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CAPITAL MARKETS, OWNERSHIP AND DISTANCE

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ABSTRACT

Capital Markets, Ownership and Distance*

This paper uses a new data-set to examine how internal capital markets and foreign ownership affect investment. Our data allow us to compare investment behaviour of listed subsidiaries with stand-alone firms while controlling for investment opportunities of parent and subsidiary firms. We evaluate how the size of ownership and the geographical proximity of majority owners to their subsidiaries affect firm investment efficiency. We find that the investment of subsidiaries is more sensitive to investment opportunities than that of stand-alone firms and falls when investment opportunities of parent firms improve. This suggests that there are internal capital markets that reallocate funds towards units with better investment opportunities. We find that investment allocation is most efficient where parents have modest ownership stakes and are distant from their subsidiaries and when subsidiaries operate in well developed financial markets. These results indicate that influence costs imposed by dominant parents may outweigh their potential informational benefits, especially when subsidiaries are located in countries with weaker financial development.

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1 INTRODUCTION[1]

There is an active debate about the impact of foreign ownership on host country economies. Policymakers in many countries including Continental Europe and the United States have sought to protect their domestic producers from the threat of foreign acquisitions. Others, in particular the United Kingdom, have taken a more benign view of foreign ownership regarding it as part of the efficient allocation of corporate control. It is often presumed that just as multinationals seek to avoid domestic taxes by shifting earnings to low tax regimes, so too they allocate capital to maximize their global returns irrespective of their impact on particular foreign subsidiaries or countries.

While foreign ownership is high on the policy agenda, there is little academic evidence on its significance for investment. For example, little is known about how investment in subsidiaries is affected by investment opportunities of parent firms or how ownership of parent firms and proximity to their subsidiaries affect investment efficiency. To date, research on these questions has been hampered by lack of financial data on multinational subsidiaries. We overcome this problem by creating a new data-set. From a population of about 30,000 listed firms worldwide we identify nearly 5,000 separately listed subsidiaries and their parents that allow us to establish the effect of ownership on investment with a greater degree of precision than has been possible to date.

The investment behaviour of firms inside and outside multinational networks relates to two distinct debates in the literature – on the existence and effects of internal capital markets and on the impact of foreign ownership on parent and host economies. Members of firm networks have access to sources of internal finance that their stand-alone counterparts may not. The existing literature on the comparative performance of subsidiaries and stand-alone firms – the bright versus the dark side of internal capital markets – highlights two opposing effects. On the one hand, in the presence of capital market imperfections, subsidiaries benefit from the access to external markets that parents provide (Inderst and Muller, 2003) or are able to access finance from other units within the multinational network (Stein, 2003). Moreover, parents may also impose discipline on subsidiaries by reallocating funds from those with greater access to those with greater need of resources (Stein, 2002). On the other hand, diversified conglomerates generally trade at lower value than comparable portfolios of specialized firms (Bhagat, Shleifer and Vishny, 1990, Berger and Ofek, 1996). Brusco and Panunzi (2000) claim that redistribution of capital between divisions weakens managerial incentives and Milgrom (1988), Milgrom and Roberts (1988) and Meyer, Milgrom and Roberts (1992) point to the wasteful influence activities in which managers of large organizations engage. This leads to soft budget constraints that cause internal capital markets to allocate too many resources to low value divisions and too few to high value divisions (Lamont 1997, Rajan, Servaes and Zingales, 2000, Scharfstein, 1998, Scharfstein and Stein, 2000, Shin and Stulz, 1998 and Wulf, 1999).

[1] We are extremely grateful for comments and suggestions made on an earlier draft by Nick Bloom, Richard Blundell, Michael Devereux, Andrew Glyn, Tomasz Mickiewiecz, Imran Rasul and Jeremy Stein and in seminars or conferences at CEDI (Brunel), CEP (LSE), RIETI, Tokyo and the WZB, Berlin.

We contribute to this debate by introducing new findings from a dataset of publicly listed subsidiaries with majority owners. Existing research on the efficiency of the internal capital markets within diversified firms has been plagued by inadequate proxies for the investment opportunities of individual divisions of conglomerates. We analyze investment in a sample of subsidiary firms in more than 60 countries, which are more than 50 per cent owned by a parent firm, and which are also separately listed on stock markets. Since both parents and subsidiaries are quoted we can separately observe their investment opportunities as proxied by their Tobin's *Q*. Our data also provide proxies for relationships between parents and subsidiaries that enable us to capture the role of information and influence activities on resource allocation in the firm. We use the size of the parent's stake in the subsidiary, the geographical distance between the two and the discrepancy in the level of financial development between subsidiary and parent countries as proxies for the channels through which information or influence effects may operate.

There is no consensus in the existing theoretical or empirical literature as to whether greater proximity along these dimensions is likely to enhance or reduce the responsiveness of subsidiary investment to the parent's investment opportunities. Concentrated owners may be able to exercise stronger governance (Allen and Gale, 2000) than dispersed owners but may intervene excessively and undermine the autonomy of local management (Burkhart, Gromb and Panunzi, 1997). Financial relationships and the quality of information about subsidiaries may weaken with distance between parents and subsidiaries (Portes and Rey, 2001 and Wei and Wu, 2002)[2] but so too may influence costs. Foreign affiliates may be able to substitute internal for external borrowing when operating in poorly developed financial markets (Desai, Foley and Hines, 2003) but may also be particularly prone to adverse influence costs.[3]

Our results also bear on the debate on the impact of foreign capital on host economies. On the one hand, foreign capital may increase the investment rate and bring various technology and productivity advantages that spill over to domestic firms. On the other hand, they may crowd out domestic firms and introduce instability by facilitating international transmission of shocks and exposing economies to increased volatility.[4] Desai and Foley (2005) argue that parents and subsidiaries exhibit highly correlated investment patterns, suggesting that foreign firms may be a transmission mechanism for macroeconomic shocks. Given the difficulty in describing the effects of foreign

[2] Grinblatt and Keloharju (2001) find that investors are more likely to trade the stocks of firms that are proximate, communicate in the investor's native tongue, and have similar cultural attributes. Guiso, Sapienza and Zingales (2004) find that even in a country with uniform regulatory and institutional structures (Italy) access to finance for small firms depends on local financial development: distance matters. Buch (2005) finds that banks hold significantly lower assets in distant markets. In a study of loans in Pakistan, Mian (2005) finds that foreign banks do not lend to 'informationally difficult' yet fundamentally sound firms. Lending declines as geographical and cultural distance between the bank's headquarters and its local branches rises.

[3] See, for example, the discussion of the behaviour of MNEs in India toward their listed subsidiaries in 2000 ('Why Bombay's Blue Chips Are Down: Local investors suspect multinationals give them a raw deal' Business Week Online October 30th 2000).

[4] On the debate of the merits of international financial integration see Bhagwati (1998), Eichengreen (2003), Obstfeld (1998), and Rodrik (1998).

ownership on the host economy, several papers have focused on identifying specific channels through which this may operate. In this spirit, our examination of investment in foreign-owned subsidiaries may help to identify relevant determinants of whether foreign owners support their subsidiaries through down-turns as suggested by the 'bail out' hypothesis or whether they are the first to withdraw their investment in the face of negative shocks (Lipsey 2001). In the sample of firms we examine in this paper we find that in the Asian crisis, foreign-owned firms cut their capital investment by 51% while domestically owned firms cut theirs by 28% between 1996 and 1998.[5]

The paper is organized as follows. Section 2 explains how the dataset was created and provides the empirical motivation for the paper. Section 3 outlines the methodological problems in the existing literature, explains the advantages of our data set and describes our empirical strategy. Sections 4 and 5 report our results. Section 6 summarizes our findings.

2 DATA AND EMPIRICAL MOTIVATION

Our sample is obtained from the OSIRIS database provided by Bureau van Dijk Electronic Publishing, which gathers its information from several sources including World'Vest Base, Fitch, Thomson Financial, Reuters, and Moody's. This database is a "comprehensive database of listed companies … around the world" and provides information on 28,915 firms listed on the world's stock exchanges. Table A1 in the appendix presents the distribution of these firms by country. The 69 countries in the data base include 23 'old' OECD countries including Japan (19,576 firms), ten former Soviet bloc transition countries (281 firms), eleven Asian countries (6,456 firms), 467 firms from African countries, 910 from the Middle East and 1,225 from Central and Latin America.

2.1 Data

OWNERSHIP DATA

The OSIRIS data base records a firm as having a parent if another entity has financial and legal responsibility for it, i.e., it holds more than 50 per cent and less than 100 per cent of the subsidiary's equity. This is a strong definition of ownership, which enables us to observe situations in which the parent firm has enough authority to control the financial decisions of its subsidiaries and operate an internal capital market.

Table 1 shows how the listed firms in selected countries are divided into stand-alone and owned firms, those that are foreign-owned and owner-firms. In the sample as a whole, three-quarters of the firms are stand-alone. This is typical of the US and is similar to the UK (71%). Stand-alone firms are markedly less dominant in Germany (48%) as well as

[5] From a sample of 1,100 listed firms in Hong Kong, Indonesia, Korea, Malaysia, the Philippines, Singapore and Thailand, which reported their capital expenditure as a proportion of total assets. See Section 2 for details for details of the sample and definitions of variables.

in most Continental European economies, where large inter-corporate shareholdings are much more prevalent than elsewhere in the advanced economies. Stand-alone firms are more dominant in India (78%), Japan (83%) and China (85%). The vast majority of parent firms own subsidiaries abroad (Columns 5 and 6). It is interesting to note that despite having the most accessible takeover market of any country in the world, the UK has an unusually high proportion of owners of foreign firms, even by the standards of the US.

Table 1. Composition of the sample by firm type and for selected countries

	1	2	3	4	5	6
Country	Firms	Stand-alone	Owned	Foreign-owned	Owner of firm(s)	Owner of foreign firm(s)
All	28,915	74	23	8	3	3
China	1,316	85	15	14	0	0
Germany	756	48	47	13	4	4
India	736	78	21	9	1	1
Japan	3,598	83	14	8	2	2
United Kingdom	1,869	71	20	9	10	9
United States	7,751	76	20	3	4	4

Notes: Columns 2-6 show the percentage of total firms in the respective category (the full list of countries is shown in Appendix 1). Column 2 shows firms that have no listed parents and no listed subsidiaries; Column 3 shows firms that report the identification number of a firm that is their ultimate (parent) (some of these firms may not be in the regression sample because we were unable to successfully match the parent); Column 4 shows firms that report the identification number of a firm that is their ultimate (parent) in another country.

We discard firms from the sample if they experienced a change in ownership over the period, or if their ownership information is unavailable, or if key financial information (matched to and collected from Datastream) is missing over the period 1994 to 2005. OSIRIS only reports ownership at one point in time, 2005, but we have older ownership data from Dun and Bradstreet, which enables us to identify ownership in 1994. After matching these data we exclude firms from the sample if the location of their owner is different in these two datasets. Because we have no information on when ownership changed, we cannot make use of the subsample of firms for which ownership changes. This leaves us with 4,886 subsidiaries which have been continuously owned and controlled by 1,028 distinct global ultimate firms over the period. By excluding subsidiaries that were spun off or acquired between 1994 and 2005 we minimize the selection problem, discussed further in Section 3, which characterizes the use of spin-offs to test for the operation of an internal capital market. Figure A1 in the appendix illustrates how the sample was constructed.

Table 2 presents basic descriptive data for the sample firms. Foreign owners are the largest firms, with median employees of 74,598, foreign-owned firms have 7,252, and

stand-alone domestic firms have an average number of 8,023. The size of the shareholding of the largest foreign owner is around 60% in the owned firms and less than 10% in the stand-alone firms. In addition to the size of ownership, we also observe the country in which parent firms are located. The average distance of foreign-owned firms from their parents is 40% of half the circumference of the world. The foreign-owned firms operate in economies in which stock markets are significantly smaller and which have lower financial development than is the case for stand-alone or owner firms in the sample (see Table 2).

Table 2. Descriptive characteristics of sample firms

	1	2	3	4	5	6
		Stand-alone	Owned	Foreign-owned	Owner of firm(s)	Owner of foreign firm(s)
Firms		16,272	4,886	2,833	1,028	969
Date of Incorporation		1974	1969	1968	1963	1961
Employees		8,023	6,643	7,252	63,208	74,598
Investment/ Total Assets	Mean	0.045	0.051	0.050	0.051	0.051
	Std dev.	0.051	0.052	0.053	0.045	0.044
	Median	0.032	0.036	0.035	0.042	0.042
Cash Flow / Total Assets	Mean	0.063	0.070	0.066	0.075	0.075
	Std dev.	0.076	0.074	0.073	0.062	0.060
	Median	0.061	0.069	0.065	0.074	0.074
Sales growth	Mean	0.070	0.068	0.069	0.092	0.094
	Std dev.	0.250	0.244	0.252	0.233	0.233
	Median	0.071	0.069	0.074	0.085	0.086
Q	Mean	1.58	1.6	1.59	1.96	1.96
	Std dev.	1.06	1.06	1.08	1.05	1.05
	Median	1.32	1.33	1.31	1.74	1.74
Shareholding of Largest Owner		9.02	61.91	57.45		
Distance to owner/(π.r) %	Mean		35.8	38.3	34.5	35
	Std dev.		23.7	22.4	25.1	24.9
	Median		36.1	40.4	32	32
Stock Market Size/GDP %	Mean	60.3	49.6	53.2	58.6	58.1
	Std dev.	32	30.9	34	27.7	28
	Median	53.2	53.2	53.2	53.2	53.2
Private Sector Credit/GDP %	Mean	145	129	129	143	141
	Std dev.	69.1	61.5	70.6	56.6	56.3
	Median	139	104	104	121	121

Notes: These data are for the firms for which we have ownership and location and financial data (i.e. the regression sample) whereas Table 1 includes all firms for which we have ownership and location data. Investment on total assets is Datastream item 08416 Asset Utilization Ratio measured as the annual item

Capital Expenditures / (Total Assets - Customer Liabilities on Acceptances). Cash-flow is Datastream item 04860 (Net cash flow from operating activities) divided by total assets. *Q* is the share price divided by the book value per share (Datastream PTBV). Sales growth is the log difference in sales in US$ from Datastream item number 07240. Distance to owner is the great circle distance between capital cities of the two countries measured as a percentage of half the earth's circumference (i.e. max is 100). Employees is Datastream item WC07011.

FINANCIAL AND INVESTMENT DATA

The OSIRIS data-base reports a unique identification number for each parent firm that enables us to match firms with financial data on their parents. This was merged with the market and financial data from Datastream. We have time series observations on firms over the period from 1994 to 2005. The average number of observations per firm is six.

Capital expenditure measures funds used to acquire fixed assets including expenditures on plant and equipment, structures and property but excluding any expenditures associated with mergers or acquisitions. To account for differences in size and for inflation over time and to avoid heteroscedasticity we divide investment by total assets at the beginning of the period. Table 2 shows that the investment ratio of owned firms and of owners is higher (at around 5% of assets) as compared with that of stand-alone firms (4.5%).[6]

We use a measure of Tobin's *Q* as a proxy for the assessment by the market of the investment opportunities available to the firm. Theoretically, marginal *Q* should be used as the approximation of present and expected future investment opportunities but since marginal *Q* is unobservable, we use average *Q* as a proxy. We measure average *Q* as the firm's market-to-book ratio at the end of the prior fiscal year. The parent's data is given in consolidated form, so we take out the effect of the subsidiary to extract the parent's *Q*.[7] Tobin's *Q* for parent firms (1.96) is significantly in excess of that of stand-alone and owned firms (1.6).

Liquidity can be calculated in two different ways, either as a stock of cash or as cash flow. The flow measure has proved to be the empirically more successful proxy for liquidity in the past (Devereux, 1989). Hence, we use cash flow as a proxy for the liquidity constraints of the firm. In accordance with our procedure with respect to investment, we adjust for size and inflation by dividing cash flow by total assets at the start of the year. Cash flow is between 6% and 7.5% of assets, with the lowest value in stand-alone firms and the highest in owner firms.

There is an active debate as to whether the significance of cash flow terms in investment equations can be interpreted as evidence of financing constraints. Based on firms' annual

[6] Note that we took the effect of subsidiary variables out of consolidated data in order to get parent's data e.g. Total *Q* = asset-weighted sum of parent and subsidiary *Q*; from which we calculate unconsolidated *Q*.
[7] We use the employment in the subsidiary *Ei* and the total consolidated employment, E_T to determine the firm's Q_j which we call parent's *Q*, but really refers to the *Q* of the entire entity except the subsidiary. The firm's consolidated *Q* is $Q_T = ((Q_i*E_i + Q_j*E_j)/E_T)$. So parent's *Q* is $Q_j = (Q_T*E_T - Q_i*E_i)/E_j$.

reports and managements' discussions of liquidity requirements, Kaplan and Zingales (1997) conclude that it cannot while Fazzari, Hubbard and Petersen (2000) contend that Kaplan and Zingales' methodology is flawed. Gomes (2002) argues that the presence of cash flow variables in investment equations is neither a necessary nor sufficient condition for capital market imperfections. They are not necessary since financial constraints should be reflected in firm valuations and therefore in marginal *Q* and they are not sufficient because non-linearities may be captured by cash flow in linear investment equations. Cooper and Ejarque (2001) demonstrate that the inclusion of profit variables may reflect market power rather than capital market imperfections in investment equations that use average in place of marginal *Q*. For this reason we are cautious in the following analysis to interpret cash flow variables as evidence of financing constraints. We return to these issues in the discussion of our econometric strategy in Section 3.

THE SAMPLE OF LISTED SUBSIDIARIES

We are concerned that our results for listed firms may not be easily generalized to the broader population of multinational subsidiaries. Table 3 provides summary information about the characteristics of listed and unlisted subsidiaries of a sub-sample of the firms in our sample. The sample comprises all of the firms – a total of 51 – that are parents of at least one of the top 2,000 listed companies and at least one of the top 2,000 unlisted companies in Western Europe. These data show that parents typically have over 50% more unlisted than listed subsidiaries. The listed subsidiaries are larger in terms of both assets and employment. The median ownership stake of the parent of unlisted subsidiaries is 100% and 57% for listed subsidiaries. In general the differences between the two types of firms suggest that listed subsidiaries are larger and more independent than their unlisted counterparts. This indicates that our choice of sample makes it less likely that we would observe an effect of parental control on the investment decisions of the subsidiary.

Table 3. Comparison between listed and unlisted subsidiaries

		Listed Subsidiaries	Unlisted Subsidiaries
Number of subsidiaries in this sample	Mean	1.37	2.16
Total Assets (USD)	Mean	12,000,000	4,900,000
	Std. dev.	29,000,000	5,300,000
	Median	4,200,000	2,900,000
Employment	Mean	31,583	13,995
	Std. dev.	54,700	9,175
	Median	13,352	11,143
Share of ownership	Mean	55.2	95.9
	Std. dev.	22	14.1
	Median	57	100

Notes: The sample is all the firms (51 of them) that are parents to at least one of the top 2,000 listed companies and at least one of the top 2,000 unlisted companies in Western Europe.

2.2 Empirical motivation

Affiliate firms may benefit from liquidity spillovers in their internal capital markets. Improved access to internal capital markets may increase financing flexibility. There may be 'more money' available if integration leads to a larger total entity, which can raise more external finance than could the individual entities themselves as suggested by the data in Table 4, which compares a number of characteristics of subsidiaries and their parents. Although cash flow and investment relative to total assets are virtually identical in parent firms and their subsidiaries, the total assets of parent firms are more than ten times as large and their cash on hand is far higher (see Table 4).

Table 4. Comparison between subsidiaries and their owners

	Parent	Subsidiary
Investment/Total Assets	0.0555	0.0581
Cash flow/Total Assets	0.0924	0.0928
Total Assets	23,230,472	1,818,149
Cash flow (USD)	938,883	107,047
Cash (USD)	18,655,999	93,517
Stock Market Size in Parent or Subsidiary Country (% GDP)	58.2	55.0

Notes: Cash is item 02003 from Datastream representing liquid assets including Cash on hand; undeposited checks; cash in banks; money orders; letters of credit; central bank deposits; bullion. Stock Market Size is the ratio of the total market value of listed companies to GDP from the World Bank.

For subsidiaries, the presence of a parent may alleviate any underinvestment problem caused by financing constraints. Descriptive statistics from our sample indicate that investment by multinational subsidiaries is, on average, less responsive to their own financial resources and more responsive to their investment opportunities than stand-alone firms (see Table 5). In our sample, the level of investment as a percentage of total assets is about 10% higher in multinational subsidiaries than in stand-alone firms. We divide the sample by comparing firms that ostensibly have fewer own resources (less than average cash flow as a proportion of total assets) but better investment opportunities (higher than average Tobin's *Q*) with those that have more cash but weaker investment opportunities. Among the sub-sample of firms with below average cash flow and above average values of Tobin's *Q*, investment by multinational subsidiaries is 14% higher than in stand-alone firms whereas for firms with above average cash flow and below average *Q*, investment in MNEs is 8% lower than in stand-alone firms.

The presence of a parent may affect a firm's ability to respond to shocks and local financial conditions. As noted in the introduction, in the Asian crisis between 1996 and 1998, foreign-owned firms in our sample cut their capital investment by 51% while

domestically owned firms cut theirs by 28%. It appears from Table 5 that more generally MNE subsidiaries and stand-alone firms respond differently to shocks. Foreign subsidiaries cut their investment during periods of recession in the subsidiary country by much more than do domestic firms: in our sample, domestic firms reduce their investment to asset ratio by 10% whereas foreign-owned ones reduce it by nearly twice this. There is no discernible reaction of subsidiary investment to a recession in the country of the parent firm.

When we compare the response of investment to a recession in countries with low and high levels of financial development (as measured by the ratio of private credit to the private sector to GDP), we find that investment falls by much more in less financially developed countries (Table 5).

Table 5. Investment / Total Assets for Stand-Alone and Foreign-Owned Firms

		Stand-alone	Foreign-owned
All firms		0.045	0.050
Firms with <ave. *CF* and >ave. *Q*		0.035	0.040
Firms with >ave. *CF* and <ave. *Q*		0.052	0.048
Financial Development:			
Private Credit/GDP in home country	High	0.051	0.052
	Low	0.063	0.065
Macro Conditions: recession in			
Own Country	No recession	0.058	0.062
	Recession	0.052	0.050
Parent Country	No recession		0.059
	Recession		0.059
Financial Development & Macro Conditions			
High Private Credit/GDP in home country	No recession	0.053	0.056
	Recession	0.049	0.048
Low Private Credit/GDP in home country	No recession	0.066	0.069
	Recession	0.058	0.054

Notes: *CF* is cash flow/total assets; *Q* is Tobin's *Q*. Financial development is measured as the ratio of private credit to GDP from the World Bank. See the Appendix for an explanation of how recession years were identified.

As Table 6 shows, more distant and less closely held subsidiaries cut investment by more in recessions. Subsidiaries located further from their parents reduce investment by 15% in recessions as compared with a 10% reduction in more proximate ones, and those subsidiaries whose equity is shared among several owners reduce investment by twice as much as those with more concentrated ownership (see Table 6).

Table 6. Variation of Investment (/Total Assets) in Recession and Non Recession Years for Foreign-Owned Firms: Distance and Ownership Concentration Effects

	Above median distance from owner	Below median distance from owner
Non-recession year in subsidiary country	0.054	0.062
Recession year in subsidiary country	0.046	0.056
	Below median ownership concentration	Above median ownership concentration
Non-recession year in subsidiary country	0.067	0.058
Recession year in subsidiary country	0.053	0.052

Notes: Ownership concentration is the share of equity held by the largest shareholder. For a detailed explanation of definitions and sources, see Section 3.

We can summarize the descriptive data presented in this section as follows:

- from the comparison of stand-alone and foreign-owned firms, there is prima facie evidence of the existence of an internal capital market for foreign-owned firms, which enhances the efficiency of investment;
- investment of foreign-owned firms appears to respond more strongly to a domestic recession than does that of stand-alone firms;
- investment by both stand-alone and foreign-owned firms is cut back more sharply in a recession in less financially developed countries;
- investment by firms with more distant parents and owners with smaller stakes respond more strongly to a domestic recession than do firms with parents in close proximity or with a larger ownership stake.

3 METHODOLOGICAL ISSUES & EMPIRICAL STRATEGY

3.1 Methodological problems

Previous investigations of the question of how ownership affects the efficiency of investment have focused on the investment behaviour of divisions of conglomerate firms. The canonical example is that of a CEO who oversees multiple lines of business, each with their own managers. Does the CEO use her authority to transfer funds across the firm's divisions, and does this tend, on average, to improve or worsen the investment efficiency of the combined entity? Empirically this question is conceived of in the following way: holding the investment conditions of one division constant, does its investment appear to be affected by the conditions of other divisions in the firm? A good example is Shin and Stulz (1998) who diagnosed inefficient cross-subsidization from the presence of a positive coefficient on the cash-flow of one division in a firm on the investment of another.

Most studies find that internal capital markets do exist, and the weight of evidence suggests that, on average, conglomerate firms engage in internal socialism among their divisions (Shin and Stultz, 1998, Scharfstein, 1998, Rajan, Servaes and Zingales, 2000, surveyed in Stein, 2003).[8] However, doubt has been cast on the conclusion of 'internal socialism' by the finding that in financially unrelated firms that are known to merge later, a similar relationship to that in Shin and Stulz between the cash flow of one firm and the investment of the other is found (Chevalier, 2004).

While the cross-subsidisation conclusion is widespread in the literature, it has primarily emerged from a methodology that is vulnerable to two related problems. It assumes that the divisions of conglomerate firms are allocated randomly to parent firms and that they are drawn randomly from the same distribution as are stand-alone firms. On the basis of these assumptions, the average industry (segment) *Q* serves as a reliable proxy for the division's investment opportunities.[9] However if the diversification decision is endogenous, then conglomerate divisions are systematically different from stand-alone firms and industry *Q*'s may not be good proxies for the opportunities of conglomerate divisions (Whited, 2001).[10] Chevalier (2004) looks at the investment activity of firms in the period before they merge into a single entity. She finds that investment patterns that have been attributed to cross-subsidisation are visible in the behaviour of pre-merger firms (i.e. that are not financially related), suggesting that some of the cross-subsidisation results in the literature may be attributable to selection bias.

In an attempt to circumvent this problem, Gertner, Powers and Scharfstein (2002) investigate the investment behaviour of firms that are spun off from a conglomerate. They observe that once a division is spun off from its parent, its investment responds more sensitively to industry *Q*, from which they infer inefficiency in the conglomerate. Çolak and Whited (2005) take issue with this approach and demonstrate that contrary to claims that it provides a clean test of the efficiency of internal capital markets, the results are contaminated by the presence of selection bias and measurement error. The decision to spin off a division is not a random one: a division is likely to be spun off only in cases where the combined entity is less valuable than the sum of its parts. Thus while the results in the 'spin off' papers provide evidence of inefficient overinvestment in their samples, it almost certainly presents a biased picture of the efficiency of internal capital markets in the population of conglomerates.[11]

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[8] Rajan, Servaes and Zingales (2000) compare the investment of divisions of diversified conglomerates with investment by stand-alone firms. They find that divisions in industries with low investment prospects (measured by average industry *Q* ratios) invest more than stand-alone firms in the same industry, and divisions with high investment prospects invest less than their stand-alone counterparts. Scharfstein (1998) shows that the sensitivity of investment to industry *Q* is much lower for conglomerate divisions than for stand-alone firms.

[9] The average Tobin's *Q* of stand-alone firms in an industry provides a reasonable proxy for the investment opportunities of a division of a conglomerate in the same industry if, as has been suggested, industry effects account for much of the variation in Tobin's *Q* (Stein 2003).

[10] Maksimovic and Phillips (2001) argue that a firm's diversification is an endogenous decision determined by the underlying characteristics of the pre-merger firms. Graham, Lemmon and Wolf (2002) argue that stand-alone firms are systematically different from divisions of conglomerate firms in the same industry.

[11] Similar methodological problems have plagued the parallel literature on the costs or benefits of group membership of Japanese keiretsu. Early studies such as Hoshi, Kashyap and Scharfstein, 1991 and Prowse

In the sample of conglomerate firms we investigate in this paper, the divisions (known more familiarly as 'subsidiaries' in this context) are separately listed firms. We therefore avoid the central empirical problem of the previous literature that the observed differences in the investment of divisions and stand-alone firms are the consequence of their different investment opportunities rather than their different financing options. Of course the financing relationship between a domestic owner or a multinational headquarters and its listed subsidiaries is different from the relationship between a conglomerate and its divisions. As noted in Section 2, we drop from our sample subsidiaries that have changed ownership recently, mitigating the selection problem associated with the use of spin-offs. Listed subsidiaries are, by their nature, not wholly owned by their parents; and this lower concentration of ownership may cause managers of listed subsidiaries to have a higher degree of autonomy than divisional managers. We may therefore be less likely to observe evidence consistent with an internal capital market than would be the case in less independent subsidiaries. To minimise this difference, we restrict our sample to listed subsidiaries which report a 'global ultimate' – a particularly strong parental relationship, which requires an ownership stake of the parent of more than 50%. To the extent we do find evidence of a financial relationship between parent and subsidiary, this provides new evidence on the presence of an internal capital market that extends from divisions to listed subsidiaries.

As we have seen, although there are sceptical voices, the conventional wisdom in the literature on internal capital markets in conglomerate firms points towards the presence of soft budget constraints or 'internal socialism'. Whilst evidence from our sample cannot be used directly in resolving this dispute because by definition our sample is different, it can nevertheless be seen to either reinforce the conventional wisdom or to add to the doubts about it discussed above. Since the firms in our sample encompass a range of ownership stakes of the parent between 50% and 100%, we can see whether the financing relationship changes as a listed subsidiary becomes more like a wholly owned one.

3.2 Empirical strategy

Tables 5 and 6 in Section 2 showed average differences between stand-alone and foreign-owned firms in the responsiveness of investment to cash flow and to *Q* and how these differences vary with ownership concentration, distance and the level of financial development. The remainder of the paper seeks to test whether these patterns persist when examined more systematically.

To do this, we use specifications very similar to those in Shin and Stulz (1998) and in Chevalier (2004).

(1) $$Inv_{it} = \alpha_0 + \alpha_1 Q_{it} + \alpha_2 CF_{it} + \alpha_3 SG_{it} + u_i + v_t + \varepsilon_{it}$$

1992 identified benefits of membership whereas more recent ones (e.g. Weinstein and Yafeh, 1998 and Morck and Nakamura, 1999) have identified costs. In a recent study of Korean chaebols, Ferris, Kim and Kitsabunnarat (2003) argue in favour of the inefficiency of the chaebol using a methodology similar to that criticized by Çolak and Whited.

where Inv_{it} is capital expenditure divided by total assets for firm i, *i.e.* $Inv_{it} \equiv I_{it} / K_{i,t-1}$; Q_{it} is Tobin's Q ratio for the firm, i.e. market value of assets divided by the book value; CF_{it} denotes firm i's cash flow divided by its total assets; SG_{it} is the sales growth for firm i.[12] The firm fixed effect is u_i and the time dummy is v_t.

We run this specification for our sample of owned firms and compare it to our sample of stand-alone firms. We use matching techniques to account for the possibility that membership of the sample of owned firms is endogenous. In particular we are concerned that the levels of our variable of interest (Q_{it}) may jointly determine the likelihood of a firm being a subsidiary and the relationship between its investment opportunities and its actual investment. We use the propensity score matching method of Rosenbaum and Rubin (1983). We identify the probability that a firm is a subsidiary using a probit model.

$$P(Sub_{ihc}=1) = F(Z_{ihc}, D_{hc}),$$

where F is the normal cumulative distribution function, Z_{ihc} is a vector of firm characteristics including Q, cash flow, and sales growth, and D_{hc} is a full set of country and industry dummies, where the subscript h is industry and c is country. We use the predicted probability, P_{ikc}, as a monotone function to select comparison stand-alone observations for each subsidiary observation. The nearest neighbour, k, to each subsidiary observation is selected such that

$$| P_{ihc} - P_{khc} | = min\{ P_{ihc} - P_{khc} \}$$

over all k in the set of stand-alone firms. Matches are only accepted if $min\{ P_{ihc} - P_{khc} \}$ is less than a caliper which we vary. The strength of this method also relies on our ability to identify the variables that determine firm ownership. While our model has only weak predictive power it does allow us to check that sample selection is not driven by our key variables of interest (see Table A2 in the Appendix). We find no significant difference between our results for the whole sample of stand-alone firms and the matched sample derived from calipers between 0.005 and 0.01.

To test for the presence of an internal capital market we supplement equation (1) with the parent firm's cash flow and the parent's Q, where the parent of firm i is designated by subscript j:

$$(2) \quad Inv_{it} = \alpha_0 + \alpha_1 Q_{it} + \alpha_2 CF_{it} + \alpha_3 SG_{it} + \alpha_4 Q_{jt} + \alpha_5 CF_{jt} + u_i + v_t + \varepsilon_{it}$$

We are concerned to ensure that any relationship between the parent's financial circumstances and the investment of the child measures a direct effect of their

[12] Since firms typically operate under conditions of imperfect competition in the product market, it is appropriate to augment the usual Q equation with sales growth to capture the impact on investment of a shift in the demand curve. The firm fixed effect is u_i and the time dummy is v_t.

relationship rather than a general correlation in the population of subsidiaries and parents caused by, for example, correlated macroeconomic conditions within or across countries. To verify this we construct a matching sample of surrogate parent firms by selecting the firm in the same industry and country of the real parent that is closest in size to the real parent to check whether a relationship emerges between subsidiary and surrogate parent that could not be due to the operation of an internal capital market.

There is continuing debate in the literature as to the appropriate specification of an investment equation. The state of the debate is summarized in Bond and Van Reenen (2003). Structural approaches either directly estimate the *Q* model or take the Euler equation route.[13] Implementation of both approaches requires restrictive assumptions to be made concerning the relationship between marginal and average Q in the former and about the nature of production function and the linearity of the marginal adjustment costs in the latter. The unique feature of our data is that it gives us access to stock market information on subsidiary as well as parent firms and we therefore use a *Q* approach.

Our first experiment in which we compare stand-alone firms with those that have a dominant parent is best thought of as a variant of the 'sample splitting' approach. In the tradition of Fazzari et al. (1998), we proceed on the basis that although the *Q* model may be misspecified, these problems may affect all firms in the same way, with the implication that differences in the coefficients on the *Q* and cash flow variables convey information on differences in investment opportunities and financing constraints across groups of firms that are listed in the same financial market (Bond and Van Reenen, p. 65), though as noted above we are cautious about the interpretation of cash flow as financing constraints.[14]

However, once we introduce the parent variables, our aim is to identify the role of parent financial variables in the investment behaviour of the subsidiary. We use firm fixed effects estimation, which means that the experiment we are considering is how does a shock to the parent firm's *Q* affect subsidiary investment, controlling for the subsidiary's investment opportunities. If the subsidiary can borrow at a lower cost of capital from the parent firm, this will already be incorporated in the subsidiary's *Q*. Given that we can control for Q_i, we can identify the impact on subsidiary investment of new information that affects Q_j making investment outcomes for the parent more attractive.

A major empirical failing of *Q* models is the very small estimated coefficient on *Q*. When interpreted within the structural model, this implies unrealistically high adjustment costs of the capital stock. Measurement error is a serious problem. For example, the firm's cash position may contain information about its investment opportunities.[15] Strong evidence of this phenomenon comes from natural experiments that investigate shocks to firms' cash

[13] For related work using the Euler equation approach see Love (2004) and Harrison, Love and McMillan (2004).

[14] The concerns about this raised in Section 2 are reflected in our empirical specification, which includes sales growth. We also test for the presence of non-linearities in the investment function.

[15] Erickson and Whited (2000) highlight the problem that average *Q* is a noisy proxy for marginal *Q* and, in particular, that average *Q* may be related to cash flow if firms accumulate cash when they are abnormally profitable.

position unrelated to their investment opportunities (Blanchard, Lopez-de-Silanes and Shleifer 1994, and see Stein 2003 for a survey). The problem of measurement error in *Q* has been addressed in different ways. The use of natural experiments of large changes in tax regime provides the opportunity for the fundamental role of *Q* to show up in changes in investment, reducing the impact of measurement error. The results (e.g. Cummins, Hassett and Hubbard 1994 and 1996) are striking: the size of the coefficient on *Q* increases by an order of magnitude as compared with its typical size in OLS estimations. These results are consistent with two other approaches to estimation that focus specifically on trying to mitigate the measurement error in *Q* generated by bubble phenomena in stock prices (Erickson and Whited 2000 and Bond and Cummins 2001).

The more familiar econometric problem of dealing with the likely endogeneity of *Q* and the cash flow and sales growth variables is sometimes dealt with by using GMM estimation, where lagged values of the levels and changes in the right hand side variables are used as instruments. Typically these approaches have struggled to find significant and / or sizeable *Q* effects and report that cash flow is highly significant even after allowing for endogeneity (see the summary in Bond and Van Reenen). However, this issue is less worrying in the context of our specifications. Since our specifications include fixed effects, we are modelling deviations in *Q*, which are in theory generated by new information and are unlikely to be easily instrumented by past values. Indeed in this context, the applicability of GMM methods is further reduced since we would not expect lagged levels of *Q*'s and changes in *Q*'s to be good instruments for current deviations of *Q*'s.

Bringing these results together, our approach is to estimate the simple model specified above using OLS (with firm fixed effects), recognizing that the estimated size of the coefficient on *Q* will be biased downwards due to the presence of measurement error. We conduct some other robustness checks and report them in Section 4 to control, for example, for the presence of non-convexities in the adjustment cost function as suggested by Abel and Eberly (1996).

Our central focus is on whether the financial variables of the parent firm affect investment in the subsidiary and how this in turn is affected by ownership concentration, distance etc. Given the problems with measurement, especially of the *Q* variable, it is necessary to discuss the direction of the likely biases on the parent financial variables. We begin by examining the correlation between subsidiary and parent variables. There is little correlation between subsidiary and parent cash flow, *Q* or investment (see Table 7): these correlations are reassuring in the sense that they do not point toward the existence of omitted variables that are correlated with both. For example, if there was a strong negative correlation between parent and subsidiary *Q*, one would worry that the finding of a negative coefficient on parent *Q* in the investment equation was due to an omitted factor. It seems that the biases will be either attenuation bias (as discussed above due to measurement error) or a positive bias to the extent that there are omitted variables correlated with both subsidiary investment and with parent financial variables. This would suggest that it will be harder for us to detect a negative sign on the parent's *Q* as implied by the 'efficiency of the internal capital market' hypothesis.

Table 7. Relationships between subsidiaries and their owners

	Number of pairs	Mean of correlations across cross-sectional subsidiary-owner pairs
Cash-flow	200,112	0.01
Q	215,151	0.001
Investment/total assets	197,212	0.015

Note: Cash-flow is Datastream item 04860 (Net cash flow from operating activities) divided by total assets. Q is the share price divided by the book value per share (Datastream PTBV). Investment/total assets is Datastream item 08416 Asset Utilization Ratio measured as the annual item Capital Expenditures / (Total Assets - Customer Liabilities on Acceptances).

4 Internal capital markets: results

The first question is whether internal capital markets operate across firms and their *listed* subsidiaries as they have been demonstrated to exist within conglomerates. The availability of Tobin's *Q* at the level of the subsidiary enables us to extend our understanding of how investment in subsidiaries responds to changes in the investment opportunities of parent firms.

We begin our experiments with the largest sample, namely of subsidiaries irrespective of whether the parent is foreign or domestic. We compare these with stand-alone firms and then introduce the interaction with the parent's financial variables. There are good reasons to expect that the presence of a parent could ease capital constraints created by imperfect external capital markets. As documented in Section 1, in our sample, parents are, on average, much larger than their subsidiaries, potentially giving them greater access to external finance. In addition the median parent in our sample has cash on hand which exceeds cash in the median subsidiary by more than two orders of magnitude (Table 4).

As discussed in Section 3, we first estimate the following equation:

(1) $Inv_{it} = \alpha_0 + \alpha_1 Q_{it} + \alpha_2 CF_{it} + \alpha_3 SG_{it} + u_i + v_t + \varepsilon_{it}$

We would expect that in perfect capital markets, α_2 and α_3 would be zero.

Table 8 indicates that in addition to Tobin's *Q*, both sales growth and cash flow have a significant effect on the level of capital expenditure undertaken by the firm, i.e. consistent with imperfect external capital markets, financial slack appears to affect investment activity. Of course these simple regressions are subject to the econometric problems of measurement error and endogeneity discussed in Section 3. We therefore concentrate on the *difference* between the estimates of α_1 and α_2 in Columns 1 and 2, i.e. between owned firms and the matched sample of stand-alone firms, which entails assuming that the

econometric problems do not affect owned and stand-alone firms in the same market in different ways.

Table 8. Regression of Investment of Stand-alone Firms and Owned Firms on Tobin's *Q*, Cash Flow and Sales Growth

	1	2	3	4	5
Variable	Stand-alone (matched sample)	Owned firms	Owned firms, including parent cash flow & *Q*	Matched to surrogate parent	As for (3) with industry × time dummies
SG_i	0.0055***	0.0059***	0.0058***	0.0053***	0.0082***
	0.0007	0.0010	0.0010	0.0011	0.0010
CF_i	0.0542***	0.0438***	0.0445***	0.0452***	0.0410***
	0.0032	0.0047	0.0046	0.0054	0.0046
Q_i	0.0075***	0.0082***	0.0082***	0.0084***	0.0066***
	0.0002	0.0003	0.0003	0.0004	0.0003
CF_j			0.0068	0.0039	0.0072
			0.0119	0.0124	0.0111
Q_j			-0.0010**	-0.0000	-0.0006**
			0.0005	0.0005	0.0003
Constant	0.0332***	0.0344***	0.0346***	0.0345***	0.0436***
	0.0004	0.0006	0.0006	0.0007	0.0009
No. obs.	30381	29576	29878	24040	29878
R^2	.0361	.0345	.0350	.0332	0.062

Notes: Columns 1 to 5 are estimated by OLS with firm fixed effects and year dummies. Column 5 also includes 2-digit industry dummies interacted with time. R^2 is the 'within' R^2. Robust standard errors are reported beneath the coefficients. *** 1%; ** 5% and * 10% level of significance.

Investment by owned firms – which potentially have access to internal sources of finance within the group in addition to external sources – is significantly less sensitive to cash flow and more sensitive to its own *Q*.[16] The size of the coefficients on *Q* are similar to those reported by Chevalier (2004) but as explained in Section 3, the magnitude and hence the economic significance of the coefficient on *Q* is difficult to discern from this exercise – we recall that Cummins et al. found a tenfold increase in the size of the coefficient when they used the natural experiment of major tax changes to control for the measurement error in *Q*.

Further evidence of the presence of internal capital markets is found by introducing the financial conditions of the parent firms. The extent to which parents move funds between entities to equalise the return from investment across projects will depend on the relative value of each entity's investment opportunities. Parents with greater investment opportunities than their affiliates will have a larger incentive to repatriate spare funds. Thus if the internal capital market actively reallocates funds across related entities then we expect the affiliate's investment to be decreasing in the parent's *Q*, holding the affiliate's *Q* constant. Since we observe the cash flow and *Q* of both parent and

[16] T-tests of the equality of the coefficients in Columns 1 and 2 are rejected at the 5% level.

subsidiary, we are able to test directly for effects consistent with presence of a financing relationship between them.

In Column 3 we investigate the effects of financial conditions within the parent on the investment of the subsidiary firms. This entails estimating equation (2) with the parent's cash flow and the parent's *Q*, where the parent of firm *i* is designated by subscript *j* (shown again for convenience):

$$(2) \quad Inv_{it} = \alpha_0 + \alpha_1 Q_{it} + \alpha_2 CF_{it} + \alpha_3 SG_{it} + \alpha_4 Q_{jt} + \alpha_5 CF_{jt} + u_i + v_t + \varepsilon_{it}$$

Table 8 indicates that the parent's cash flow is not significant in the subsidiary's investment equation and the parent's *Q* has a significant negative effect. As predicted by the efficient internal capital market or 'internal Darwinism' argument and contrary to the 'internal socialism' argument, an increase in the parent's *Q* leads to a reduction in the subsidiary's investment.

In Column 4 we check that the negative influence of the parent's *Q* is not picking up some spurious industry or country effect by matching subsidiaries with a surrogate parent. The surrogate parent is another firm in the same industry and country and as close in size as possible to that of the real parent. We find that there is no significant influence of the surrogate parent *Q* on the subsidiary's investment. In Column 5 we approach this issue in another way by running the standard regression (Column 3) augmented by interactions between the 2-digit industry of the firm and the year. The inclusion of the additional dummies does not affect the results. In line with the work of Abel and Eberly on non-convex adjustment costs, we checked to see if higher orders of *Q* were significant in the investment equation but they were not.

In order to check whether there is something specific to US MNEs, we repeat the basic regressions for the sample of foreign-owned firms excluding US firms both as owners and as subsidiaries (Table 9). The results remain unchanged. We also split the sample between firms whose principal activity is in manufacturing and those with a non-manufacturing core. The results for manufacturing firms were similar to those for the full sample (Table 9).

Table 9. Robustness Checks: Non-US Firms and Manufacturing Firms

	1	2
Variable	Non-US firms	Manufacturing firms
SG_i	0.0065***	0.0037**
	0.0010	0.0015
CF_i	0.0446***	0.0516***
	0.0048	0.0064
Q_i	0.0082***	0.0082***
	0.0003	0.0005
CF_j	0.0184	-0.0047
	0.0147	0.0182
Q_j	-0.0010***	-0.0016***
	0.0005	0.0005
Constant	0.0344***	0.0379***
	0.0007	0.0009
N	28152	13798
R^2	.0356	0.0382

Notes: Columns 1 and 2 are estimated by OLS with firm fixed effects and year dummies. R^2 is the 'within' R^2. Robust standard errors are reported beneath the coefficients. *** 1%; ** 5% and * 10% level of significance.

This section has presented several pieces of evidence from our data that suggest owners reallocate funds across subsidiary entities and that this is consistent with the efficient operation of an internal capital market. Parent firms have greater cash resources and superior access to external capital markets. Investment by owned firms is less sensitive to cash flow and more sensitive to investment opportunities than stand-alone firms. And subsidiaries' investment is negatively affected by the opportunities available to the parent. Our discussion in Section 3 suggested that the likely biases would work against finding evidence consistent with an internal capital market and against finding a negative effect of the parent's *Q*. The results we report would therefore tend to underestimate both effects.

The earlier discussion suggests that these results may be interpreted as implying that internal capital markets allocate capital efficiently since they appear to mitigate liquidity constraints and to increase the sensitivity of capital expenditure to investment opportunities. Our results appear to be at least consistent with the effects of increased information in the internal capital markets of owned firms and their separately listed subsidiaries as compared with stand-alone firms listed in the same market.

5 Information versus influence effects in internal capital markets: hypotheses and results

5.1 Hypotheses

The results above suggest that internal capital markets exist: parents appear to have a financing relationship with their separately listed subsidiaries. Moreover this transfer is negatively related to the investment opportunities of the parent firm, suggesting that finance is being allocated in response to the relative profitability of projects within the group. With the full sample of subsidiaries, we can examine how the operation of the internal capital market responds to changes in the size of the owner's stake in the subsidiary. Our second set of experiments uses the sample of foreign-owned firms since this provides the cross-sectional variation across (i) distance between owner and subsidiary, and (ii) the development of the capital market in the parent and subsidiary country that we use to identify the conditions under which internal capital markets enhance rather than depress efficient investment.

Theories that emphasize the 'bright side' of internal capital markets focus on the information and control advantages afforded to the CEO as a provider of internal finance over the providers of external finance. This theory rests on the superior ability of the CEO to pick winners from among her business units as discussed in Gertner, Scharfstein and Stein (1994) and Li and Li (1996). This is likely to be improved when the subsidiary is nearby and when the owner has a large stake.

However for different reasons, control and proximity may worsen the efficiency with which internal capital markets allocate funds to subsidiaries. Much of the theoretical work on the 'dark side' of internal capital markets considers the incentives of managers at the level below the CEO. Several papers have addressed the question of why such behaviour may distort the CEO's capital budget decision, rather than just affect the distribution of managerial compensation.[17] Scharfstein and Stein (2000) consider the case where the CEO is herself an agent and finds it more attractive to compensate the managers of poorly performing divisions with greater investment rather than with cash, which the CEO would prefer to reserve for alternative uses. Stein (2003) cites the example of the successful diversified conglomerate, General Electric, whose policy of rotating its managers between divisions has the benefit of reducing managers' incentives to lobby for excess capital.

Thus the efficiency of internal capital markets involves a trade-off between the potentially positive effects of information and deleterious effects of influence. If parents in close proximity are able to overcome capital market imperfections better than parents at a distance then more concentrated ownership and closer parents should be associated with a more negative relationship to parents' *Q*. If the influence of the parent is to the detriment of the subsidiary, and this increases more with proximity than do the beneficial

[17] Rajan, Servaes and Zingales (2000) suggests that 'socialism', i.e. a more equal allocation of resources among divisions, might increase incentives for division managers to cooperate and reduce rent-seeking behaviour.

effects of increased information, then we would expect proximity to decrease the efficiency of the internal capital market.

Likewise we explore whether the quality of the institutional environment of the country in which the subsidiary is located relative to that of the parent influence the 'internal liquidity' and 'competition for funds' effects. There is evidence suggesting that foreign affiliates often substitute internal borrowing for external borrowing when operating in environments with poorly developed financial markets (Desai, Foley, and Hines, 2003). Table 10 indicates that in our sample, over 50% of our owned firms are 'high-high', i.e. both subsidiaries and their parents are listed in a country with a high level of financial development. In 40% of the sample subsidiaries but not their parents are located in countries with low financial development.

Table 10. Location of parents and subsidiaries by level of financial development

% Parent-subsidiary pairs:		
	Parent in High Financial Development Country	Parent in Low Financial Development Country
Subsidiary in High Financial Development Country	53.7%	1.03%
Subsidiary in Low Financial Development Country	40.5%	5.64%

Notes: Data is from 4,200 parent-subsidiary pairs. For details of the source of the data, see Section 3.

Do subsidiaries in countries with relatively poor financial institutions benefit more from the availability of an internal capital market than those in countries with institutional quality closer to that of the parent? Or are they more vulnerable to influence costs? If the former is so, we predict a stronger effect of parent *Q* on subsidiary investment when interacted with a measure of weakness of the financial institutions in the subsidiary's country. These predictions are summarized in Table 11: if information benefits outweigh excessive control and influence costs, we would predict enhanced Tobin's *Q* effects in subsidiaries operating in countries with weaker domestic financial markets.

Table 11 summarizes the interactive influences of ownership characteristics on the predicted Tobin's *Q* relations to subsidiary investment. By including interactive terms of the Tobin's *Q* variables in equation 2, we would predict that if the informational benefits conferred by the parent on the subsidiary outweigh their excessive control and influence costs, then there should be enhanced Tobin's *Q* effects associated with more concentrated and closer parents and of their presence when subsidiaries are located in a weaker financial environment (and vice versa if influence costs outweigh information benefits).

Table 11. Prediction of the effect of (a) a more concentrated parent, (b) a closer parent, and (c) the presence of a parent when the subsidiary is in a weaker financial environment on the Tobin's *Q* terms of the parent and subsidiary in an investment equation of the subsidiary

Theory	*Q* (subsidiary)	*Q* (parent)
Information	+	-
Influence	-	+

5.2 Results for distance and control

Column 1 of Table 12 reports the effects of concentration of ownership of the parent on the investment of the subsidiary. The interactive effect of the ownership stake of the largest owner on the foreign owners' *Q* and cash flow are reported. The negative *Q* effect of the parent diminishes with the size of the largest foreign ownership. Thus the internal capital market is stronger (exhibiting more reallocation in response to changes in investment opportunities) when the parent less tightly controls its subsidiary. Column 3 of Table 12 confirms that the same pattern characterizes the smaller sample of foreign-owned firms.

In Column 4, we report the impact of distance from the parent on the investment of its subsidiary for the sample of foreign-owned firms. We find that the effect of the parent's *Q* becomes more negative as distance increases. Consistent with influence effects dominating information effects this suggests that investment in subsidiaries of more distant firms is more sensitive to their parent's investment opportunities. Increased investment opportunities for the headquarters are more likely to result in reduced investment by the subsidiary when the subsidiary is located further from the parent. We interpret this as evidence that the loss of information is outweighed by the benefits of reduced influence. The CEO is less susceptible to influence activities from more remote managers, with whom she has a more 'arms length' relationship as a result of greater geographical distance and a smaller ownership stake.[18]

[18] The results in Table 12 suggest that the failure to find a significant effect of parent cash flow on subsidiary investment in the basic regression in Table 8 (or the equivalent regression for foreign-owned firms in Column 2 of Table 12) reflects heterogeneity in the sample. Once the proximity measures of ownership concentration or distance are introduced, the parent's cash flow becomes significant.

Table 12. Ownership Concentration and Distance

	1	2	3	4
Variable	Owned firms × ownership concentration	Foreign-owned firms	Foreign-owned × ownership concentration	Foreign-owned × distance
SG_i	0.0049***	0.0066***	0.0069***	0.0067***
	0.0012	0.0017	0.0022	0.0018
CF_i	0.0516***	0.0430***	0.0457***	0.0443***
	0.0060	0.0087	0.0115	0.0089
CF_j	0.0236*	0.0077	0.0232*	0.0463***
	0.0128	0.0119	0.0139	0.0226
$CF_j \times Conc_j$	-0.0029*		-0.0029*	
	0.0015		0.0015	
Q_i	0.0085***	0.0088***	0.0097***	0.0086***
	0.0004	0.0006	0.0007	0.0006
Q_j	-0.0012***	-0.0012***	-0.0012***	-0.0000
	0.0004	0.0004	0.0004	0.0001
$Q_j \times Conc_j$	0.0003***		0.0003***	
	0.0001		0.0001	
$CF_j \times Dist_j$				-0.0011**
				0.0005
$Q_j \times Dist_j$				-0.0019***
				0.0007
Constant	0.0363***	0.0347***	0.0354***	0.0348***
	0.0008	0.0013	0.0016	0.0013
N	22079	9537	6798	9087
R^2	.0393	.0377	.0464	.0378

Notes: Columns 1 to 4 are estimated by OLS with firm fixed effects and year dummies. R^2 is the 'within' R^2. Robust standard errors are reported beneath the coefficients. *** 1%; ** 5% and * 10% level of significance.

To summarize, the internal capital market is stronger (exhibiting more reallocation in response to changes in investment opportunities) when the firms are more distant or the owner's stake is smaller (although above 50%). We interpret this as supporting the primacy of influence costs over information effects.[19] The presence of other owners or lower geographical proximity serves to distance the CEO of the parent firm from the managers of the subsidiary. The costs of lower information appear to be outweighed by the benefits of reduced influence effects.

5.3 Results for financial development and structure

In this section, we test whether the efficiency of investment in owned firms is sensitive to the level of financial development broadly defined (by the ratio of credit to the private sector to GDP) and or to the financial structure of the country as defined by the size of the stock market to GDP.

[19] As shown in Table A3 in the Appendix, these results hold for the sample of Non US firms as well.

We conduct this experiment in two steps: first we look at the sample of owned firms and simply add to our basic regression (Table 8) an interaction between the firm's financial variables (cash flow and *Q*) and a measure of financial development or structure. Column 1 of Table 13 reports that in countries with a higher level of financial development, there is a greater impact of *Q* on investment. There is no sign that a larger stock market per se has this effect (Column 3). In Columns 2 and 4, we look at foreign-owned firms and at whether the *relative* level of financial development or stock market size between the country in which the subsidiary is located and that of its parent affects the role of the parent's *Q* in the subsidiary's investment. The measures we use are the ratios of private credit to GDP (or stock market capitalization to GDP) in the subsidiary country to the parent country.

Table 13. Country Financial Development and Financial Structure.

	1	2	3	4
Variable	Owned	Foreign-owned	Owned	Foreign-owned
SG_i	0.0063***	0.0057***	0.0054***	0.0041***
	0.0010	0.0018	0.0010	0.0020
CF_i	0.0344***	0.0444***	0.0412***	0.0372***
	0.0083	0.0088	0.0053	0.0097
Q_i	0.0058***	0.0087***	0.0081***	0.0095***
	0.0006	0.0006	0.0003	0.0007
$CF_i \times PrivCred_i$	0.9339			
	0.6808			
$Q_i \times PrivCred_i$	0.2307***			
	0.0470			
CF_j		0.0585**		0.0701***
		0.0263		0.0212
$CF_j \times PrivCred_{ij}$		-0.0377**		
		0.0177		
Q_j		0.0008		-0.0019**
		0.0008		0.0008
$Q_j \times PrivCred_{ij}$		-0.0017**		
		0.0006		
$CF_i \times StockMarket_i$			0.0782	
			0.0621	
$Q_i \times StockMarket_i$			0.0011	
			0.0020	
$CF_j \times StockMarket_{ij}$				-0.0373***
				0.0105
$Q_j \times StockMarket_{ij}$				0.0007
				0.0008
Constant	0.0344***	0.0353***	0.0341***	0.0333***
	0.0006	0.0013	0.0006	0.0015
N	29356	9309	29014	7739
R^2	.0359	.0385	.0345	.0392

Notes: Columns 1 to 4 are estimated by OLS with firm fixed effects and year dummies. R^2 is the 'within' R^2. Robust standard errors are reported beneath the coefficients. *** 1%; ** 5% and * 10% level of significance. $Privcred_{ij}$ is the ratio of private credit to GDP in the subsidiary country to that in the parent country. $StockMarket_{ij}$ is the ratio of stock market capitalization over GDP in the subsidiary country to that in the parent country.

Column 2 records that as the gap between the level of financial development in the subsidiary country and the owner country narrows, the negative effect of parent *Q* intensifies and efficient allocation within the MNE is enhanced. This is consistent with the hypothesis that influence effects are more likely to prevail when the subsidiary is in a weaker financial environment. There is a smaller effect of parent *Q* on investment in subsidiaries operating in weak financial markets.[20]

6 Conclusions

The purpose of this paper is to investigate how the presence of a parent affects the investment behaviour of subsidiary firms. The study is relevant to several different but related literatures on internal capital markets, foreign direct investment and the macroeconomic experience of countries in financial crisis.

The approach we have taken is to examine the influence of foreign ownership in two stages. First in the context of internal versus external capital markets, we present evidence supporting the existence of internal capital markets that reallocate finance to members of multinational networks with superior investment opportunities. Second, we explore how various characteristics of the relationship between the subsidiary firm and its parent affect the efficiency of this reallocation. A new data set is employed that allows the investment opportunities of the subsidiary firm to be observed independently of those of the parent.

The results reported in this paper point in the direction of suggesting that there are benefits associated with ownership from the perspective of subsidiary firms. In general the information and resources available to parent firms relative to stand-alone firms improve the allocation of capital. There is evidence consistent with reduced financial constraints and of the allocation of capital according to the relative profitability of different parts of the global businesses.

The beneficial effects of foreign ownership are particularly in evidence when the ownership stake of the foreign parent is relatively modest and when the parent is distant from the subsidiary. The possible loss of information associated with smaller ownership stakes and distance appears to be outweighed by the potential influence drawbacks that arise from large ownership stakes and close proximity of a parent.

When we examine the impact of financial development, we find that there is a greater impact of own-*Q* on investment in countries with better financial development. We find that efficient allocation within MNEs is more in evidence as the gap between the level of financial development between subsidiary and owner country diminishes. Presumably this is because influence effects can be better controlled when financial environments are

[20] We note that allowing for heterogeneity of this kind brings out the significant positive effect of parent cash flow on subsidiary investment – a phenomenon we saw earlier when distance and ownership concentration were introduced.

more similar and function better. Thus whereas geographical distance appears to enhance efficiency in the firm network, divergence in financial development reduces it.

Returning to the initial puzzle presented by investment behaviour in the Asian crisis, our results suggest that the larger responses of foreign-owned firms in reducing their capital investment during the East Asian crisis may reflect the greater alternative investment opportunities available to foreign-owned firms. Distant parents with small ownership stakes may have been particularly well placed to make objective commercial assessments without being subject to the same degree of local influence as domestic firms and those in close proximity to their subsidiaries.

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Appendix

1. Construction of the data-set

A. Primary source

We begin with the population of firms listed on the world's stock exchanges provided by the OSIRIS database published by Bureau van Dijk Electronic Publishing which gathers its information from several sources including World'Vest Base, Fitch, Thomson Financial, Reuters, and Moody's. For 2005, there are 28,915 firms listed on the world's stock exchanges. Table A1 presents the distribution of these firms by country.

Table A1.

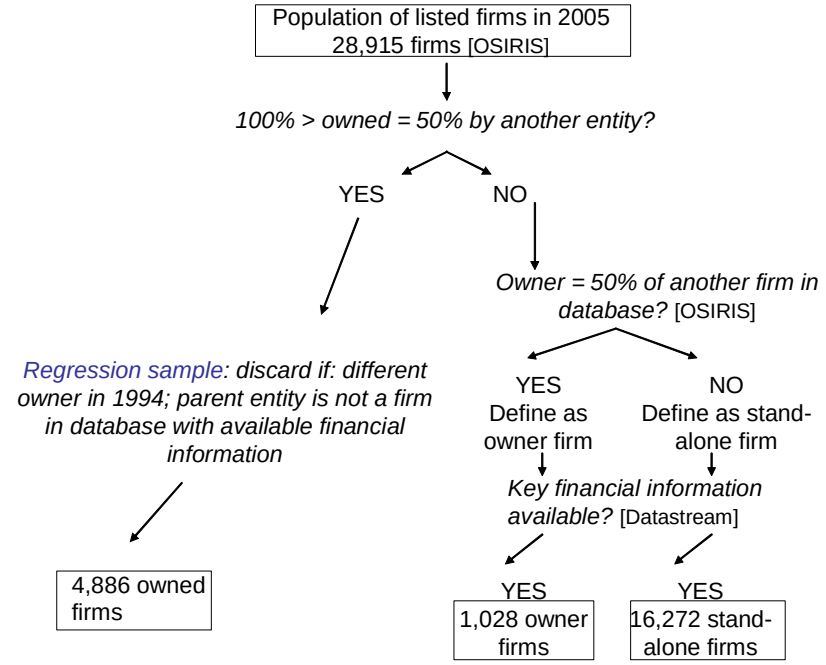
	1	2	3	4	5	6
Country	Firms	Stand-alone	Owned	Foreign-owned	Owner of firm(s)	Owner of foreign firm(s)
	Number	(% firms)	(% firms)	(% firms)	(% firms)	(% firms)
Argentina	92	54%	45%	20%	1%	1%
Australia	1362	81%	16%	13%	3%	3%
Austria	90	66%	31%	7%	3%	3%
Bahrain	28	64%	32%	21%	4%	4%
Belgium	137	54%	42%	13%	4%	4%
Brazil	401	63%	36%	14%	1%	1%
Canada	1356	76%	22%	15%	3%	2%
Chile	232	72%	26%	12%	2%	2%
China	1316	85%	15%	14%	0%	0%
Colombia	77	75%	22%	12%	3%	3%
Costa Rica	17	88%	12%	6%	0%	0%
Croatia	23	52%	48%	17%	0%	0%
Czech Republic	49	55%	45%	14%	0%	0%
Denmark	147	71%	26%	10%	3%	3%
Egypt	364	86%	14%	11%	0%	0%
Estonia	13	46%	54%	15%	0%	0%
Finland	127	68%	28%	8%	5%	5%
France	699	38%	56%	9%	6%	6%
Germany	756	48%	47%	13%	4%	4%
Greece	233	39%	58%	11%	3%	3%
Hong Kong	269	78%	19%	7%	3%	3%
Hungary	28	75%	18%	7%	7%	7%
Iceland	14	71%	21%	7%	7%	7%
India	736	78%	21%	9%	1%	1%
Indonesia	297	81%	19%	13%	0%	0%
Ireland	64	66%	25%	11%	9%	9%
Israel	169	82%	17%	8%	1%	1%
Italy	229	41%	53%	11%	6%	6%
Jamaica	30	53%	43%	3%	3%	3%
Japan	3598	83%	14%	8%	2%	2%
Jordan	31	84%	16%	6%	0%	0%

Kazakhstan	15	73%	27%	13%	0%	0%
Kenya	13	62%	38%	0%	0%	0%
Korea, Republic	1460	60%	39%	8%	1%	1%
Kuwait	49	88%	10%	4%	2%	2%
Latvia	23	65%	35%	9%	0%	0%
Lithuania	10	40%	60%	20%	0%	0%
Luxembourg	37	57%	41%	14%	5%	5%
Malaysia	941	86%	13%	7%	1%	1%
Mauritius	37	89%	11%	8%	0%	0%
Mexico	141	66%	26%	4%	8%	8%
Morocco	13	54%	46%	8%	0%	0%
Netherlands	175	65%	22%	6%	14%	14%
New Zealand	110	81%	18%	8%	1%	1%
Nigeria	32	84%	16%	9%	0%	0%
Norway	136	68%	27%	6%	5%	5%
Pakistan	140	76%	21%	2%	2%	2%
Panama	15	80%	20%	13%	0%	0%
Peru	162	74%	26%	6%	0%	0%
Philippines	226	83%	16%	8%	1%	1%
Poland	64	41%	59%	13%	0%	0%
Portugal	72	50%	44%	10%	7%	7%
Russia	45	58%	42%	7%	0%	0%
Saudi Arabia	16	69%	31%	13%	0%	0%
Singapore	516	79%	19%	8%	2%	2%
Slovakia	11	55%	45%	0%	0%	0%
South Africa	319	73%	20%	1%	6%	6%
Spain	148	48%	45%	11%	8%	8%
Sri Lanka	135	87%	10%	4%	3%	3%
Sweden	242	57%	35%	3%	9%	9%
Switzerland	224	44%	48%	12%	8%	8%
Thailand	420	86%	13%	6%	1%	1%
Tunisia	40	70%	28%	5%	3%	3%
Turkey	242	84%	14%	4%	1%	1%
United Arab Emi	11	64%	36%	9%	0%	0%
United Kingdom	1869	71%	20%	9%	10%	9%
United States	7751	76%	20%	3%	4%	4%
Venezuela	58	81%	19%	3%	0%	0%
Zimbabwe	13	62%	31%	0%	8%	8%

B. Identifying stand-alone, owned and owner firms in the data-set.

The OSIRIS data records a firm as having a parent if another entity has financial and legal responsibility for it, i.e., it holds more than 50 per cent and less than 100 per cent of the subsidiary's equity. Figure A1 illustrates the selection criteria and data sources used to construct the sample of owned, owner, and stand-alone firms.

Figure A1. Constructing the sample



The OSIRIS data only reports ownership at one point in time 2005, but we have older ownership data from Dun and Bradstreet which enables us to identify ownership in 1994. After matching these data we exclude firms from the sample if the location of their owner is different in these two datasets.

We discard subsidiary firms from the sample if they experienced a change in ownership over the period, or if their ownership information is unavailable, or if key financial information (matched to and collected from Datastream) is missing over the period. This leaves us with 4,886 subsidiaries which have been continuously owned and controlled by 1,028 distinct global ultimate firms over the period.

C. Sources and definitions of variables

The OSIRIS data-base reports a unique identification number for each parent firm that enables us to match firms with financial data on their parents. This was merged with the market and financial data from Datastream.

The parent's data is given in consolidated form, so we take out the effect of the subsidiary to extract the parent's pure data.[21]

[21] For example we use the employment in the subsidiary E_i and the total consolidated employment, E_T to determine the firm's Q_j which we call parent's Q, but really refers to the Q of the entire entity except the subsidiary. The firm's consolidated Q is $Q_T = ((Q_i*E_i + Q_j*E_j)/E_T)$. So parent's Q is $Q_j = (Q_T*E_T - Q_i*E_i)/E_j$.

Capital expenditure: funds used to acquire fixed assets including expenditures on plant and equipment, structures and property but excluding any expenditures associated with mergers or acquisitions. To account for differences in size and for inflation over time and to avoid heteroscedasticity we divide investment by total assets at the beginning of the period. Datastream item 08416 Asset Utilization Ratio measured as the annual item Capital Expenditures / (Total Assets - Customer Liabilities on Acceptances).

Average Q: the firm's market-to-book ratio at the end of the prior fiscal year. To calculate parent's Q, we took the effect of subsidiary variables out of consolidated data in order to get parent's data, i.e. Total *Q* = asset-weighted sum of parent and subsidiary *Q*; from which we calculate unconsolidated *Q*. *Q* is the share price divided by the book value per share (Datastream PTBV).

Liquidity. Cash flow divided by total assets at the start of the year. Datastream item 04860 (Net cash flow from operating activities) divided by total assets. Q is the share price divided by the book value per share (Datastream PTBV).

Sales growth. Sales growth is the log difference in sales in US$ from Datastream item number 07240.

Distance to owner is the great circle distance between capital cities of the two countries measured as a percentage of half the earth's circumference (i.e. max is 100).

Employees is Datastream item WC07011.

Ratio of credit to the private sector to GDP and size of the stock market to GDP.

Recession year dummy. Quarterly GDP data from the IMF's International Financial Statistics (IFS). The recession dummy variable indicating whether a country is experiencing a recession in a particular year is constructed following Braun and Larrain (2005). For each country 'troughs' are identified as years when the current log of real local currency GDP (from World Bank, 2005) deviates by more than one standard deviation from its trend level (computed using the Hodrick-Prescott filter with a smoothing parameter of 100). A local peak is then defined as the most recent year for which cyclical GDP (the difference between actual and trend values) is higher than the previous and posterior years. The recession variable is one for the years between the peak and trough (excluding the peak year), and zero for other years.

2. Propensity Score Matching Results
Table A2.

We use the propensity score matching method of Rosenbaum and Rubin (1983). We identify the probability that a firm is a subsidiary using a probit model. We use the predicted probability, P_{ikc}, as a monotone function to select comparison stand-alone observations for each subsidiary observation. The nearest neighbour, *k*, to each subsidiary

observation is selected to minimize the difference between the subsidiary firm and the stand-alone firm with similar predicted values.

Matching Regression:

Qi	0.008
	(0.005)*
SG_i	0.069
	(0.029)**
CF_i	0.012
	(0.003)***
Age	0.006
	(0.001)***
Industry dummies	Yes
Country dummies	Yes
Observations	24982
R^2	0.081

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

3. Robustness: Distance and Ownership Concentration Interactions for Non-US firms

Table A3.

This table extends the robustness check of Table 9 to illustrate that the findings in Table 12 are robust to excluding the US firms from the sample.

	1	2
Variable	Non-US firms	Non-US firms
SG_i	0.0066***	0.0067***
	0.0019	0.0023
CF_i	0.0428***	0.0441***
	0.0098	0.0124
Q_i	0.0089***	0.0101***
	0.0007	0.0007
CF_j	0.0555**	0.0173
	0.0265	0.0159
Q_j	-0.0000	-0.0018***
	0.0001	0.0005
$CF_j \times Dist_j$	-0.0014**	
	0.0005	
$Q_j \times Dist_j$	-0.0029***	
	0.0008	
$CF_j \times Conc_j$		-0.0025
		0.0016
$Q_j \times Conc_j$		0.0004***
		0.0001
Constant	0.0357***	0.0359***
	0.0014	0.0017
N	7858	5903
R^2	.039	.0477