FERRETING OUT TUNNELING: AN APPLICATION TO INDIAN BUSINESS GROUPS*

MARIANNE BERTRAND
PARAS MEHTA
SENDHIL MULLAINATHAN

Owners of business groups are often accused of expropriating minority shareholders by tunneling resources from firms where they have low cash flow rights to firms where they have high cash flow rights. In this paper we propose a general methodology to measure the extent of tunneling activities. The methodology rests on isolating and then testing the distinctive implications of the tunneling hypothesis for the propagation of earnings shocks across firms within a group. When we apply our methodology to data on Indian business groups, we find a significant amount of tunneling, much of it occurring via nonoperating components of profit.

I. INTRODUCTION

Weak corporate law and lax enforcement mechanisms raise fears of expropriation for minority shareholders around the world. These fears seem especially warranted in the presence of business groups, a common organizational form in many developed and developing countries. In a business group, a single shareholder (or a family) completely controls several independently traded firms and yet has significant cash flow rights in only a few of them.[1] This discrepancy in cash flow rights between the different firms he controls creates strong incentives to expropriate. The controlling shareholder will want to transfer, or *tunnel,* profits across firms, moving them from firms where he has

* We thank Abhijit Banerjee, Simon Johnson, Tarun Khanna, Jayendra Nayak, Ajay Shah, Susan Thomas, two anonymous referees, the editor (Edward Glaeser), and seminar participants at the MIT Development and Public Finance Lunches, the Harvard/MIT Development Seminar, the NBER-NCAER Conference on Reforms, the Harvard Business School Conference on Emerging Markets, the University of Michigan, the London Business School, the London School of Economics, the University of Chicago Graduate School of Business, and Princeton University for their useful comments. The second author is also grateful for financial support from a National Science Foundation Graduate Fellowship.

1. In many cases, control is maintained through indirect ownership. For example, the ultimate owner may own firm A, which in turn owns firm B, which in turn owns firm C. Such ownership structures, which are quite common according to La Porta, Lopez-d-Silanes, Shleifer, and Vishny [1999], are called pyramids. It is the chain of ownership in pyramids that generates the sharp divergence between control and cash flow rights. Dual class shares are another way to generate such a divergence. In India, the country we study below, dual class shares have not been allowed so far, although recent legislation has attempted to change this.

The Quarterly Journal of Economics, February 2002

low cash flow rights to firms where he has high cash flow rights.[2] Cash can be transferred in many ways: the firms can give each other high (or low) interest rate loans, manipulate transfer prices, or sell assets to each other at above or below market prices, to list just a few. If prevalent, tunneling may have serious consequences. By reducing the returns to being an outside shareholder, it can hinder equity market growth and overall financial development. Illicit profit transfers may also reduce the transparency of the entire economy, clouding the accounting numbers and complicating any inference about firms' health. In fact, several observers argued that tunneling made it hard to assess solvency during the emerging market crises of 1997–1998, and possibly exacerbated the crisis.[3]

Anecdotes of tunneling are easy to find. In India, for example, one group firm, Kalyani Steels, had more than two-thirds of its net worth invested in other companies in its group. Yet these investments yielded less than a 1 percent rate of return, fueling speculation that they were merely a way to tunnel profits out of Kalyani Steels. However, hard evidence of tunneling beyond anecdotes of this kind remains scarce, perhaps because of the illicit nature of this activity. The strongest statistical evidence so far is cross-sectional: group firms where the controlling shareholder has higher cash flow rights have higher q-ratios and greater profitability.[4] While informative, this cross-sectional relationship is not a test of tunneling since it could also result from differences in preexisting efficiency or any number of other unobservable factors.

This paper introduces a general procedure to quantify tunneling. It is based on tracing the propagation of earnings shocks

2. Johnson, La Porta, Lopez-de-Silanes, and Shleifer [2000] argue that the expropriation threat is especially big in business groups. Bebchuk, Kraakman, and Triantis [2000], Wolfenzon [1999], and Shleifer and Wolfenzon [2000] provide theoretical models of various forms of tunneling. In the United States something akin to business groups existed historically, although cartelization was the major issue surrounding them. In modern times, expropriation of shareholders in large U. S. firms is thought to occur through poor decision making [Berle and Means 1934; Jensen and Meckling 1976] or high executive compensation [Bertrand and Mullainathan 2000, 2001].

3. Johnson, Boone, Breach, and Friedman [2000] show that countries with better legal protection against tunneling were less affected by the crisis.

4. Examples of papers that have documented such correlations include Bianchi, Bianco, and Enriques [1999], Claessens, Djankov, Fan, and Lang [1999], and Claessens, Djankov, and Lang [2000]. A broader literature has studied groups more generally [Khanna and Palepu 2000; Hoshi, Kashyap, and Scharfstein 1991]. Other papers have documented differences in the price of voting and nonvoting shares [Zingales 1995; Nenova 1999].

through a business group. Consider a group with two firms: firm H, where the controlling shareholder has high cash flow rights, and firm L, where he has low cash flow rights. Suppose that firm L experiences a shock that would (in the absence of tunneling) cause its profits to rise by 100 dollars. Because some of this increase will be tunneled out of firm L, the actual profits of firm L will rise by less than 100 dollars, with the shortfall measuring the amount of diversion. Since the shortfall is being tunneled to H, we would also expect H to respond to L's shock even though H is not directly affected by it. Moreover, we would not expect this pattern if instead H were to receive the shock: there is no incentive to tunnel from a high- to a low-cash-flow-right firm.[5] We develop a general set of tests based on these observations and use variation in mean industry performance as a source of profit shocks.[6]

As an illustration, we apply this test to a panel of Indian firms. We find evidence for the full set of predictions implied by tunneling. Other results suggest that these findings are not due to mismeasurement of a firm's industry, simple coinsurance within groups or internal capital markets. Moreover, the magnitudes of the effects we find are large: more than 25 percent of the marginal rupee of profits in low-cash-flow-right firms appears to be dissipated.[7]

Our procedure further allows us to examine the mechanics of tunneling. Indian groups appear to tunnel by manipulating nonoperating components of profits (such as miscellaneous and nonrecurring items). In fact, there is no evidence of tunneling on operating profits alone. Rather, nonoperating losses and gains seem to be used to offset real profit shocks or transfer cash from other firms. Finally, we examine whether market prices incorporate tunneling. We find that high market-to-book firms are more

5. This asymmetry is important. Money flows only from low- to high-cash-flow-right firms, not vice versa. As we will see, this is a crucial distinction between tunneling and other theories of why shocks might propagate through a group, most notably risk sharing.

6. Other papers have used shocks in a related way. Blanchard, Lopez-de-Silanes, and Shleifer [1994] examine how U. S. firms respond to windfalls (winning a law suit) to assess agency models. Lamont [1997] uses the oil shock to assess the effects of cash flow on investment. Bertrand and Mullainathan [2001] use several shock measures to assess the effects of luck on CEO pay.

7. It is worth noting that business groups may add social value in other ways that offset the social costs they may impose through tunneling. They might help reduce transaction costs, solve external market failures, or provide reputational capital for their members. We will not, therefore, be attempting to test whether groups are on net bad but merely whether, and if so how much, they tunnel.

sensitive to both their own shock and shocks to the other firms in their group. Firms whose *group* has a high market-to-book are also more sensitive to their own shock, but are not significantly more sensitive to the group's shock. This suggests that the stock market at least partly penalizes tunneling activities.

II. A Test for Tunneling

We begin by describing the exact implications of tunneling for the propagation of shocks.[8] Let us return to the fictional example of two group firms, high-cash-flow-right firm H and low-cash-flow-right firm L. Consider again a 100-dollar profits shock affecting firm L. Because the controlling shareholder would benefit more if these 100 dollars were in H, he will look for a way to divert them out of L. This gives the first prediction: group firms should on average underrespond to shocks to their own profits.

Of course, since tunneling may be costly (either because of resource dissipation or because of a risk of being caught), the controlling shareholder may transfer only some of the 100 dollars out of firm L. How much he transfers will be a function of his cash flow rights in L. The less his cash flow rights in L, the less he values the extra dollar left in L and the more of the profits he will want to tunnel out of L. This gives the second prediction: the underresponse to shocks to own profits should be larger in low-cash-flow-right firms.

The cash tunneled from firm L eventually ends up in firm H. So H will appear to respond to L's shock even though H is not directly affected by L's shock. This gives the third prediction: group firms will on average be sensitive to shocks affecting other firms in the group.[9]

We know from above that when cash flow rights in firm L are low, more money will be tunneled out of L. But this also implies that more money will be tunneled into H when cash flow rights in L are low. This gives the fourth prediction: group firms will be more sensitive to shocks affecting low-cash-flow-right firms in their group than to shocks affecting high-cash-flow-right firms.

8. Bertrand, Mehta, and Mullainathan [2000] present a model that formalizes these implications.

9. This prediction distinguishes tunneling from a pure mismanagement interpretation of the profits shortfall. The first two predictions could simply reflect a dissipation of resources through inefficient operation rather than a diversion to other group firms.

Finally, suppose that a 100-dollar shock were now to affect firm H instead of firm L. Since the controlling shareholder has more cash flow rights in H than in L, he will have no incentives to tunnel from H to L. This means that H will respond one for one to its own shock, which is just another way to understand the second prediction above. It also means that L will not be sensitive to H's shock. A more general version of this observation gives the fifth prediction: low-cash-flow-right firms will be less sensitive to shocks affecting other firms in their group.

To transform these general predictions into testable implications, we need to isolate specific shocks using available data. Industry shocks provide an ideal candidate since they affect individual firms but are to a large extent beyond the control of individual firms. Some notation will be helpful in defining these mean industry movements. Let $perf_{ktI}$ be a level measure of reported performance for firm k in industry I at time t (in our case profits before depreciation, interest, and taxes). A_{ktI} be a measure of the firm k's assets (in our case, total book value of assets), and $r_{ktI} = perf_{ktI}/A_{ktI}$ be a measure of return on assets for that firm. To isolate the industry shock, we compute the asset-weighted average return for all firms in industry I: $\hat{r}_{It} = \Sigma_k A_{ktI} r_{ktI} / \Sigma_k A_{ktI}$.[10] Given this industry return, we can predict what firm k's performance ought to be in the absence of tunneling by calculating $pred_{ktI} = A_{ktI} * \hat{r}_{It}$.

Our empirical test will then consist of regressing a firm's actual reported performance on its predicted performance and on the predicted performance of other firms in its group.[11] More specifically, we can test the five implications above: (1) group firms should be less sensitive to shocks to their industry than nongroup (stand-alone) firms; (2) low-cash-flow-right group firms will show smaller sensitivities to shocks to their industry than high-cash-flow-right ones; (3) group firms should be sensitive to industry shocks affecting other firms in their group; (4) group firms should be especially sensitive to shocks affecting the low cash-flow-right firms in their group; (5) low-cash-flow-right group

10. A mechanical correlation arises if we include a firm itself in estimating its industry return and then use that industry return to predict the firm's own return. To prevent this, we exclude, for every firm, the firm itself in computing its industry return. In this sense, $\hat{r}_{It}$ should actually be indexed by k, but we drop this subscript for simplicity.

11. Given that this is a predicted *level* of performance, our terminology of shocks may seem inappropriate. But since we include firm fixed effects, we will in fact be identifying the effect of industry *shocks*.

firms should show smaller sensitivities in predictions 3 and 4. These five predictions form a simple test of tunneling, one that requires only firm-level data on earnings, industry, group membership, and ownership structure.[12]

III. An Application to Indian Business Groups

We now apply this test to Indian data. As in many other countries, group firms in India are often linked together through the ownership of equity shares. In most cases, the controlling shareholder is a family; among the best-known business families in India are Tata, Bajaj, Birla, Oberoi, and Mahindra.[13]

Nominally, corporate governance laws in India are quite good, consistent with its English colonial past and its common law heritage [Sarkar and Sarkar 1999]. In reality, however, corruption makes these laws difficult to enforce and shareholder expropriation a major concern in India. In recent years the role of corporate governance in financial development has received significant attention from the Indian business press and central government. Business groups have come under particular scrutiny for advancing their private interests at the expense of outside shareholders.[14] Tunneling is also allegedly a problem.[15] Indeed, greater oversight of related party transactions was one of

12. A notable feature of these tests is their symmetry. One might have thought that there should be no tunneling for negative groups. This is in fact not clear. For example, suppose that an industry earns a 10 percent natural rate of return and a negative shock reduces it to 5 percent. Since this reduces the amount that can be tunneled out, we will see just as much sensitivity to this shock (for example, among high-cash-flow-right group firms) as to a positive one. Rather than asymmetry in changes, one might expect that below some nominal rate of return, tunneling would cease. A priori, it is unclear where this threshold lies. We tried some thresholds (e.g., zero nominal rate of return) and found standard errors that were too large to reject either linearity or significant nonlinearity. Johnson and Friedman [2000] provide further discussion of asymmetry.

13. Piramal [1996] and Dutta [1997] provide accounts of groups in India.

14. One Financial Times Asia article charges that the "boards of Indian companies, especially the family-owned ones, are prime examples of crony capitalism. They are invariably filled with family members and friends. . . . In such an environment, the promoter can operate to further his own interests even as he takes the other shareholders for a ride."

15. A 1998 Financial Times Asia article reports that "[c]hanneling funds to subsidiaries and group companies in the form of low or nil interest loans or low-yield investments is not new. Such a lockup of costly funds often results in poor financial performance. JCT, Kalyani Steels, Bombay Burmah Trading Company; and DCM Shriram Industries are examples. JCT's average return over the last four years on outstanding loans and advances of Rs. 270 crores is is just 4 percent. Similarly Kalyani Steels' 1996–97 investments in group companies was worth Rs. 196.80 crores—more than two-thirds its net worth—while the company earned just 1.45 crores as dividends."

the specific recommendations made by a government committee organized to study corporate governance.[16] Thus, with its weak corporate governance and allegations of impropriety, India provides an ideal location to test for tunneling.

III.A. Data Source

We use Prowess, a publicly available database maintained by the Centre for Monitoring Indian Economy (CMIE). Prowess includes annual report information for companies in India between 1989 and 1999. It provides much of the information needed for this analysis: financial statements, industry information, group affiliation for each firm, and some corporate ownership data. We exclude state-owned and foreign-owned firms from our sample since these may not be comparable to the private sector domestic firms that interest us. Our sample contains about 18,500 firm-year observations, although sample sizes vary because of missing variables for some firms.[17]

We rely on CMIE classification of firms into group and non-group firms, and of group firms into specific group affiliation. CMIE classification is based on a "continuous monitoring of company announcements and a qualitative understanding of the groupwise behavior of individual companies" (Prowess Users' Manual, v.2, p.4). Note also that CMIE assigns each company to a unique ownership group, based on the group most closely associated with that company. Conversations with local experts corroborate these classifications; which group a firm belongs to is widely known.

16. The Kumar Mangalam Committee recommended measures to strengthen the board of directors' role in "reduc[ing] potential conflict between the specific interests of management and the wider interests of the company and shareholders including misuse of corporate assets and abuse in related party transactions." These measures included guidelines for strengthening the independence of boards and for the establishment of an audit committee by the board of directors to review, among other things, "[a]ny related party transactions, i.e. transactions of the company of material nature with promoters or the management, their subsidiaries or relatives, etc. that may have potential conflict with the interests of the company at large."

17. Prowess does not use consolidated accounting data, which implies that our findings are not caused by accounting mechanics. In fact, during the sample period under study, Indian accounting standards did not require disclosing consolidated accounts for group firms. Very few firms used consolidated financial statements in practice [Price, Waterhouse & Co. 1999].

III.B. Measurement of Controlling Shareholder's Cash Flow Rights

A key variable in our analysis is the cash flow rights of the controlling shareholder in a particular firm. There are two components to cash flow rights. First are *direct* rights, which are derived from shares that the controlling shareholder (or his family) has in the company. Second are *indirect* rights, which are derived from shares held by another company in which the controlling shareholder has some shares.

Prowess provides two reasonable proxies for direct cash flow rights. Both are derived from data on equity holding patterns, which is available for about 60 percent of firms (all of them publicly traded). For these firms, CMIE reports the shares of equity held by foreigners, directors, various financial institutions, banks, various governmental bodies, the top fifty shareholders, corporate bodies, and others.[18]

As in many countries, Indian families typically control the firms they have financial stakes in by appointing family members or family friends to the board of directors and to top managerial positions. Since the company shares held by these board members benefit the controlling shareholder in some sense, the information on director ownership provides a first proxy for direct cash flow rights.[19]

The equity held by "other shareholders," where others are defined as shareholders that are neither directors, nor banks, nor foreigners, not financial institutions, nor government bodies, nor corporate bodies, nor the top fifty shareholders, provides a second proxy. By measuring the shares held by small, minority share-

18. The exact ownership categories reported by CMIE are Foreigners, Insurance Companies, Life Insurance Corporation, General Insurance Corporation, Mutual Funds, Unit Trust of India, Financial Institutions (Industrial Financial Corporation of India, Industrial Development Bank of India, Industrial Credit and Investment Bank of India, Industrial Credit and Investment Corporation, Commercial Banks), Government Companies (Central Government Companies, State Government Companies), State Finance Corporation, Other Government Organizations, Corporate Bodies, Directors, Top Fifty Shareholders, and Others.

19. For example, the Financial Times Asia reports that "the boards of Indian companies . . . are invariably filled with family members and friends, whether or not they are qualified for the position" [Financial Times Asia Intelligence Wire, October 10, 1999]. The article goes on to say: "In such an environment, the promoter can operate to further his own interests even as he takes the other shareholders for a ride." Of course, if some of the directors are not family members or friends, this proxy will overstate the direct cash flow rights.

holders, it captures the amount of cash flow rights the family does *not* own.[20]

Although both variables are good proxies for direct cash flow rights, they do little to capture indirect cash flow rights. Because Prowess only provides information by ownership category, it is impossible to back out of such indirect cash flow rights.[21] Consequently, our ranking of firms (in terms of cash flow rights) within a group is noisy. For example, suppose that the ultimate owner owns 10 percent of firms A and B and firm B owns 40 percent in firm A. The ultimate owner seemingly has a 10 percent direct cash stake in both firms but actually has a 14 percent stake in firm A. If we modify the example so that the direct ownership stake in firm A is actually 9 percent, then adding indirect cash flow rights reverses the ranking.[22]

Three points should be noted about this important measurement issue. First, indirect cash flow rights by their very nature should be smaller than direct rights because they are diminished as they pass through the chain of ownership. In the above example, despite the large indirect ownership of A by B (40 percent), the final difference is only 4 percent since A has only a 10 percent direct stake in B. Moreover, when our ranking of firms was wrong in the second example above, this was because both B and A were very close in terms of direct cash flow rights (10 percent versus 9 percent).[23] Second, to the extent that any significant error is introduced into our rankings of firms, there will be an attenuation bias. This will bias our estimates toward zero, raise standard errors, and make it *more* difficult to find evidence of tunneling. Finally, although these imperfect measures may make the CMIE

20. The two measures, the equity stake of directors and the equity stake held by minority shareholders, correlate negatively. The correlation is imperfect, however, (about $-.35$ for group firms), suggesting that these are not redundant proxies. Besides measuring the absolute level of director and other equity holdings, we also measure their relative levels within each group. Finally, because we use within-group differences in director and other ownership levels to identify the direction and magnitude of money flows across firms in a business group, we exclude from the sample all groups where there is no difference between the maximum and the minimum level of direct ownership or between the maximum and minimum level of other ownership.

21. Indian disclosure laws do not mandate release of this information. We have attempted to gather this information in many other ways, from investment bankers to the groups themselves; our attempts have been fruitless.

22. We are grateful to an anonymous referee for providing variants of these examples.

23. This is not to say that one cannot construct examples where indicted ownership matters, but rather that because of the multiplication by the direct ownership in firms, indirect ownership will have on average a smaller effect on cash flow rights.

data a less than perfect place to apply our test, it is highly representative of the typical data available to implement our test in most countries. Detailed data on ownership between firms are usually hard to get, whereas many countries have readily available categorical ownership data of the kind provided by CMIE.

III.C. Measurement of Performance

The CMIE data were collected with a focus on accounting numbers. Consequently, we cannot use it to compute reliable annual stock return measures for many firms between 1989 and 1999. More specifically, we lack dividend data for many observations, which is especially troubling since dividend payments would be the most direct way for a controlling shareholder to affect final returns.[24] Moreover, comparisons with both aggregate data and data on specific firms from the Bombay Stock Exchange show that the stock prices reported on CMIE are themselves noisy. In several cases, the returns we computed lagged or led true returns.[25] These problems constrain us to use the more reliable "profits before depreciation, interest and tax" as our specific performance measure, $perf_{ktI}$. Our asset measure, $Assets_{ktI}$, is total assets. Each firm's industry comes from CMIE's classification of firms into industries. Our sample contains 134 different "four-digit" industries.[26]

III.D. Summary Statistics

Table I reports summary statistics for the full sample and for group and nongroup firms separately. In this table, and throughout the remainder of the paper, nongroup firms are referred to as "stand-alones." Group firms and stand-alones, respectively, account for about 7,500 and 11,000 of the observations in our full sample. All nominal variables in the sample are deflated using

24. By examining the firms with some, not necessarily reliable dividend data, we see that dividends are a sizable fraction of returns.

25. Despite the noisiness, we did estimate the regressions below using market value as a dependent variable, and the results are quite similar. But, because of ths noisiness of the data, we do not have great faith in these results. They are available as Table B in the unpublished appendix, available from the authors upon request. The average level of market capitalization appears much more reliable, however, and we use it in subsection IV.B. to relate q ratios to the extent of tunneling.

26. They can be found in Table A of the appendix available from the authors upon request. The breakdown is at roughly the level of the four-digit SIC code in the United States.

TABLE I
SUMMARY STATISTICS

Sample:	All	Groups	Stand-alones
Total assets	131.80	252.76	49.69
	(525.91)	(741.6)	(272.66)
Total sales	94.39	188.16	30.73
	(305.66)	(459.77)	(57.84)
Profit before depreciation, interest, and taxes	16.84	32.90	5.94
	(63.84)	(90.99)	(30.48)
Ratio of PBDIT to total assets	.126	.142	.115
	(.128)	(.115)	(.134)
Ratio of operating profit to total assets	.284	.328	.254
	(.285)	(.312)	(.261)
Ratio of nonoperating profit to total assets	−.157	−.186	−1.38
	(.259)	(.288)	(.235)
q ratio	.537	.645	.447
	(.818)	(.916)	(.714)
Year of incorporation	1974.55	1967.51	1979.33
	(20.03)	(22.89)	(16.18)
Director equity	16.70	7.45	22.99
	(18.33)	(13.05)	(18.72)
Other ownership	29.90	27.57	31.48
	(17.39)	(16.06)	(18.07)
Director equity spread	—	15.19	—
		(14.88)	
Other ownership spread	—	33.31	—
		(21.66)	
Sample size	18600	7521	11079

a. *Data Source:* Prowess, Centre for Monitoring Indian Economy (CMIE), for the years 1989–1999. All monetary variables are expressed in 1995 Rs. crore, where crore represents 10 million.

b. Standard deviations are in parentheses.

c. "Operating profit" refers to manufacturing sales revenue minus total raw material expenses, energy expenses, and wages and salaries. "q ratio" is the ratio of market valuation to total assets. "Director equity spread" is the difference between the minimum and maximum level of director equity in a group; "Other ownership spread" is the difference between the minimum and maximum level of other ownership in a group. Ownership and ownership spread variables are measured in percentages and so range from 0 to 100.

the Consumer Price Index series from the International Financial Statistics of the International Monetary Fund (1995 = 100).

The average group firm in the sample belongs to a group with fifteen firms. Many groups in our data, however, consist of two or three firms.[27] Group firms are, on average, twelve years older than nongroup firms: the typical group firm was created in 1967,

27. Some ownership groups have several smaller companies that are set up for taxation or retail business purposes. It is much more difficult for CMIE to get access to the annual reports of these smaller companies. CMIE also tracks sub-

TABLE II
SENSITIVITY TO OWN SHOCK: GROUP VERSUS STAND-ALONE
DEPENDENT VARIABLE: PROFIT BEFORE DIT

	(1)	(2)	(3)	(4)
Own shock	1.05	.10	−4.58	−5.10
	(.02)	(.05)	(.48)	(.47)
Own shock* group	**−.30**	**−.30**	**−.26**	**−.27**
	(.02)	(.02)	(.02)	(.02)
Ln assets	.16	2.98	−.33	2.47
	(.32)	(.34)	(.33)	(.34)
Own shock* ln assets	—	.10	—	1.0
		(.00)		(.01)
Own shock* year of incorp.	—	—	.003	.003
			(.000)	(.000)
Sample size	18600	18600	18588	18588
Adjusted R^2	.93	.93	.93	.93

a. *Data Source:* Prowess, Centre for Monitoring Indian Economy, for years 1989–1999. All monetary variables are expressed in 1995 Rs. crore, where crore represents 10 million. Sample includes both stand-alone and group firms.
b. All regressions also include year fixed effect and firm fixed effects.
c. Standard errors are in parentheses.

the typical stand-alone firm in 1979. More importantly, group firms tend to be much larger than stand-alones. The average group firm has total assets of Rs. 253 crores, while the average stand-alone has total assets of Rs. 52 crores. Stand-alones also have lower levels of sales and profits. We will control for these size and age differences in our analysis.

The average level of director ownership among group firms is 7.5 percent. The average level of ownership by other shareholders is 27.5 percent. The gap in director ownership between the top and bottom of a group (i.e., the gap between the firm with the highest level of director ownership and the firm with the lowest level of director ownership) is 15 percent on average. The average gap in other ownership is 33 percent.

III.E. Sensitivity to Own Shock

In Table II we test the first prediction of tunneling: group firms should be less sensitive to shocks to their own industry than stand-alones. We estimate

sidiary companies with small turnover but does not include them in the database we use in this paper.

$$(1)\quad perf_{kt} = a + b(pred_{kt}) + c(group_k * pred_{kt}) + d(controls_{kt}) + Firm_k + Time_t,$$

where $group_k$ is a dummy variable for whether firm k is in a group or not, $controls_{kt}$ are other variables that might affect firm performance (specifically age and log assets), $Firm_k$ are firm fixed effects, and $Time_t$ are time dummies.[28] The coefficient b measures the general sensitivity of firms to industry performance; the interaction term $group_k * pred_{kt}$ captures the differential sensitivity of group firms. If group firms are less sensitive, as tunneling would predict, then c should be negative. Note that because the regression is expressed in performance levels, the magnitude of the effects can easily be interpreted.

Column (1) displays our basic result. A one-rupee shock leads to about a one-rupee (1.05) increase in earnings for a stand-alone firm. For a group firm, it leads to .3 rupee smaller increase, or only a .75 rupee increase.[29] This suggests that 30 percent of all the money placed into a group firm is somehow dissipated.

In Table I we saw that stand-alone firms are smaller and older on average than group firms. This could confound our estimate of the effect of group affiliation if size or age affects a firm's responsiveness to shocks. In column (2) we include an interaction between the logarithm of total assets and the industry shock. In column (3) we do the same for age. In column (4) we include both interactions simultaneously. The direct effects are always included. From these, it is clear that both size and age do affect the responsiveness to shocks. But it is also clear that the difference between group and stand-alone firms remains significant even in the presence of additional controls.[30] In short, the data support the first prediction.

28. The inclusion of firm fixed effects deals with several issues. First, even though we are using level of predicted performance, we are identifying off of changes in predicted performance, hence our use of the term "shocks" throughout the paper. Second, the fixed effects account for any inherent, fixed differences between firms. Third, because firms do not change groups in our sample, the firm fixed effects also account for any fixed differences between groups.

29. We have also estimated this and all regressions below excluding small groups, which we define as groups with less than five firms in the CMIE data. The results were not affected when we restrict ourselves to that subsample.

30. We have also attempted more flexible specifications by allowing for more nonlinear terms for size and age in the interaction. These produced identical results.

The second prediction provides a more stringent test: *within*-group firms, high-cash-flow-right firms should show greater sensitivity to own shocks. We estimate for the set of group firms

$$(2)\quad perf_{kt} = a + b(pred_{kt}) + c(cash_k * pred_{kt}) + d(controls_{kt}) + Firm_k + Time_t,$$

where $cash_k$ is the cash flow rights of the controlling party in firm k, measured either with director or other ownership. The interaction term, $cash_k * pred_{kt}$, measures differential sensitivity by level of cash flow rights. Under the tunneling hypothesis, we would expect $c > 0$.[31]

Panel A of Table III uses director equity as the proxy for cash flow rights. Column (1) shows that group firms where director equity is higher are more sensitive to their own industry shock. Each one-percentage point increase in director equity increases the sensitivity to a one-rupee industry shock by .03 rupee. Recall that among group firms, the average difference in director ownership between the firm with the greatest and the firm with the lowest director ownership was about 15. Thus, for each rupee of industry shock, the typical firm with the highest director ownership is .45 rupee more sensitive than the typical firm with the lowest director ownership. This suggests that group firms with high controlling party's cash flow rights may be as sensitive to the marginal rupee as stand-alone firms. The magnitude of this effect is striking and suggests that ownership plays a large role in the extent of the sensitivity.

To assess whether the findings in column (1) capture some aspects of director ownership that are unrelated to group membership, we reestimate equation (2) in column (3) on the subsample of stand-alone firms. We find that director ownership also increases the responsiveness to shocks for stand-alone firms. The effect, however, is quantitatively much smaller, only a sixth of the size of the effect for group firms (.004 versus .025 for group firms).

In columns (2) and (4) we allow for the effect of own industry shock to differ by firm size and firm age. These additional controls do not alter the estimated coefficient on "Own shock · director equity" for the sample of group firms (column (2)). They do, however, lead to an increase in the coefficient on "Own shock ·

31. When we use "Other ownership" in the interaction, we expect a negative term since this measure is negatively related to cash flow rights.

TABLE III
SENSITIVITY TO OWN SHOCK BY DIRECTOR AND OTHER OWNERSHIP
DEPENDENT VARIABLE: PROFIT BEFORE DIT

Panel A: Director equity

	Sample:			
	Groups (1)	Groups (2)	Stand-alones (3)	Stand-alones (4)
Own shock	.713	−5.075	1.058	−4.316
	(.009)	(.742)	(.006)	(.518)
Own shock * director equity	**.025**	**.030**	**.004**	**.019**
	(.003)	(.003)	(.001)	(.001)
Ln assets	.052	4.261	−.590	1.568
	(.733)	(.807)	(.176)	(.178)
Own shock * ln assets	—	.118	—	.201
		(.008)		(.006)
Own shock * year of incorp.	—	.002	—	.002
		(.000)		(.000)
Sample size	7521	7510	11079	11078
Adjusted R^2	.92	.93	.95	.96

Panel B: Other ownership

	Sample:			
	Groups (1)	Groups (2)	Stand-alones (3)	Stand-alones (4)
Own shock	.919	−5.764	1.033	−3.983
	(.023)	(.743)	(.052)	(.603)
Own shock * other ownership	**−.007**	**−.007**	**.001**	**.002**
	(.001)	(.001)	(.000)	(.000)
Ln assets	1.616	5.189	−.292	2.049
	(.724)	(.806)	(.166)	(.180)
Own shock * ln assets	—	.103	—	.154
		(.008)		(.006)
Own shock * year of incorp.	—	.003	—	.002
		(.003)		(.000)
Sample size	7521	7510	11079	11078
Adjusted R^2	.92	.93	.95	.96

a. *Data Source:* Prowess, Centre for Monitoring Indian Economy, for years 1989–1999. All monetary variables are expressed in 1995 Rs. crore, where crore represents 10 million.
b. All regressions also include year fixed effect and firm fixed effects.
c. Standard errors are in parentheses.

director equity" in the sample of stand-alone firms (.019 instead of .004). Because standard errors are relatively small, we can still reject that the effect of director ownership on industry shock sensitivity is the same between group firms and stand-alone firms. More director equity increases the responsiveness of a firm to its own industry shock, and this effect is significantly larger among group firms.

In Panel B of Table III we use our other proxy for direct cash flow rights, the ownership stake of other small shareholders. As predicted, we find that the sensitivity of a group firm to its own industry shock decreases with its level of other ownership. A one-percentage point increase in other ownership decreases the responsiveness of a group firm to a one-rupee shock by about .01 rupee (column (1)). Given that the average spread between highest and lowest other ownership among group firms is about 33, the implied magnitude of the effect is the same as in Panel A. Among stand-alone firms (column (3)) the effect of other ownership is of the opposite sign and economically small. Finally, note that the coefficient on "Own shock · other ownership" is roughly unaffected by the inclusion of controls for firm age and firm size interacted with own industry shock (columns (2) and (4) for group and stand-alone firms, respectively).

In summary, these results in Table III are consistent with the idea that fewer resources are tunneled out of the group firms where the promoting family has higher equity stakes and where there are fewer minority shareholders to expropriate. In fact, group firms where the controlling party has a large stake show the same sensitivity to their own industry shocks as stand-alone firms.

III.F. Sensitivity to Group Shocks

We now examine whether a firm responds to shocks affecting other firms in its group (prediction 3). We estimate

$$(3)\quad perf_{kt} = a + b(pred_{kt}) + c(opred_{kt}) + d(controls_{kt}) + Firm_k + Time_t,$$

where $opred_{kt} = \Sigma_{j \neq k}\, pred_{jt}$, the sum being over all other firms in the same business group (excluding the firm itself). A positive

TABLE IV
SENSITIVITY OF GROUP FIRMS TO GROUP AND SUBGROUP SHOCKS
DEPENDENT VARIABLE: PROFIT BEFORE DIT

	(1)	(2)	(3)	(4)	(5)
Own shock	.730	.732	.732	.732	.732
	(.009)	(.009)	(.009)	(.009)	(.009)
Group shock	.011	—	—	—	—
	(.001)				
Shock below median (director equity)	—	.016	—	—	—
		(.002)			
Shock above median (director equity)	—	−.002	—	—	—
		(.005)			
Shock below 66th pctile (director equity)	—	—	.015	—	—
			(.002)		
Shock above 66th pctile (director equity)	—	—	−.001	—	—
			(.001)		
Shock above median (other ownership)	—	—	—	.014	—
				(.002)	
Shock below median (other ownership)	—	—	—	.007	—
				(.004)	
Shock above 33rd pctile (other ownership)	—	—	—	—	.017
					(.002)
Shock below 33rd pctile (other ownership)	—	—	—	—	−.002
					(.004)
Sample size	7521	7521	7521	7521	7521
Adjusted R^2	.93	.92	.92	.92	.92

a. *Data Source:* Prowess, Centre for Monitoring Indian Economy, for years 1989–1999. All monetary variables are expressed in 1995 Rs. crore, where crore represents 10 million.

b. Sample is group firms only.

c. "Shock below median (director equity)" is a variable that sums the industry shocks to all the firms in the same group (excluding the firm itself) that have below median level of director ownership in their group. All the other subgroup shocks are defined accordingly.

d. Also included in each regression are the logarithm of total assets, year fixed effects, and firm fixed effects.

e. Standard errors are in parentheses.

coefficient on $opred_{kt}$ suggests that firms within a group are in fact sensitive to each other's shocks.[32]

In column (1) of Table IV we find a moderate response of group firms to each other's shocks. The coefficient on "Group shock" of .011 suggests that for each rupee earned by the group, an *average* firm in the group receives .011 rupee. Since we know that group firms underreact by about 1 − .73 = .27 rupee to a

32. Note that we control for the firm's own shock, $pred_{kt}$. This control means that we do not confuse an overlap of industry between firms in the same group with a flow of cash within that group.

one-rupee shock and since there are about fifteen firms in each group, this coefficient implies that about 61 percent of the money that is tunneled out reappears elsewhere in the group.[33]

The next prediction of tunneling (prediction 4) is that the source of the shock matters: firms should respond more to groups affecting low-cash-flow-right firms than to groups affecting high-cash-flow-right firms. We study this prediction in columns (2) to (5). We define $Hopred_{kt}$ as the sum of shocks affecting all high cash-flow-right firms in k's group and $Lopred_{kt}$ as the equivalent sum for low-cash-flow-right firms. We then estimate

$$(4) \quad perf_{kt} = a + b(pred_{kt}) + c_L(Lopred_{kt}) + c_H(Hopred_{kt}) + d(controls_{kt}) + Firm_k + Time_t.$$

If group firms are in fact more sensitive to groups to the firms with low cash flow rights, we should find that $c_L > c_H$.

In column (2) we classify a group's firms as low- or high-cash-flow-right using the median director equity in that group as a threshold. We find that firms show greater sensitivity to shocks affecting the low-cash-flow-right firms in their group. A one-rupee shock to firms below group median in terms of director ownership increases the average group firm's earnings by .02 rupee. By contrast, the average group firm's earnings do not respond to industry shocks to firms in the high-cash-flow-right group. Column (3) instead contrasts shocks to firms below and above the sixty-sixth percentile of director equity in their group. This isolates a smaller group of firms in the high-cash-flow-right group and allows resources to be equally skimmed from a larger number of firms. The results are very similar.

In column (4) we classify a group's firms as low- or high-cash-flow-right using the median other shareholders' equity in that group as a threshold. In this case, we find that the average group firm is equally sensitive to shocks to the two subgroups. In column (5) we isolate a larger set of firms with low cash flow rights by using the thirty-third percentile of other shareholders' equity as the breaking point. The results suggest that few to no resources are transferred from the subgroup of firms with low levels of other equity. In contrast, the coefficient on the shock to firms

33. The remaining 39 percent may be a dissipation factor, suggesting real costs of redistribution. Alternatively, it may reflect redistribution to firms that are not in our sample. Most notably, tunneling may occur through nonpublic firms such as holding companies, which are not represented in our data set.

TABLE V
SENSITIVITY TO GROUP SHOCK BY LEVEL OF DIRECTOR OWNERSHIP IN GROUP
DEPENDENT VARIABLE: PROFIT BEFORE DIT

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Level in group:	Lower ⅔	Top ⅓	Below topmost firm			Topmost firm		
Own shock	.62	.89	.63	.63	.63	1.01	1.01	1.01
	(.01)	(.02)	(.01)	(.01)	(.01)	(.02)	(.02)	(.02)
Group shock	.013	.010	.012	—	—	.020	—	—
	(.002)	(.002)	(.001)			(.008)		
Shock below 66th pctile (director equity)	—	—	—	.015	—	—	.032	—
				(.002)			(.012)	
Shock above 66th pctile (director equity)	—	—	—	.003	—	—	.007	—
				(.006)			(.018)	
Shock below 33rd pctile (other ownership)	—	—	—	—	−.000	—	—	−.013
					(.004)			(.025)
Shock above 33rd pctile (other ownership)	—	—	—	—	.017	—	—	.034
					(.002)			(.011)
Sample size	4905	2616	5780	5780	5780	1741	1741	1741
Adjusted R^2	.90	.95	.90	.97	.97	.97	.97	.97

a. *Data Source:* Prowess, Centre for Monitoring Indian Economy, for years 1989–1999. All monetary variables are expressed in 1995 Rs. crore, where crore represents 10 million.

b. Firms are separated into different "Level in group" based on their within-group level of director equity. For example, "Topmost Firm" are the set of firms that have the highest level of director ownership in their group.

c. Also included in each regression are the logarithm of total assets, year fixed effects, and firm fixed effects.

d. Standard errors are in parentheses.

with high levels of other equity is large (about .02) and statistically significant. These results complement the findings in Table III: not only are more resources "disappearing" from low-cash-flow right firms, these resources are also the ones more likely to "show up" elsewhere in the group.

III.G. Does Money Go to the Top?

In Table V we test the final prediction of tunneling: resources should disproportionately flow toward high-cash-flow-right firms. We rank firms based on their within-group level of director equity and construct four different subsamples: firms with below the sixty-sixth percentile of director equity in their group, firms with above the sixty-sixth percentile of director equity in their group, firms with strictly less than the highest level of director equity in their group, and firms with the highest level of director equity in their group. We compare sensitivity to group shocks and sub-

group shocks for firms in the four different samples by reestimating equations (3) and (4) separately for these samples. In addition to the variables reported in the table, each regression includes the logarithm of total assets, year fixed effects, and firm fixed effects. The dependent variable in all regressions is still profit before depreciation, interest, and taxes.

When we contrast firms above and below the sixty-sixth percentile in director equity (columns (1) and (2)), we find no statistically significant differences in their sensitivity to the overall group shock. In fact, the point estimate on "Group shock" is higher for firms with low levels of director ownership (.013 versus .010).[34] In columns (3) to (6), we contrast the sensitivity to the group shock for the firms with the highest level of director ownership in their group compared with that for all other firms in the group. With this split of the data, the theoretically expected patterns emerge. Firms at the very top gain about .02 rupee for every one-rupee shock to their group (column (6)). All the other firms gain only .012 rupee for the same one-rupee shock (column (3)). Because standard errors are rather large in column (6), however, these two estimates are not statistically different.

Interestingly, when we break down the overall group shock into two subshocks, the results become even more suggestive. We find that top firms gain between .032 and .034 rupee for every one-rupee shock to group firms either below the sixty-sixth percentile in terms of director equity or above the thirty-third percentile in terms of other ownership (columns (7) and (8)). All the other firms gain between .015 and .017 rupee on average for the same subshocks (columns (4) and (5)). To summarize, these results give some evidence that the firms with the highest level of director equity in their group seem to benefit most from shocks to the rest of the group. Moreover, these firms benefit the most from shocks to firms with low director equity or higher other shareholders' ownership.

III.H. Alternative Explanations

Although these findings match the predictions of the tunneling hypothesis, other possible explanations need to be considered.[35] First, suppose that group firms are more diversified than

34. Similar results follow if we use median cutoffs.

35. A purely mechanical explanation could be that cross-ownership between firms generate dividend payments that look like tunneling. This effect, however,

stand-alones and low-cash-flow-right ones are more diversified than high-cash-flow-right ones. Then the reduced sensitivity to the industry shock could reflect mismeasurement of these firms' industries. We investigate these questions directly by using detailed product data to construct diversification measures. For these measures, we find no difference between group and nongroup firms. Nor do we find any difference between high- and low-cash-flow-right group firms in the extent of their diversification. This suggests that differences in industry mismeasurement do not drive our findings.[36]

Another possibility is that coinsurance between group firms generates both reduced sensitivity to own shock and redistribution between firms. Such coinsurance may be common in countries such as India, where capital markets are still nascent [Khanna and Palepu 2000]. Insurance may also take a financing form in which a rich group firm invests in other firms' products, essentially forming a groupwide internal capital market. A simple coinsurance scheme, however, could not generate all of our results. Specifically, why do high-cash-flow-right firms systematically receive less insurance or financing? More generally, why does cash flow in only one direction, from low- to high-cash-flow-right firms?

For an insurance story to accommodate our findings, high-cash-flow-right firms within a group would have to be better providers of insurance or financing. We test this hypothesis in several ways and find no evidence for it. First, we find no difference in cash richness (a proxy for ease of insurance provision) between high- and low-cash-flow-right group firms. Second, we find that adding an interaction of industry cash richness with the various shock measures does not affect the results. Finally, to examine the possibility that these results reflect internal capital markets, we control for the extent of borrowing between firms in a group. This also does not affect the results. As a whole, we find little support for these alternative explanations.

would be too small to explain our results. Moreover, our results do not change when we exclude "earnings from dividends" from our measure of earnings.

36. All the results in this section are described in detail in Bertrand, Mehta, and Mullainathan [2000] as well as in Tables C and D of the unpublished appendix.

TABLE VI
SHOCK SENSITIVITY: AN ACCOUNTING DECOMPOSITION

Panel A: Sensitivity to own shock		
Sample:	Groups	Stand-alones
Dep. variable:		
Operating profits	1.22	1.17
	(.018)	(.009)
Nonoperating profits	−.478	−.103
	(.014)	(.006)

Panel B: Sensitivity to own shock by director ownership		
Sample:	Groups	Stand-alones
Dep. variable:		
Operating profits	.0123	.0082
	(.0056)	(.0013)
Nonoperating profits	.0131	−0.0038
	(.0043)	(.0008)

Panel C: Sensitivity to group shock by level of director ownership in group		
Sample:	Topmost firm	Below topmost firm
Dep. variable:		
Operating profits	.0066	.0114
	(.0128)	(.0026)
Nonoperating profits	.0134	.0006
	(.0078)	(.0020)

a. *Data Source:* Prowess, Centre for Monitoring Indian Economy, for years 1989–1999. All monetary variables are expressed in 1995 Rs. crore, where crore represents 10 million.

b. Each coefficient contains the result of a separate regression in which the dependent variable is either operating profits or nonoperating profits, as indicated. In Panel A the reported coefficient is the coefficient on "Own shock." In Panel B the reported coefficient is the coefficient on "Own shock · director equity." In Panel C, the reported coefficient is the coefficient on "Group Shock." Also indicated in each regression are the logarithm of total assets, year fixed effects, firm fixed effects, and "Own shock" (Panels B and C).

c. In Panel C the subsamples are for group firms only. Topmost firm and below topmost firms are defined using director's equity. For example, "Topmost firm" are the set of firms that have the highest level of director ownership in their group.

d. Standard errors are in parentheses.

IV. OTHER RESULTS

IV.A. An Accounting Decomposition

If business groups in India are indeed tunneling resources, as the evidence so far strongly suggests, how are they doing it? We address this question in Table VI where we replicate the previous analysis but replace our standard profits measure with other

balance sheet items. More formally, we decompose profits into two components. *Profits = Operating Profits + Nonoperating Profits*. Operating profits are defined as sales minus total raw material expenses minus energy expenses minus wages and salaries.[37] Nonoperating profits are the "residual." They include such diverse items as write-offs for bad debts, interest income, amortization, extraordinary items, and unspecified items.

Panel A of Table VI compares the sensitivity of group and stand-alone firms to their own shock for these two measures (as in Table II). Each entry in this panel is the coefficient on "Own shock" from a separate regression. We see in the first row that group firms' operating profits are, if anything, *more* sensitive to their own industry shock.[38] It is on nonoperating profits that group firms are far less sensitive to their own shock. More specifically, nonoperating profits seem to fall when there is a positive shock to a firm's industry. Although nonoperating profits decline moderately in stand-alone firms, the fall is much larger for group firms.

In Panel B we examine the differential sensitivity to own industry shock by the controlling party's cash flow rights (as in Table III). Each entry in this panel belongs to a separate regression. For simplicity, we only report in this table the coefficient on "Own shock * director equity." Each regression also includes the logarithm of total assets, firm fixed effects, year fixed effects, and the direct effect of "Own shock." As a benchmark, we report in the second column the equivalent regressions for stand-alone firms. The first row shows that there is little evidence of tunneling in operating profits. While group firms' sensitivity rises with director equity, stand-alone firms show a nearly equivalent rise. The difference is only about .004. In the second row, however, we see a much greater effect on nonoperating profits. The difference between group and stand-alone firms is around .017, or four times the difference on operating profits.

In Panel C we examine how each of the two profit measures respond to the group shock (as in Table V). Each entry represents the coefficient on "Group shock" from a separate regression which includes year and firm fixed effects, the logarithm of total assets,

37. Total raw material expenses include raw material expenses, stores and spares, packaging expenses, and purchase of finished goods for resale.

38. In all regressions in Table VI, the shock measure relates as before to total industry profits (operating and nonoperating). So, the shock measures have not changed, only the dependent variables have.

and own shock. These results complement those of Panels A and B since they tell us about the mechanisms for tunneling money into a firm. We find a pattern very similar to that in Panels A and B. Much of the differential sensitivity of high- and low-cash-flow-right firms to the group shock occurs on nonoperating profits.

Hence, according to the findings in Table VI, the tunneling of money both into and out of firms in India occurs through nonoperating profits.[39] This implies that transfer pricing (which would affect operating profits) is not an important source of tunneling in India. Moreover, it suggests that nonoperating profits may be a force that moves in the opposite direction of operating profits and serves to dampen final earnings. In unreported regressions, we examine this by simply regressing a firm's nonoperating profits on its operating profits, while controlling for size, year dummies, and firm fixed effects. As expected, we find a strong negative coefficient. When we interact operating profits in this regression with a variety of variables, we find results quite similar to our tunneling findings. Group firms show a much more negative relationship between operating and nonoperating profits. Also, among group firms, the ones with low cash flow rights show the most negative relationship. This evidence reinforces the view that manipulation of nonoperating profits is a primary means of removing cash from and placing cash into group firms in India.

IV.B. Market Valuation

Given our findings so far, it is natural to ask whether stock prices reflect the extent of this tunneling. Does the market penalize firms or groups which show more evidence of tunneling? To address this issue, we compute for each firms an average "q" ratio. We do this by first regressing standard firm level market-to-book ratios on log(total assets), year fixed effects, industry fixed effects, and firm fixed effects. The value of the firm fixed effect in this regression is the variable we call "Firm Q." Our q measure is, therefore, the market premium for the firm relative to other firms in its industry, size class, and year. We also compute an average q ratio for each group. To do this, we estimate a similar regression at the firm level but include group fixed effects instead of firm fixed effects. The group fixed effects from these

39. We have attempted further decomposition of nonoperating profits and found no consistent pattern. No one subcomponent of nonoperating profits is systematically more important. This may be because different firms tunnel in different ways.

TABLE VII
SENSITIVITY TO OWN AND GROUP SHOCK BY FIRM AND GROUP Q RATIOS
DEPENDENT VARIABLE: PROFIT BEFORE DIT

	(1)	(2)	(3)	(4)
Own shock	−.046	.388	.600	.049
	(.056)	(.027)	(.017)	(.060)
Own shock * firm Q	.178	—	—	.143
	(.013)			(.016)
Own shock * relative Q	—	.143	—	—
		(.011)		
Own shock * group Q	—	—	.414	.171
			(.037)	(.044)
Group shock	−.008	.010	.011	−.008
	(.003)	(.002)	(.003)	(.004)
Group shock * firm Q	.012	—	—	.012
	(.001)			(.001)
Group shock * relative Q	—	.008	—	—
		(.001)		
Group shock * group Q	—	—	.006	−.001
			(.007)	(.006)
Adjusted R^2	.94	.94	.93	.94

a. a. *Data Source:* Prowess, Centre for Monitoring Indian Economy, for years 1989–1999. All monetary variables are expressed in 1995 Rs. crore, where crore represents 10 million.

b. Sample is group firms only.

c. "Firm Q" is a variable that represents the estimated firm fixed effects in a regression of firm-level q ratios (market valuation over total assets) on log(total assets), year fixed effects, industry fixed effects, and firm fixed effects. "Group Q" is a variable that represents the estimated group fixed effects in a regression of firm-level q ratios on log(total assets), year fixed effects, industry fixed effects, and group fixed effects. "Relative Q" is the difference between "Firm Q" and the mean of "Firm Q" within groups.

d. Also included in each regression are the logarithm of total assets, year fixed effects, and firm fixed effects.

e. Standard errors are in parentheses.

regressions define the variable we call "Group Q." Finally, we form a "Relative Q" measure for each firm, which equals its own q minus its group q, and captures a firm's performance relative to the rest of the group.

In Table VII we examine how these new variables influence the sensitivity of a firm to its own shock and to the group shock. In column (1) we show that firms with higher q are *more* sensitive to both their own shock and to the group shock. Under the tunneling interpretation, this suggests that firms that have more money transferred to them and less money taken away from them have higher q ratios. In column (3) we see the same pattern for relative q. In column (3) we see that the groups with the highest q ratios are those with firms that show higher sensitivity to their own shock, and thus have less money taken away from them. The

coefficient on group shock interacted with "Group Q" is positive but insignificant. In column (4) we include interactions of the shock measures with both "Firm Q" and "Group Q." The results are qualitatively similar.

The findings in this section suggest that the stock market (at least partly) recognizes tunneling and incorporates it into pricing. Firms that have more resources tunneled to them are valued more by the market. Firms that have less money tunneled away from them are also valued more. Finally, groups that tunnel less money are valued more. These results complement previous empirical findings that market valuations positively correlate with the controlling shareholders' cash flow rights.[40]

V. Conclusion

We have developed a fairly general empirical methodology for quantifying tunneling in business groups. We examined whether shocks propagate between firms in a business group in accord with the controlling shareholder's ownership in each firm. We applied the methodology in Indian data and found significant amounts of tunneling, mostly via nonoperating components of profits. We also found that market prices partly incorporate tunneling.

These results raise some questions. If groups expropriate minority shareholders so much, how do they persist? Why do minority shareholders buy into them in the first place? We feel that there are three broad possibilities. First, groups may grow through acquisitions. If this is the case, and markets are efficient, then the act of takeover would generate a one-time drop in share price amounting to the extent of tunneling. Second, shareholders may not recognize the extent of tunneling that takes place in groups. For example, the lack of detailed ownership information may make it difficult for shareholders to figure out with great reliability which group firms are high- and which are low-cash-flow-right firms. Finally, groups may provide other benefits, which offset the costs imposed by tunneling. To cite one example, they may provide important political contacts, which are quite

40. For example, Bianchi, Bianco, and Enriques [1999], Claessens, Djankov, Fan, and Lang [1999], and Claessens, Djankov, and Lang [2000]). In the Indian data we find that firms with a higher level of other equity within a group have a lower q ratio. We do not, however, find a significant relationship between level of director ownership and q ratio within groups.

valuable in a heavily regulated economy. Given the extent of tunneling found here, assessing the relevance of each of these possibilities appears to be an important direction for future research.

UNIVERSITY OF CHICAGO GRADUATE SCHOOL OF BUSINESS, NATIONAL BUREAU OF ECONOMIC RESEARCH, AND CENTRE FOR ECONOMIC AND POLICY RESEARCH
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY AND NATIONAL BUREAU OF ECONOMIC RESEARCH

REFERENCES

Bebchuk, Lucian, R. Kraakman, and G. Triantis, "Stock Pyramids, Cross-Ownership, and Dual Class Equity: The Mechanisms and Agency Costs of Separating Control from Cash Flow Rights," in *Concentrated Corporate Ownership,* A National Bureau of Economic Research Conference Report. R. Morck, editor (Chicago, IL: University of Chicago, 2000).

Berle, A., and G. Means, *The Modern Corporation and Private Property* (New York, NY: Macmillan, 1934).

Bertrand, Marianne, and Sendhil Mullainathan, "Agents with and without Principals," *American Economic Review Papers and Proceedings,* XC (2000), 203–208.

Bertrand, Marianne, and Sendhil Mullainathan, "Are CEOs Rewarded for Luck? The Ones without Principals Are," *Quarterly Journal of Economics,* CXVI (2001), 901–932.

Bertrand, Marianne, Paras Mehta, and Sendhil Mullainathan, "Ferreting out Tunneling: An Application to Indian Business Groups," National Bureau of Economic Research Working Paper No. 7952, 2000.

Bianchi, M., M. Bianco, and L. Enriques, "Pyramidal Groups and the Separation between Ownership and Control in Italy," mimeo, Bank of Italy, 1999.

Blanchard, Olivier, Florencio Lopez-de-Silanes, and Andrei Shleifer, "What Do Firms Do with Cash Windfalls," *Journal of Financial Economics,* XXXVI (1994), 337–360.

Claessens, Stijn, Simeon Djankov, and Harry Lang, "The Separation of Ownership and Control in East Asian Countries," mimeo, World Bank, 2000.

Claessens, Stijn, Simeon Djankov, Joseph Fan, and Harry Lang, "Expropriation of Minority Shareholders: Evidence from East Asia," Policy Research Paper No. 2088, World Bank, 1999.

Dutta, Sudipt, *Family Business in India* (New Delhi: Response Books, Sage Publications, 1997).

Hoshi, Takeo, Anil Kashyap, and David Scharfstein, "Corporate Structure, Liquidity, and Investment: Evidence from Japanese Industrial Groups," *Quarterly Journal of Economics,* CVI (1991), 33–60.

Jensen, Michael, and William Meckling, "Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure," *Journal of Financial Economics,* III (1976), 305–360.

Johnson, Simon, P. Boone, A. Breach, and E. Friedman, "Corporate Governance in the Asian Financial Crisis," *Journal of Financial Economics,* LVIII (2000), 141–186.

Johnson, Simon, Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer, "Tunneling," *American Economic Review Papers and Proceedings,* XC (2000), 22–27.

Johnson, Simon, and Eric Friedman, "Tunneling and Propping," MIT Working Paper, 2000.

Khanna, Tarun, and Krishna Palepu, "Is Group Membership Profitable in Emerging Markets? An Analysis of Diversified Indian Business Groups," *Journal of Finance,* LV (2000), 867–891.

Lamont, Owen, "Capital Flows and Investment: Evidence from the Internal Capital Markets," *Journal of Finance,* LII (1997), 83–109.
La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert Vishny, "Corporate Ownership around the World," *Journal of Finance,* LIV (1999), 471–517.
Nenova, Tatiana, "The Value of a Corporate Vote and Private Benefits: Cross-Country Analysis," mimeo, Department of Economics, Harvard University, 1999.
Piramal, G. *Business Maharajas* (Bombay: Viking Press, 1996).
Price, Waterhouse & Co., *Doing Business in India* (New York: Price Waterhouse, 1999).
Sarkar, Jayati, and Subrata Sarkar, "The Governance of Indian Corporates," *India Development Report,* 1999–2000, Kirit S. Parikh, editor (New Delhi: Oxford University Press, 1999).
Shleifer, Andrei, and Daniel Wolfenzon, "Investor Protection and Equity Markets," National Bureau of Economic Research Working Paper No. 7974, 2000.
Wolfenzon, Daniel, "A Theory of Pyramidal Ownership," mimeo, Department of Economics, Harvard University, 1999.
Zingales, Luigi, "What Determines the Value of Corporate Votes," *Quarterly Journal of Economics,* CX (1995), 1047–1073.