of their shareholders). Consistent with this prediction, recent studies have estimated significant declines in returns on investment for large U.S. companies over the 1970s and 1980s (Shinnar, et al., 1989, Mueller and Yun, 1998), and rates of return on investment less than company costs of capital for substantial fractions of large U.S. corporations over the same period (Mueller and Reardon, 1993).

The apparent objective of many takeovers during the late 1980s merger wave was to replace managements, which were thought to be doing an inadequate job maximizing shareholder welfare. Indeed, several takeovers were of firms that had engaged in substantial merger activity, and were followed by immediate divestiture of previously acquired assets. Although hostile takeovers were actually a fairly small fraction of the total number of mergers in the late 1980s (Schleifer and Vishny, 1988), some of them were quite large and,

given their objectives, received considerable attention. The result has been a renewed interest of American managers in shareholder value, substantial downsizing of many companies, and refocusing on "core lines of business," and the like. In the process, American firms have been reputed to have become considerably more efficient and competitive (Economist, 1994, pp. 65-66).

At the same time, European firms have seemed to be in a period of decline, and even the Japanese and other Asian economies have stumbled. The performance of European companies was the subject of a recent article by Henk DeJong (1995). DeJong examined several measures of performance of the 100 largest European companies over the period 1991-1993. He found substantial differences in performance. In particular, "Anglo-Saxon companies," i.e., British firms, performed significantly better than "Germanic companies," those based in Germany, Holland, Switzerland, and Austria. DeJong attributed these findings to differences in corporate governance between Great Britain and the Germanic countries, and conjectured that the threat of takeovers forced UK managers to be profit maximizers. Germanic company managers, on the other hand, were protected from takeovers by the large fractions of their shares in the hands of friendly banks, and thus were free to maximize the growth of their firms. This proposed explanation is somewhat ironic, given the estimates of returns on investment for the United States in the 1970s and 1980s[2], and given that the hypothesis that managers maximize growth was put forward with Anglo-Saxon corporations in mind, and rested on the assumption that managerial discretion arose from the widespread diffusion of shares in these countries (Marris, 1964).

These developments and findings are intriguing and warrant further study. In this paper we present estimates of the ratios of returns on investment to costs of capital over the period 1985-96 for a sample of 6241 companies from around the world. These estimates are made using the technique developed by Mueller and Reardon (1993) discussed in the next section. Section II describes the data, and

Sections III-V present the findings. Stated briefly, we confirm the existence of significant differences between the performance of Anglo-Saxon and Germanic companies, which DeJong identified. We find that U.S. companies performed much better over this more recent 12 year period, than over the 1970s and 1980s. The best performance, however, is observed for Asian companies. The implications of the findings are discussed in the final section.

I. Methodology

Let I_t be a firm's investment in period t, C_{t+j} the cash flow this investment generates in t + j, and it the firm's discount rate in t, then the present value of this investment is

$$PV_t \equiv \sum_{j=1}^{\infty} \frac{C_{t+j}}{(1+i_t)^j} \qquad (1)$$

If we take PV_t from (1) and place it into (2), we can define for any i_t, a permanent return, r_t, on the investment I_t, which creates an equivalent present value to that defined by (1).

$$PV_t = \frac{I_t\, r_t}{i_t} = c_t\, I_t \qquad (2)$$

where $c_t = r_t / i_t$.

A firm which maximizes shareholder wealth undertakes all investments for which r_t, as defined by (2), is equal to or greater than i_t ($c_t > 1$). It undertakes no investments with $i_t > r_t$.

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

$$M_t \equiv M_{t-1} + PV_t - \delta_t\, M_{t-1} + \mu_t \qquad (3)$$

where PV_t is the present value of the investment made during t, δ_t the depreciation rate for the firm's total capital, and μ_t the market's error in evaluating M_t.

The assumption of capital market efficiency implies that the error term in (3) has the usual properties assumed in regression analysis. Equation (3) can thus be used to estimate both δ and c under the assumption that δ_t and c_t are either constant across firms or over time, or both. Replacing PV_t in (3) with cI_t, and rearranging yields

$$\frac{M_t - M_{t-1}}{M_{t-1}} = -\delta + c\frac{I_t}{M_{t-1}} + \frac{\mu_t}{M_{t-1}} \qquad (4)$$

Equation (4) is favored over other possible rearrangements of (3), because it does not involve a lagged dependent variable, and in cross-section regressions is less likely to be subject to heteroscedasticity owing to the deflation of all error terms by M_{t-1}.

To estimate (4) we need data on the market value of each firm and its investment. The market value of a firm at year t is defined as the market value of its outstanding equity shares at the end of year t plus the market 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 as

I = After tax profits + Depreciation - Dividends + Δ Debt + Δ Equity + R&D + Advertising

where Debt and Equity are funds raised using new debt and equity issues. Since R&D and advertising are expensed in all countries although they are actually forms of investment, we add them to investment to obtain a measure of the firm's additions to its total capital.

II. The Data

The data are taken from the 1996 version of the Compustat and Global Vantage data bases. These data sets contain accounting and financial data on 18581 companies with listed stocks from virtually every country in the world starting in 1985. We exclude 8066 companies active in financial and service industries. After the construction of our basic variables and after elimination of some obvious outliers in the data, the number of companies reduces to 6241. The data series used in this study ends in 1996. In many countries and for many companies data were not available for all 12 years. Table 1 reports the distribution of observations entering our basic regression across time starting in 1986 (the number of observations for 1985 is the same), and the means, medians and standard deviations of our two key variables.

III. Estimates of $\underline{c}$s and $\underline{\delta}$s

A. Separate Country Estimates

Equation (4) is used to estimate $\underline{\delta}$ s and $\underline{c}$s in several ways. Since our interest is in differences in investment performance across countries, we first present estimates in which we constrain the coefficients on each company's investment to be the same for all firms in a given country. The intercept in equation (4) is an estimate of the depreciation rate, the fall in a company's market value in a given year that is expected to occur, if the firm makes no investments. Depreciation rates can be expected to vary across companies depending on the kinds of capital they invest in. To allow for these differences, we first estimate (4) after assigning each company to a two-digit SIC industry, and estimating a separate depreciation rate (intercept) for each industry. Time dummies were also included for each year to pick common movements in stock market values. These time dummies were constrained to sum to zero, so that the intercepts

measure the average annual depreciation rates across the sample for any industry (Suits, 1984).

The first column in Table 2 presents the results from this estimation using all available data for each country for the period 1985 through 1996 (the coefficients on the time dummies are not reported). The number of observations for each industry and for each country is also reported. The time and industry dummies and annual company investments explain 82 percent of the changes in company market values, a rather impressive figure in a sample of 40,527 observations. Turning first to the estimates of depreciation, we see that almost all have the predicted negative sign, and fall in the plausible interval between zero and ten percent. The only exceptions to this pattern in the manufacturing sector occurred for the transportation industry (SIC 37), which had an estimated 12.3 percent depreciation rate per annum, and the pharmaceuticals industry (SIC 283) with an estimated negative four percent depreciation rate.

The coefficients on investment have been grouped by country in rough accordance to corporate governance/geographic differences. The coefficients on investment for the Anglo-Saxon countries are all around one. Thus, the average firm in these countries earned a return on investment roughly equal to its cost of capital. The estimate of c for the United States, 1.22, is considerably higher than the 0.72 estimate reported by Mueller and Reardon (1993) for a similar sample of US companies over the 1969-88 period, suggesting a dramatic improvement in this country's investment performance.

The next set of estimates is for the "Germanic"-continental European countries. All estimated cs are less than 1.0, and range as low as 0.68. Thus over this 13 year period the northern continental European countries as a group performed much worse than the Anglo-Saxon countries. On average no country in this group earned a return on investment equal to or greater than its cost of capital.

An even worse performance is exhibited by the three Mediterranean countries, Italy, Spain and Portugal. In these countries the estimated returns on investment came to only 60 percent of the companies' costs of capital. Greece would appear to be an exception among the Mediterranean countries, but the number of observations available for Greece, in comparison with the other three countries, is too small to allow us to draw firm conclusions about Greece.

The estimated $\underline{c}$s for the four Scandinavian countries are on average higher than for the other European countries and resemble those of the Anglo-Saxon countries.

Among the six so-called Asian tigers, only corporations in Korea failed to earn returns on investment above their costs of capital. All three of the remaining Asian countries -- Indonesia, India and the Philippines -- had estimated returns on investment below their costs of capital ($\underline{c} < 1$), on the other hand. Our estimates incorporate the stock markets' reactions to corporate investments in each country through 1996 and thus, of course, do not reflect the collapse in stock market prices that began in Asia toward the latter part of 1997. Nevertheless, even in our data Korea and Indonesia, two Asian countries whose corporate and banking sectors have been heavily criticized after the crisis began, are seen to be underperformers. In both countries the stock market's evaluation of company investments indicated that companies earned returns on investment that were less than their costs of capital.

In four of the six Latin American countries, estimated $\underline{c}$s were less than 1.0, as was the case for their Mediterranean ancestors, although the paucity of data for four of the countries makes it difficult to draw firm conclusions. Both South Africa and Israel, for which we have fairly large samples, exhibited returns on investment above their costs of capital.

In Table 2 depreciation rates were allowed to vary across industries, but were constrained to be the same across countries. Table 3 allows depreciation to vary across countries, but does not present separate estimates for each industry. On the left-hand side of the table estimates are presented with only separate year dummies included (coefficients again constrained to sum to zero and suppressed). We again observe some clustering in the estimates across countries, now with respect to both the depreciation rates and the $\underline{c}$s. Both our estimated depreciation rates and the $\underline{c}$s are measures of the performance of companies in each country. Our measured depreciation rates are the fall in the market value of a company that is predicted in the absence of any new investment. Large measured depreciation implies that the market has low expectations for the future performance of a company and writes down the value of its assets accordingly. The figures in Table 3 reveal that the continental European countries performed worse than the Anglo-Saxon countries with respect to both measures of performance. Estimates of depreciation for the Anglo-Saxon countries ranged from 1.9 to 4.3 percent, while the range for the continental European countries was from 9.2 to 14.8 percent, roughly four times as great.

Although the estimates of $\underline{c}$ for the continental European countries still tend to be lower than those for the Anglo-Saxon countries, four of the six estimates are greater than in Table 2, and the estimated of $\underline{c}$ for the Netherlands is greater than 1.0. This increase in the estimated $\underline{c}$s may in part be due to our estimating separate $\underline{\delta}$s for each country in Table 3, while we constrained the $\underline{\delta}$s to be the same for each country in Table 1 (although, of course, we estimated different $\underline{\delta}$s across industries). To see this, consider Figure 1. A scatter of points is presented which when fitted to Eq. (4) yields an estimated depreciation rate of 0.10 and a $\underline{c}$ of 1.0. If the intercept is constrained to equal that for other firms, however, and the pooled data yield an estimate for of 0.04, the scatter of points for this firm will produce a lower estimate of $\underline{c}$. By constraining this firm to have a lower depreciation rate than it actually had, we will have produced a lower

estimate of its $\underline{c}$. Poorer than average performance as measured by the decline in the market's evaluation of the firm's existing assets gets translated into a lower evaluation of the contribution of its investment to the firm's market value.

The somewhat higher $\underline{c}$s for the continental European countries and lower $\underline{c}$s for the Anglo-Saxon countries can be explained in this way. For example, the Netherlands has both the highest estimated $\underline{c}$ among the continental European countries and the highest $\underline{\delta}$.

A comparison of the estimated $\underline{c}$s and $\underline{\delta}$s for the other countries between Tables 2 and 3 reveals (1) similar $\underline{c}$s in both Tables, and (2) generally higher (lower) $\underline{c}$ estimates with relatively high (low) estimates of $\underline{\delta}$ For example, the estimated $\underline{c}$ for Korea in the left-hand side of Table 3 is now slightly above 1.0 and equal to that for Japan. But our estimates of the depreciation rates for these two countries are 14.6 percent for Korea and only 2.3 percent for Japan.

On the right-hand side of Table 3 estimates are presented which also include separate dummies for each firm. These dummies allow us to estimate a separate depreciation rate for each firm, and thus capture both differences due to the industry and technology of a firm, and firm specific differences as, for example, related to their age and the age of their capital stocks. The coefficients on the firm-effects dummies are also constrained to sum to zero and suppressed. The estimates of $\underline{\delta}$ and $\underline{c}$ after allowing for firm effects are very similar to those on the left-hand side of the Table, where separate firm effects have not been removed. The $\underline{c}$s for the continental European countries are again higher than in Table 2, but so too are the mean depreciation rates. The mean $\underline{\delta}$ for firms in the Netherlands is now 16.4 percent. All of the Asian tigers have estimated $\underline{c}$s above 1.0, but again Korea differs dramatically from the other countries in having a mean depreciation rate across its companies of 18.4 percent. Three of the remaining five Asian tigers actually had positive intercepts implying negative depreciation rates.

B. Separate Company Estimates

Equation (4) can also be used to estimate separate $\underline{\delta}$s and $\underline{c}$s for individual firms. To illustrate the kinds of results we get when we estimate (4) using company level time series data, we present the estimates for the 10 largest manufacturing companies, based on 1995 market values, for which we had at least ten observations in the UK, Germany, Japan, and the USA. The left-hand side of Table 4 presents our estimates when both $\underline{\delta}$ and $\underline{c}$ are unconstrained. Considerable variation in the estimates is observed even within each country, but the pattern of results still resembles that observed in Tables 2 and 3. The median estimated $\underline{c}$s for each country are respectively, 1.10 (UK), 0.61 (Germany), 1.14 (Japan), and 0.92 (USA).

As in the pooled regressions, there is reason to fear a relationship between our estimates of depreciation and our estimates of returns on investment, although for a somewhat different reason. To see the potential problem consider Figure 2. A firm has assets of 100 that depreciate at 10 percent per year. The market correctly evaluates the worth of the firm's assets and the rate at which they depreciate. In year zero the firm invests 20 at a return equal to the firm's cost of capital. Under the assumption that the market has rational expectations, we expect the firm's market value to rise by 10 in year zero, 20 for the new investment less 10 for the depreciation of the firm's capital stock. This would put us at point $\underline{a}$ in Figure 2. In year 1 the firm invests zero and the market correctly adjusts its evaluation of the firm downward by 10 percent, we are at point $\underline{b}$ in Figure 2. A straight line fit to these two points gives us correct estimates of both -$\underline{\delta}$ (0.10) and $\underline{c}$ (1.0).

Now suppose that the market correctly evaluates the firm's assets and the rate at which they depreciate, but revalues the firm's market value to reflect the investment of 20 with a one year lag. In year 0 we are then at point $\underline{a}'$ and at year 1 we are at point $\underline{b}'$. A line fit through these points implies a negative depreciation rate (-$\underline{\delta}$ =.10), and an estimate

of $\underline{c}$ of -1.0. In estimating Eq. 4 using time series data for individual firms, we cannot include time dummies for each year to screen out the impact of general ups and downs in the stock market on our estimates of $\underline{\delta}$ and $\underline{c}$. Any large moves in an individual company's market value caused by market wide shifts, or any lags in the market's estimates of the impact of investment can bias our estimates of the two key parameters. To try and control for this possible bias, we have reestimated Eq. 4 for each company constraining the intercept, our estimate of - $\underline{\delta}$, to equal -.04. (This is our estimate of depreciation across the grand sample, when no allowance is made for industry differences.)

The importance of the adjustment can be seen in each of the samples. For example, all of the German companies now have estimated $\underline{c}$s less than 1.0. The seemingly attractive investment performance of the steel company Thyssen disappears, once it is constrained to have a 4 percent depreciation rate like the average firm in our sample, rather than the 43 percent rate that we estimated in the unconstrained regressions.

In Table 5 we summarize our results when separate regressions are run in each country for every company for which we have at least seven time series observations. For the reasons just given, the most meaningful comparisons are for the regressions in which $\underline{\delta}$ has been constrained to equal 0.04 (the last two columns of Table 5). The same pattern appears in the results by individual companies as we saw in the pooled panel regressions. The estimated $\underline{c}$s are near or above 1.0 for the Anglo-Saxon countries, near or below 1.0 for the Scandinavian countries, and uniformly below one for the continental European countries. With the exception of the two Korean companies, the Asian tigers outperform all other groups. Individual companies in Italy, Spain and Portugal under perform all other groups. The lone Greek company for which we have 7 or more observations performed very well.

IV. Estimating cs by Source of Funds

Managers' discretion to pursue their own goals arises to a considerable degree from their ability to rely on internal cash flows to finance investment, and thus avoid the discipline of the external capital market. Estimates of much lower returns on reinvested cash flows than on new debt and equity issues as reported by Baumol et al. (1970) and Mueller and Reardon (1994) for Anglo-Saxon companies are consistent with this view. As a last look at international differences in rates of return, therefore, we examine the relationship between the estimated cs for each firm and the composition of its investment funds.

To do so we divide a firm's investment funds into five components: internal cash flows (CF'), new debt issues (ΔD), new equity issues (ΔE), R&D (RD) and advertising (A). We had no data on company advertising (except for USA and Canada) and little on R&D so we had to approximate these by multiplying industry advertising and R&D to sales ratios by company sales. This procedure may add a possibly large error of observation to these variables, and thus we have estimated the equations with and without R&D and advertising as right-hand side variables.

Table 6 presents the results for a modification of Eq. 4 in which investment has been divided into its main sources of funds. Looking first at the upper portion of the table where the results for the full sample are presented, we see that for the Anglo-Saxon countries[3], the coefficients on new debt and equity issues are very close to one another and to 1.0 as predicted by the neoclassical theory of Modigliani and Miller (1958). As was the case in previous studies for the United States, we see that the coefficients on cash flows are significantly less than 1.0, although the difference is reduced considerably, once firm effects are allowed for. Evidence of the effects of managerial discretion on investment is also apparent in the results for the two samples of continental European countries. The

coefficients on changes of debt and equity are again very near to 1.0, but the coefficients on cash flow are even lower than for the Anglo-Saxon countries. In stark contrast, no evidence of overinvestment out of any of the three sources of finance is visible in the six Asian tiger nations. The coefficients on ΔD imply that the returns on projects financed out of new debt issues roughly equal the companies' costs of capital. Consistent with the "hierarchy of finance" the returns on new equity issues are estimated to be some 25 percent or so above the companies' costs of capital. The coefficients on cash flows are completely inconsistent with the hierarchy of finance story, on the other hand, and imply returns on reinvested cash flows that are greater than the costs of capital of the firms. This is particularly true of the estimates which allow for individual firm depreciation rates. This finding for the Asian tigers reconfirms the impression obtained earlier that the returns on investment in these Asian countries have on average been substantially above their costs of capital. The hierarchy of finance reappears in the OLS estimates for the Scandinavian countries. As with the Asian countries, however, once differences in firm performance are allowed for by the separate estimates of firm effects, the coefficient on cash flows jumps up dramatically for the Scandinavian countries. As already noted, figures for R&D and advertising are not available for most countries and have been approximated using industry R&D and advertising to sales ratios. R&D and advertising is reported for many US companies, however, and R&D is reported for Canadian firms. Our last set of estimates breaks total investment into its components for just these two countries, therefore (see Table 7). Looking first at the estimates for the USA, we see that the hierarchy of sources of funds is visible in the coefficients on debt and equity, but not in the coefficient on cash flow. This result is consistent with the generally positive findings we have reported above for the USA over our sample period. The coefficients on both R&D and advertising are estimated to be less than 1.0 when all firms are constrained to have the same depreciation rate, and greater than 1.0 when firm-specific depreciation rates are estimated. What appears as lower returns on R&D, advertising and

cash flows in the OLS regressions gets picked up in the high depreciation rates estimated for some firms in the fixed effects regression. In the Canadian sub-sample it is only the coefficients on advertising and cash flow that rise dramatically when firm-effects are controlled for.

V. Conclusions

The reader might find some of the findings of this paper surprising and puzzling. In closing we shall try and remove some of this surprise and puzzlement by explicating just what the results do and do not imply. First of all, it must be emphasized that our findings do not imply that individuals would be today, or even necessarily would have been at the start of the sample period, better off investing in Asian firms than in continental European firms. Our measures of returns are based on the amount of share- or debtholder wealth created per mark or yen of investment by a German or Japanese company, not the amount created by investments in the German or Japanese stock and bond markets. Once the capital market realizes that a particular German company is investing in projects with rates of return lower than the company's cost of capital its stock price reflects this investment policy. Anyone who buys the company's shares once the market has adjusted to the firm's investment policy can expect the normal return on this investment, even if the company earns a less than normal return on its investment. Differences in returns on shares across companies reflect unanticipated changes in companies' investment activities, while differences in the returns as we measure them reflect the actual returns. The estimates of $\underline{c}$ greater than 1.0 for Japan may seem surprising, given how poorly the Japanese economy performed during a good portion of our sample period, and the poor performance of the Japanese stock market. The first thing to note in this regard is that our $\underline{c}$s measure the return on a company's investment relative to its cost of capital. Central bank policy has produced very low interest rates and thus very low costs of capital in Japan. A $\underline{c}$ equal to 1.0 is consistent with a return on investment of

near zero if the firm's cost of capital is near zero. Second of all, we measure returns on the investments actually made. If firms cut back investment in response to a decline in the economy, the return on investment can remain equal to the cost of capital even though the economy is stagnant. Many U.S. companies earned returns on investment less than their costs of capital during the 1980s, despite the reasonable growth of the economy, because they invested very large sums at a time when their costs of capital were high. The Italian economy has done well over the sample period, while Italian firms in our sample have not. Our sample of necessity includes only companies listed on stock exchanges or in developed over-the-counter markets. Typically these are much larger than the average firm in their country, and are neither family nor state controlled. Italy's economic success in recent years is generally attributed to its dynamic small and medium sized family firms. These companies are not in our sample. A management that maximizes the market value of its firm equates the marginal return on its investment to the firm's cost of capital. Both returns on investment substantially above firm costs of capital, and returns below costs of capital seem inconsistent with this prediction. It should be noted, however, that we calculate returns over all of the investments a company makes. Our $\underline{c}$s thus measure the ratio of average returns on investment to costs of capital. If marginal returns decline with investment, average returns exceed marginal returns, and a firm with a marginal return on investment equal to its cost of capital would have a $\underline{c}$ greater than 1.0. Thus, estimates of $\underline{c}$ greater than 1.0 are not necessarily inconsistent with the assumption that company managers maximize firm market values. Even in the Asian countries, where some companies have been growing very rapidly and estimated $\underline{c}$s are much greater than 1.0, marginal returns on investment could equal firm costs of capital, if Penrosian costs of further growth are sufficiently large to make marginal returns lie far below average returns (Penrose, 1959). Conversely, an estimate of $\underline{c}$ equal to 1.0 would imply that the average firm had a marginal return on investment that was less than its cost of capital over the sample period. Such a conclusion follows a fortiori for countries like

Germany and Spain with estimated $\underline{c}s$ well under 1.0. Thus, in several countries the results reported here appear to contradict the prediction that managers invest up until the point where marginal returns equal the cost of capital for the average company in these countries. Of course, this prediction is for ex ante expected returns, while our calculations are of realized returns. It might be that a management expected to earn a return on its investments equal or above its cost of capital, but was disappointed by the market. Assuming that such errors are random, we should not, therefore, be surprised to find some firms with $\underline{c}s$ differing from 1.0, and perhaps even some countries with $\underline{c}s$ differing from 1.0, if random shocks systematically impact some countries. The results for the Anglo-Saxon and Scandinavian countries might be broadly consistent with the assumption that managers were trying to equate marginal returns with their costs of capital ex ante, and the same might be said for the Asian countries, if Penrosian costs of growth are assumed high enough. The pervasive under performance of continental European companies' investments is hard to explain, however, without appealing to differences in capital market discipline and corporate governance. To test this conjecture systematically, we would need data on corporate governance structures and market control differences at the firm level. Such tests are beyond the scope of our data base and therefore of this paper. Our results do, however, suggest that such future research is warranted.

Notes

1. See Mueller (1985), Ravenscraft and Scherer (1987), Morck, Shleifer and Vishny (1988), and for the UK Hughes (1992).

2. Evidence of overinvestment by US corporations that is consistent with a managerial discretion hypothesis predates the 1970s (see, e.g., Baumol, Heim, Malkiel, and Quandt (1970); Grabowski and Mueller (1975)).

3. The grouping of countries is as follows. Anglo-Saxon: Australia, Canada, Great Britain, Ireland, New Zealand and USA Germanic: Austria, Belgium, France, Germany, Netherlands and Switzerland, Southern Europe: Italy, Spain and Portugal Scandinavia: Denmark, Finland, Norway and Sweden Asian Tigers: Hong Kong, Japan, Korea, Malaysia, Singapore, Thailand, Taiwan Other Asia: India, Indonesia and The Philippines. The Latin American countries, South Africa, Israel and Greece are excluded.

TABLES AND FIGURES

Table 1. Summary Statistics and Sample Composition By Year and Country

Country	n	Sample	$\Delta mv_t / mv_{t-1}$			$Investment_t / mv_{t-1}$			Year												
Name	Firms	Period	mean	sd	median	mean	sd	median	86	87	88	89	90	91	92	93	94	95	96	Total
Australia	177	1986-96	0.137	0.501	0.050	0.147	0.243	0.109	11	46	61	79	108	112	119	139	144	157	125	1101
Canada	562	1986-96	0.155	0.595	0.024	0.148	0.264	0.108	235	254	307	337	352	352	369	387	482	498	5	3578
Great Britain	579	1986-96	0.144	1.133	0.043	0.190	1.160	0.116	55	100	134	229	377	403	433	475	496	556	408	3666
Ireland	22	1986-96	0.265	0.773	0.159	0.254	0.579	0.161	5	3	3	6	11	12	13	13	18	20	13	117
New Zealand	19	1986-96	0.098	0.354	0.081	0.143	0.252	0.094	5	5	6	7	11	14	17	17	16	17	13	128
United States	2328	1986-96	0.139	0.601	0.015	0.141	0.253	0.112	120	131	139	145	150	152	163	173	191	204	238	1595
Austria	34	1986-96	0.052	0.432	-0.008	0.249	0.484	0.169	2	2	4	6	14	17	17	22	27	25	19	155
Belgium	38	1986-96	0.085	0.335	0.006	0.190	0.292	0.139	4	5	5	5	15	20	20	22	34	36	32	198
France	194	1986-96	0.134	0.918	0.014	0.267	0.932	0.159	33	37	39	54	84	89	105	109	133	164	145	992
Germany	237	1986-96	0.062	0.387	-0.008	0.232	0.328	0.181	43	58	66	83	144	168	167	176	213	220	186	1524
Netherlands	70	1986-96	0.134	0.613	0.053	0.265	0.534	0.193	16	17	21	23	51	57	60	61	65	67	44	482
Switzerland	72	1986-96	0.102	0.443	0.009	0.237	0.403	0.160	10	14	14	15	26	26	24	30	61	65	52	337
Italy	59	1986-96	0.020	0.299	-0.026	0.195	0.297	0.157	12	18	18	21	25	43	42	43	46	47	24	339
Spain	67	1986-96	0.080	0.440	0.006	0.211	0.447	0.122	9	10	14	17	35	45	35	36	49	54	44	348
Portugal	10	1989-96	-0.036	0.303	-0.096	0.115	0.249	0.117				1	3	4	5	5	6	9	8	41
Greece	5	1989-96	0.139	0.612	-0.032	0.131	0.218	0.089				3	3	2	2	2	2	3	1	18
Denmark	50	1986-96	0.132	0.446	0.033	0.169	0.327	0.144	3	5	6	7	12	14	15	17	41	42	41	203
Finland	30	1986-96	0.196	1.021	0.018	0.222	0.653	0.113	1	6	7	9	11	14	14	14	24	25	27	152
Norway	39	1986-96	0.157	0.512	0.055	0.175	0.311	0.128	2	2	3	3	21	24	23	26	31	33	31	199
Sweden	50	1986-96	0.140	0.337	0.100	0.185	0.217	0.131	6	8	8	8	15	19	30	35	38	46	47	260

Table 1. Summary Statistics and Sample Composition By Year and Country (continued)

Country	n	Sample	$\Delta mv_t / mv_{t-1}$			Investment$_t$ / mv_{t-1}			Year											
Name	Firms	Period	mean	sd	median	mean	sd	median	86	87	88	89	90	91	92	93	94	95	96	Total
HongKong	46	1986-96	0.111	0.399	0.037	0.121	0.184	0.072	10	13	15	19	23	26	30	32	39	42	21	270
Japan	897	1986-96	0.056	0.326	-0.002	0.076	0.139	0.060	539	701	769	812	821	826	839	838	809	805	93	7852
Korea	13	1989-96	0.198	0.531	0.090	0.333	0.491	0.222				3	3	5	6	11	10	10	2	50
Malaysia	165	1986-96	0.363	3.241	0.072	0.237	2.499	0.081	2	10	12	16	50	71	82	80	101	145	113	682
Singapore	79	1986-96	0.192	0.763	0.039	0.163	0.378	0.102	8	14	14	24	36	46	47	54	76	72	26	417
Thailand	98	1987-96	0.399	1.553	0.053	0.306	0.940	0.151		1	4	43	56	63	45	41	42	44	18	357
Taiwan	12	1989-96	0.006	0.734	-0.060	0.096	0.111	0.067				3	7	5	1	1	3	3	1	24
India	41	1990-96	0.147	0.556	0.030	0.207	0.370	0.130					2	8	17	21	32	28	9	117
Indonesia	73	1989-96	0.201	0.728	0.019	0.240	0.660	0.131				4	13	24	35	47	52	60	19	254
The Philippines	15	1987-96	0.274	1.108	0.015	0.376	1.339	0.100		2	2	4	5	3	3	3	6	4	10	42
Argentina	6	1989-96	-0.333	0.494	-0.255	-0.015	0.635	0.095				1	3	2	1		2	1	2	12
Brasil	44	1989-96	1.027	16.666	-0.621	1.766	17.689	-0.000				6	5	5	15	26	30	35	43	165
Chile	10	1989-96	0.275	0.534	0.176	0.103	0.283	0.068				1	2	3	2	5	5	5	4	27
Colombia	4	1990-96	0.289	0.882	-0.018	0.181	0.226	0.170					1	1	1	1	2	2	2	10
Mexico	25	1988-96	-0.211	0.448	-0.126	0.072	0.239	0.031			1	1			10	14	15	20	17	78
Panama	2	1986-96	0.165	0.310	0.129	0.105	0.174	0.071	1	1	2	2	2	2	2	2	2			16
South Africa	40	1986-96	0.093	0.497	0.004	0.126	0.233	0.096	8	11	13	10	19	19	21	23	26	24	26	200
Israel	29	1986-96	0.210	0.811	-0.003	0.153	0.307	0.113	10	10	12	13	16	16	17	18	24	19	5	160
Total	6241		0.130	1.307	0.015	0.156	1.264	0.103	223	266	295	332	388	408	431	458	511	544	191	4052

Table 2. Separate Estimates of Depreciation (δ) by Industry and Returns on Investment (c) by Country, 1985-96

Industry Name	SIC	– δ	Std. Error	n
Agriculture, Forestry, Commercial Fishing	100	-0.027	0.03	370
Metal Mining, Oil and Gas Extraction	10-14	-0.046	0.01	2624
Construction	15-17	0.022	0.01	1983
Food, Kindred Products & Tobacco	20	0.062	0.01	2465
Textiles & Apparel	22	0.078	0.01	1318
Lumber, Wood & Furniture and Fixtures	24	0.053	0.02	649
Paper, Allied Products & Printing,Publishing	26	0.054	0.01	1855
Chemicals (Without Pharmaceuticals: 283)	28	0.078	0.01	2540
Pharmaceuticals	283	-0.058	0.01	2097
Petroleum Refining and Related Industries	29	0.057	0.01	531
Rubber and Misc. Plastics Products	30	0.073	0.01	904
Leather and Leather Products	31	0.055	0.03	169
Stone,Clay,Glass,Concrete Products	32	0.067	0.01	1281
Primary Metal Industries	33	0.071	0.03	1660
Fabricated Metals	34	0.041	0.01	1367
Industrial & Comcl. Machinery, Computer Eq.	35	0.039	0.01	5082
Electrical Machinery, Other Electrical Eq.	36	0.036	0.01	4618
Transportation Equipment	37	0.123	0.01	1859
Measurement Instruments	38	0.016	0.01	3253
Misc. Manufacturing	39	0.080	0.02	584
Transportation	47	0.035	0.01	1551
Communications	48	-0.004	0.02	754
Electric, Gas, Sanitary Services	49	0.057	0.01	1013

Country Name	c	Std. Error	n
Australia	1.06	0.06	1101
Canada	1.17	0.04	3578
Great Britain	0.90	0.02	3666
Ireland	1.18	0.03	117
New Zealand	0.97	0.07	128
USA	1.22	0.02	1595
Austria	0.68	0.12	155
Belgium	0.88	0.04	198
France	0.91	0.03	992
Germany	0.74	0.05	1524
Netherlands	0.98	0.07	482
Switzerland	0.86	0.06	337
Italy	0.61	0.05	339
Spain	0.60	0.12	348
Portugal	0.61	0.15	41
Greece	1.77	0.67	18
Denmark	0.94	0.09	203
Finland	1.27	0.26	152
Norway	1.13	0.16	482
Sweden	0.90	0.08	260

Country Name	c	Std. Error	n
HongKong	1.17	0.10	270
Japan	1.22	0.04	7852
Korea	0.95	0.07	50
Malaysia	1.27	0.00	682
Singapore	1.64	0.08	417
Thailand	1.34	0.18	357
Taiwan	1.15	0.72	24
India	0.82	0.04	117
Indonesia	0.87	0.14	254
Philippines	0.73	0.03	42
Argentina	0.61	0.17	12
Brasil	0.89	0.12	165
Chile	0.80	0.75	27
Colombia	1.11	0.66	10
Mexico	0.61	0.08	78
Panama	1.60	0.19	16
South Africa	1.13	0.10	200
Israel	1.67	0.17	160

Estimation method: OLS, Adj. R-Sq=0.82, n = 40,527, Standard errors are robust to heteroskedacticity (White, 1980)

Table 3. Separate Pooled Regressions for Each Country

	OLS					Fixed Effects					
	δ	s.e.	c	s.e.	Adj R-sq	δ	s.e.	c	s.e.	Adj R-sq	n
Australia	-0.019	0.014	1.06	0.071	0.34	-0.025	0.018	1.15	0.057	0.39	1101
Canada	-0.019	0.009	1.17	0.049	0.32	-0.027	0.012	1.25	0.049	0.36	3578
Great Britain	-0.027	0.006	0.90	0.023	0.86	-0.025	0.008	0.91	0.008	0.90	3666
Ireland	-0.025	0.032	1.14	0.042	0.83	-0.022	0.037	1.13	0.038	0.85	117
New Zealand	-0.043	0.026	0.98	0.091	0.52	-0.050	0.029	1.00	0.100	0.50	128
USA	-0.031	0.005	1.20	0.025	0.29	-0.044	0.006	1.31	0.029	0.33	15956
Austria	-0.119	0.027	0.68	0.121	0.72	-0.085	0.038	0.83	0.073	0.82	155
Belgium	-0.092	0.013	0.93	0.025	0.73	-0.113	0.019	0.98	0.034	0.77	198
France	-0.112	0.011	0.92	0.034	0.90	-0.109	0.013	0.93	0.034	0.92	992
Germany	-0.131	0.012	0.83	0.056	0.59	-0.143	0.012	0.92	0.041	0.65	1524
Netherlands	-0.148	0.015	1.06	0.053	0.87	-0.164	0.015	1.07	0.042	0.90	482
Switzerland	-0.116	0.014	0.91	0.060	0.77	-0.132	0.016	0.97	0.050	0.81	337
Italy	-0.123	0.015	0.73	0.072	0.59	-0.125	0.017	0.76	0.077	0.65	339
Spain	-0.034	0.025	0.53	0.127	0.45	-0.061	0.030	0.81	0.067	0.59	348
Portugal	-0.101	0.039	0.56	0.159	0.43	-0.075	0.051	0.65	0.205	0.54	41
Greece*											18
Denmark	-0.029	0.024	0.95	0.091	0.55	-0.095	0.031	1.15	0.114	0.68	203
Finland	-0.077	0.031	1.23	0.213	0.72	-0.158	0.085	1.28	0.212	0.71	152
Norway	-0.034	0.027	1.10	0.162	0.58	0.012	0.046	1.14	0.133	0.58	199
Sweden	-0.019	0.018	0.86	0.096	0.43	-0.024	0.028	0.85	0.089	0.46	260
Hong Kong	-0.014	0.021	1.03	0.116	0.49	0.006	0.026	1.07	0.150	0.49	270
Japan	-0.023	0.004	1.03	0.051	0.44	-0.037	0.005	1.24	0.048	0.44	7852
Korea	-0.146	0.024	1.03	0.079	0.95	-0.184	0.029	1.04	0.082	0.94	50
Malaysia	0.065	0.024	1.25	0.004	0.96	0.079	0.043	1.25	0.006	0.96	682
Singapore	-0.069	0.019	1.60	0.076	0.78	-0.022	0.024	1.66	0.060	0.78	417
Thailand	0.029	0.057	1.20	0.198	0.77	0.023	0.008	1.22	0.185	0.76	357
Taiwan*											24
India	0.019	0.024	0.75	0.016	0.73	0.066	0.038	0.76	0.022	0.70	254
Indonesia	-0.058	0.043	0.99	0.168	0.46	0.182	0.125	1.02	0.144	0.45	117
Phillipines	0.010	0.069	0.70	0.015	0.83	0.077	0.144	0.70	0.042	0.73	42
Argentina*											12
Brasil	-0.055	0.025	0.89	0.115	0.90	0.990	0.131	0.09	0.082	0.99	165
Chile	0.243	0.073	0.30	0.211	0.54	0.478	0.081	0.12	0.300	0.60	27
Colombia*											10
Mexico	-0.260	0.024	0.70	0.130	0.81	-0.220	0.031	0.65	0.127	0.81	78
Panama*											16
South Africa	-0.061	0.029	1.21	0.124	0.39	-0.059	0.033	1.24	0.146	0.29	200
Israel	-0.022	0.047	1.51	0.163	0.61	-0.060	0.052	1.52	0.176	0.60	160

The OLS and Fixed Effects equations contain time dummies which are not reported.
Standard errors are robust to heteroskedasticity (White, 1980)
*: Not estimated due to the insufficient number of observations

Table 4. Firm Specific Estimates of Depreciation (δ) and Returns on Investment (c)

			Unconstrained OLS						Constrained OLS		
									δ = - 0.04		
	Company Name	SIC	δ	s.e.	c	s.e.	n	R-Sq.	c	s.e.	MV In 1995 *
Great Britain	BTR PLC	371	-0.22	0.09	1.62	0.38	11	0.63	0.94	0.24	19,222.54
	GRAND METROPOLITAN	205	-0.06	0.05	1.05	0.19	10	0.77	1.01	0.15	16,482.51
	GUINNESS PLC	208	-0.18	0.05	2.91	0.36	10	0.88	2.13	0.34	12,587.25
	GE COMPANY PLC	360	-0.09	0.28	1.13	2.23	10	-0.09	0.77	0.65	10,550.47
	ICI-IMPERIAL CHEM INDS	280	-0.24	0.07	1.31	0.42	10	0.49	0.30	0.27	9,221.18
	SCOTTISH & NEWCASTLE	208	-0.03	0.07	1.08	0.34	10	0.51	1.11	0.15	5,505.84
	BLUE CIRCLE INDS	327	-0.14	0.13	1.28	0.58	11	0.28	0.88	0.22	3,753.17
	RMC GROUP PLC	324	-0.00	0.05	0.87	0.18	11	0.69	0.91	0.16	3,722.65
	GKN PLC	371	-0.12	0.13	0.83	0.41	11	0.24	0.62	0.19	3,119.13
	BURMAH CASTROL	291	0.06	0.11	0.41	0.71	11	-0.07	0.99	0.35	2,893.80
Germany	DAIMLER-BENZ AG	371	-0.13	0.16	0.44	0.29	11	0.12	0.30	0.14	51,272.81
	VOLKSWAGEN-VW AG	371	-0.22	0.22	0.51	0.35	10	0.11	0.23	0.07	32,177.87
	HOECHST AG	280	-0.07	0.26	0.44	0.70	11	-0.06	0.36	0.16	31,767.39
	BAYER AG (GROUP)	280	-0.15	0.45	0.71	1.41	11	-0.08	0.38	0.20	31,095.48
	BMW	371	-0.22	0.12	0.74	0.21	11	0.53	0.45	0.10	25,072.65
	BASF AG	280	0.10	0.21	-0.06	0.42	11	-0.11	0.20	0.16	21,461.37
	THYSSEN AG	350	-0.43	0.20	1.37	0.55	10	0.36	0.30	0.16	11,815.16
	LINDE AG	353	-0.13	0.11	1.33	0.55	11	0.32	0.94	0.29	7,448.57
	SCHERING AG	283	-0.18	0.31	0.89	1.16	10	-0.05	0.39	0.33	6,719.31
	MAN AG	371	-0.18	0.21	0.46	0.40	10	0.04	0.21	0.14	5,115.59
Japan	HITACHI LTD	357	-0.17	0.25	0.99	1.09	11	-0.02	0.44	0.21	3,483,240.02
	MITSUBISHI HEAVY INDS	350	-0.01	0.13	1.41	2.20	10	-0.07	1.80	1.26	3,118,965.02
	TOSHIBA CORP	357	-0.16	0.15	1.47	1.01	11	0.10	0.68	0.33	2,630,757.40
	HONDA MOTOR CO	371	-0.01	0.15	0.60	0.60	11	0.00	0.72	0.20	2,281,696.34
	NISSAN MOTOR CO	371	-0.21	0.17	1.15	0.59	10	0.24	0.57	0.20	2,115,520.36
	CANON INC	357	-0.09	0.10	1.13	0.52	11	0.27	0.87	0.24	1,570,787.25
	KAWASAKI STEEL	331	0.48	0.15	-7.70	2.38	11	0.49	0.08	1.40	1,254,258.54
	SANYO ELECTRIC	357	-0.12	0.10	1.26	0.43	10	0.46	1.02	0.27	1,042,559.82
	KOBE STEEL LTD	331	0.14	0.13	-1.57	1.69	11	-0.01	0.21	1.08	949,860.10
	NIPPON OIL CO LTD	291	-0.06	0.10	1.20	0.94	10	0.07	1.05	0.51	851,011.61
USA:	GENERAL ELECTRIC	360	0.01	0.03	0.90	0.07	10	0.95	0.96	0.07	235,478.86
	FORD MOTOR	371	-0.13	0.03	0.95	0.03	10	0.99	0.90	0.03	182,119.00
	GENERAL MOTORS	371	-0.18	0.06	0.88	0.09	10	0.92	0.76	0.08	123,761.79
	EXXON CORP	291	-0.08	0.08	1.60	0.87	10	0.21	1.16	0.29	110,006.00
	COCA-COLA	208	0.22	0.12	-0.27	1.78	10	-0.12	2.77	1.20	97,047.20
	PHILIP MORRIS	200	0.04	0.08	0.89	0.45	10	0.25	1.19	0.33	90,839.09
	MERCK & CO	283	-0.55	0.50	13.19	8.12	10	0.15	4.96	1.67	82,439.12
	IBM CORP	357	-0.14	0.10	0.70	0.73	10	-0.01	0.05	0.33	71,681.85
	JOHNSON & JOHNSON	283	-0.13	0.34	2.64	2.92	10	-0.02	1.86	0.56	57,804.64
	PEPSICO INC	284	-0.11	0.13	1.50	0.64	11	0.31	1.20	0.27	37,639.94

*: In millions of respective country currency units

Table 5. Firm by Firm OLS Regressions with N>=7

		Unconstrained OLS				Constrained OLS: δ = - 0.04	
		δ		c		c	
Country	n	mean	median	mean	median	mean	median
Australia	93	-0.094	-0.074	1.54	1.24	1.18	1.00
Canada	313	-0.078	-0.067	1.41	1.06	1.26	0.97
Great Britain	356	-0.109	-0.091	1.35	1.09	1.03	0.94
Ireland	10	-0.143	-0.095	1.90	1.96	1.45	1.47
New Zealand	11	-0.061	-0.053	0.96	0.91	0.94	0.90
USA	1368	-0.162	-0.106	1.95	1.39	1.42	1.07
Austria	11	-0.153	-0.106	0.87	0.91	0.55	0.43
Belgium	15	-0.107	-0.082	0.90	0.93	0.73	0.68
France	64	-0.164	-0.148	1.25	1.08	0.84	0.77
Germany	124	-0.177	-0.148	1.15	1.14	0.70	0.57
Netherlands	43	-0.146	-0.146	1.01	0.89	0.75	0.74
Switzerland	20	-0.100	-0.151	0.85	0.91	0.75	0.66
Italy	22	-0.137	-0.129	0.79	0.71	0.52	0.49
Spain	24	-0.143	-0.068	1.02	0.89	0.74	0.72
Portugal	3	-0.211	-0.117	0.93	0.76	0.43	0.63
Greece	1	0.043	0.043	1.94	1.94	2.04	2.04
Denmark	10	-0.086	-0.109	0.96	1.00	0.82	0.81
Finland	10	-0.062	-0.073	0.86	1.08	1.03	1.05
Norway	17	-0.014	-0.079	0.70	1.07	0.95	1.01
Sweden	13	-0.043	-0.062	0.68	0.93	0.70	0.89
HongKong	19	-0.146	-0.104	3.12	1.99	2.12	1.77
Japan	804	-0.080	-0.055	1.71	1.45	1.33	1.25
Korea	2	-0.095	-0.095	0.83	0.83	0.76	0.76
Malaysia	32	0.042	0.046	1.24	1.05	2.04	1.18
Singapore	28	-0.050	-0.011	1.74	1.26	1.58	1.58
Thailand	13	-0.169	-0.192	1.78	1.02	1.48	0.92
India	3	0.103	0.163	1.08	0.71	1.59	1.67
Phillipines	2	0.155	0.155	0.10	0.10	1.10	1.10
Brasil	4	-0.267	-0.368	0.83	0.81	0.91	1.01
Panama	2	0.044	0.044	1.31	1.31	1.52	1.52
South Africa	15	-0.244	-0.141	3.87	1.80	2.01	1.28
Israel	13	0.038	-0.023	1.31	1.23	1.48	1.55

Table 6. Estimating cs by Source of Funds

		−δ	ς	Adj-Rsq	−δ	CF	ΔD	ΔE	RD	A	N	Adj-Rsq
Anglo-	OLS	0.022 (4.77)	0.97 (22.20)	0.65	0.008 (1.17)	0.64 (5.41)	1.03 (39.31)	1.00 (14.75)	1.36 (14.70)	0.43 (3.23)	39841	0.66
Saxon	FE*	0.027 (4.79)	0.99 (17.36)	0.67	0.11 (16.69)	0.91 (14.83)	0.95 (41.52)	0.95 (16.73)	2.94 (13.99)	2.12 (7.37)	39841	0.68
	OLS				-0.04 (8.72)	0.62 (6.00)	1.05 (40.46)	1.01 (14.00)	-	-	39841	0.65
	FE*				-0.001 (0.19)	0.91 (14.82)	1.02 (47.16)	0.98 (16.55)	-	-	39841	0.67
Asian	OLS		1.25 (57.09)			1.71 (9.75)	1.01 (12.78)	1.25 (78.20)	-.44 (2.43)	1.40 (1.52)		
Tigers	FE		1.26 (72.12)			3.07 (8.13)	0.98 (12.15)	1.20 (53.57)	0.10 (0.34)	8.43 (7.21)		
	OLS					1.18 (5.90)	1.02 (12.71)	1.27 (77.86)	-	-		
	FE*					3.84 (7.69)	1.00 (13.44)	1.20 (70.11)	-	-		
Other Asia	OLS		0.32 (1.02)			2.23 (2.70)	0.50 (1.83)	0.23 (0.69)	2.13 (1.45)	-2.21 (0.50)		
	FE		0.25 (0.76)			5.80(4.59)	0.43 (1.35)	0.22 (0.71)	11.15 (2.13)	-9.03 (0.65)		
	OLS					1.96 (3.32)	0.47 (1.77)	0.23 (0.66)	-	-		
	FE*					6.27 (5.79)	0.52 (1.69)	0.21 (0.67)	-	-		
Germanic	OLS		0.86 (28.19)			0.49 (8.42)	0.96 (74.01)	1.07 (25.28)	-.09 (1.20)	0.25 (0.98)		
	FE		0.95 (30.72)			0.83 (7.41)	0.91 (20.84)	1.04 (22.68)	0.65 (3.13)	1.75 (1.68)		
	OLS					0.26 (5.20)	0.98 (160.52)	1.06 (24.99)	-	-		
	FE*					1.00 (8.65)	0.95 (51.00)	1.05 (23.13)	-	-		
Southern	OLS		0.55 (6.41)			0.48 (5.15)	0.91 (21.46)	0.66 (5.49)	-0.04 (0.37)	-0.75 (1.29)		
Europe	FE		0.80 (13.75)			0.84 (4.67)	0.89 (18.37)	0.66 (6.01)	-0.24 (1.15)	4.97 (3.89)		
	OLS					0.15 (1.87)	0.92 (21.52)	0.61 (5.29)				
	FE*					0.95 (5.25)	0.89 (18.59)	0.68 (5.91)				
Scandinavia	OLS		1.10 (8.96)			0.99 (3.98)	1.01 (15.25)	1.43 (3.39)	1.48 (2.23)	-1.91 (2.25)		
	FE		1.22 (8.39)			2.18 (6.82)	0.89 (15.36)	1.54 (4.04)	3.71 (2.76)	-1.18 (0.29)		
	OLS					0.85 (4.53)	1.01 (14.49)	1.41 (3.30)	-	-		
	FE					2.36 (7.50)	0.93 (17.31)	1.53 (4.04)	-	-		

Both equations are estimated with time effects. t-values (in parantheses) are calculated using White(1980) correction for standard errors.
*: No. of Firms 6076, T-bar: 6.55 (The firms are observed on average on 6.55 years)

Table 7. OLS and Fixed Effects regressions using reported Advertising and R D Data.

			Total							
		$-\delta$	Investment	CF	ΔD	ΔE	A	RD	Adj-Rsq	n
USA	OLS	0.040 (4.01)		1.03 (19.13)	0.99 (23.69)	1.97 (30.85)	0.56 (5.15)	0.89 (8.37)	0.29	5027
	FE	0.019 (15.75)		1.24 (17.08)	0.90 (19.72)	1.86 (24.59)	1.23 (6.75)	3.45 (17.52)	0.34	5027
	OLS	0.054 (6.41)	1.09 (39.24)						0.25	5027
	FE	0.007 (9.62)	1.28 (38.33)						0.30	5027
Canada	OLS	0.041 (1.58)		0.81 (5.39)	1.10 (8.80)	1.70 (12.68)	1.25 (1.94)	1.56 (4.10)	0.31	716
	FE	0.053 (1.03)		1.41 (6.16)	1.07 (8.25)	1.95 (11.81)	3.83 (1.91)	1.26 (1.70)	0.38	716
	OLS	0.028 (1.30)	1.22 (14.87)						0.29	716
	FE	0.105 (1.82)	1.39 (14.73)						0.36	716

Canadian Sample had only 86 observations with reported advertising and R&D data.
Results here are based on a sample with reported R&D data and (716-86) = 630 approximated advertising figures.

Figure 1: Possible Bias with Cross-Section Estimates

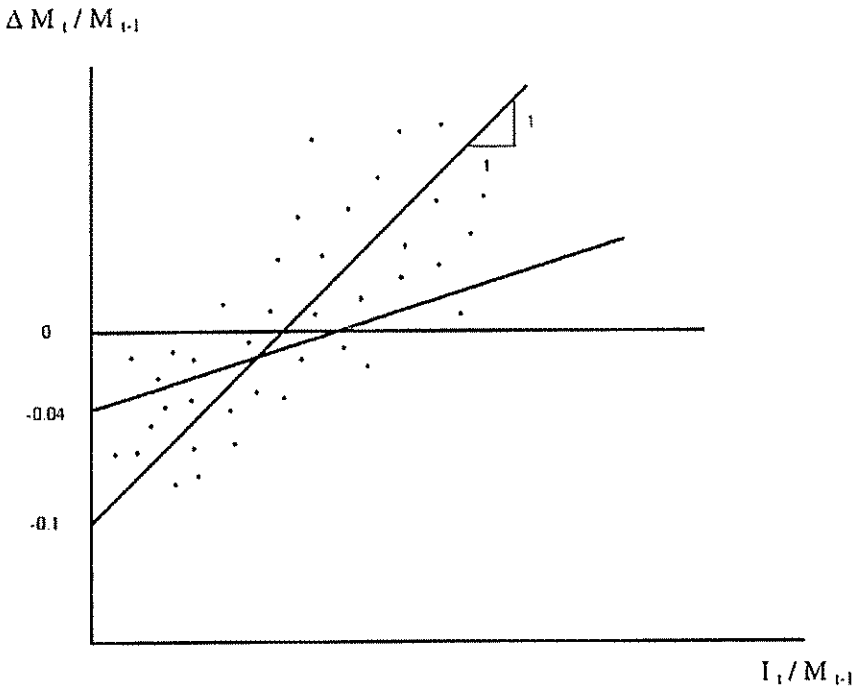
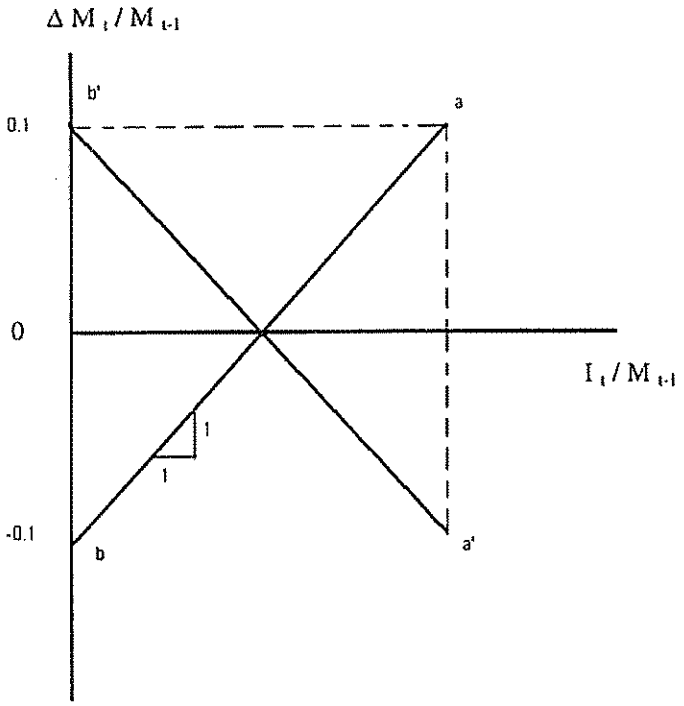


Figure 2: Possible Bias with Single-Firm Estimates



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APPENDIX

Appendix: Data and Calculation of Variables

Data are taken from the 1996 versions of the Standard and Poors' Compustat (USA and Canada) and Global Vantage (all remaining countries) tapes. These tapes contain income, balance sheet, and stock market information for 18581 corporations traded on the stock exchanges of the corresponding country. The sample period for the data is from 1985 through 1996. We exclude 8066 firms whose SIC codes were greater than 5000 (i.e., those that are active in the financial sector and services). Most of the sample firms (80 %) are active in manufacturing industries. Utilities are 8 % of the sample firms. 12% come from the agriculture, construction, or mining sector.

The variables (Compustat data item numbers in parentheses: we use the corresponding variables from the Global Vantage data base) are as follows. To compute the market value, we use the market value of common stock, and the book value of total debt and preferred stock. The market value of common stock is taken as the end-of-fiscal year number of shares (54) multiplied by the end-of-fiscal year price per share (199). We use the book value of total debt (9+34) instead of its market value. An accurate estimate of the market value of a firm's outstanding debt obligations requires knowledge not only of the associated coupon and maturity structure but also of the credit quality of each component. Because such information is not available from standard data sources, alternatives have been developed to approximate market values. There is some evidence that book values slightly overestimate market values, however the null hypothesis that the means of the distributions of annual ratios of market (calculated using the NBER methodology) to book values are identical cannot be rejected at the 95% confidence level for the 1975-91 period for a large sample of NYSE companies (Lewellen and Badrinath, 1997). The preferred stock is taken to be, in order and as available, redemption value (56), liquidating value (10), or par value (130).

The investment of a firm in year t is meant to represent all funds available to the company which could have been paid out directly to shareholders but were instead retained. Thus, investment in year t is defined as

$$I = IB + DEP - DIV + NND + NNE + R\&D + ADV,$$

where IB (18) is income before extraordinary items (i.e. profits after taxes and interest), DEP (14) is accounting depreciation and DIV (21) is total dividends paid in the fiscal year. These come directly from the annual income statements of each company. Net new debt (NND) is derived by taking the change in total debt since the previous period. Net new equity (NNE) is calculated as sales (108) less purchases (214) of common and preferred stock. Where these items are not available, NNE is approximated by the change in number of common shares outstanding multiplied by the average share price ((197+198)/2).

R&D expenditures (46) are reported on Compustat and Global Vantage databases for many companies. Missing values are interpolated from surrounding values on the premise that ratios to sales are fairly constant over short periods of time, or approximated using company R&D data at the 3-digit SIC code level from the FTC's Annual Line of Business Reports. Approximately 85 % of all observations for the USA are reported. The remaining figures are either interpolated using the surrounding values or proxied using FTC's Annual Line of Business Reports. For Canada and for a large number of other countries, the same figures are about 20 % and 80 %, respectively. Another exception is Japan with about 60% of reported R&D expenditures.

Advertising expenses (45) are not reported on Global Vantage database. Advertising expenditures for all companies (except for USA and Canada) are proxied using aggregate advertising-to-sales ratios at the 4-digit SIC code level from a recent study by Rogers and Tokle

(1993) (RT, henceforth) who use firm level data from Leading National Advertisers (LNA) to compute 4-digit advertising sales ratios. The remaining advertising figures are approximated by multiplying the actual company sales by 2-digit advertising to sales ratios that come from the 1990 IRS reports on Corporation Returns (Table 6-Balance Sheets, Income Statements, Tax, and Selected Other Items, by Major Industry). About one third of all companies in the USA report advertising expenditures. Approximately 20% of the remaining advertising expenditures are proxied using 4-digit ratios from RT (1993) and about 20 % are proxied from surrounding values. The rest is calculated from 2-digit advertising to sales ratios from the IRS reports. Only 6% of all Canadian companies in our sample have reported advertising expenses, 20% of all observations are approximated using RT (1993) ratios and the remaining ones come from the IRS reports. For the remaining countries, about 25 % of all advertising figures are proxied using RT (1993) ratios and the remaining figures are again proxied from IRS reports. Advertising expenditures proxied using the RT (1993) ratios explain about 70% of the variation in reported advertising figures and slightly underestimate the reported figures. The IRS estimates of advertising explain 68% of the variation in reported advertising figures and again underestimate the reported figures. The best fit is obtained with company specific estimates of advertising figures which produce an Adjusted R-squared of 0.94 again these estimates tend to understate the true advertising expenditures.

All variables are deflated using the CPI (1987=1.00) of the respective country. This index is the appropriate one because the returns are measured in terms of the shareholders' purchasing power. The main data source for the CPI is the 1995 version of the World Data (World Bank Indicators), the missing years (1995 and 1996) are taken from the OECD's MEI (Main Economic Indicators) and the non-OECD member countries' CPI for these two years is collected from various sources.