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**PYRAMIDS**

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# Pyramids

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## Abstract

Most corporate finance models of firm behavior study the typical US corporation: one firm with a large set of dispersed shareholders. In contrast, in many countries around the world, firms are often held in groups with complicated ownership structures. These groups, often referred to as pyramids, raise very distinct questions about firm behavior; these questions that are especially relevant for developing countries where these groups are most prevalent. In this paper, we first describe some empirical research we have performed on the nature of agency problems within pyramids. We then discuss a variety of questions, both theoretical and empirical, that remain to be explored.



## I. Introduction

Ownership structures in the United States are simple. Firms typically have dispersed shareholders and when they own other firms, they typically have them as a subsidiary. But this pattern is not the norm around the world. In fact, while they may seem exotic from a US perspective, many firms around the world are organized into so-called pyramids. La Porta, Lopez-de-Silanes, Shleifer and Vishny (1999) find that approximately 25% of the firms in their sample are members of pyramids. In a pyramid, an ultimate owner uses *indirect* ownership to maintain control over a large group of companies. The mechanics of this are illustrated with a stylized example in Figure 1. Here, the ultimate owner owns enough shares (assumed here to be 20%) to control firm A. Firm A, in turn, owns enough shares to control B, and so on. This chain of ownership allows the ultimate owner to control all the firms, even the ones in which he has no direct ownership. The ultimate owner, therefore, maintains control over all firms in the pyramid without being entitled to much of their cashflows. In Figure 1, for example, if firm D pays a dividend of a hundred dollars, 20 of these dollars go to firm C, five to firm B, and so on, with just about thirty cents going to the ultimate owner.

INSERT FIGURE 1

By contrast, in the typical US firm, as well as in many other stand-alone firms around the world, formal control and cash flow rights usually go hand in hand. In this case, the agency problem comes primarily from managers' limited ownership. from the potential divergence between informal control and cash flow rights when managers have limited ownership. Pyramids, on the other hand, raises a set of very different agency problems that are rarely discussed in standard corporate finance models. In this paper, we first first discuss one such question, i.e. whether firms in pyramids "tunnel," and then lay out several important open questions in this area of research.

## II. Tunneling

The separation of ownership and control in a pyramid generates strong incentives for the ultimate owner to divert resources between the different firms in a pyramid. In the stylized example in Figure 1, it is clearly in the ultimate

owner's interest to divert profits from firm D to firm A, thereby transforming a thirty cent gain into a 20 dollar gain. This diversion, which has been referred to as tunneling (Johnson, La Porta, Lopez-de-Silanes and Shleifer 2000), can take several forms: high (or low) interest rate loans, selling of inputs or purchasing of outputs at non-market prices, leasing of assets, and guarantees of other companies borrowing are only a few of the ways companies may tunnel resources across each other.

If prevalent, tunneling can have large consequences. For example, during the emerging market crises of 1997-98, many alleged that tunneling was a root cause. More generally, because minority shareholders effectively face a tax when resources are tunneled, this may raise a serious barrier to financial development. The very process of transferring resources may also entail social costs. For example, it may cloud accounting numbers and make it hard to infer the health of specific companies.

Establishing the prevalence of tunneling activities and quantifying their magnitude has been a notoriously difficult empirical task, in part because ultimate owners try to tunnel in subtle and hard-to-detect ways. In Bertrand, Mehta and Mullainathan (2002), we lay out a general procedure to get at this important measurement question. This procedure can be most easily understood with an analogy with brain imaging techniques, such as PET (Positron Emission Tomography) scans. In a PET scan, a scanner tracks blood flow in the brain by following the path of radioactively tagged material, such as glucose, that has been injected into the blood. Similarly, we propose to follow the flow of cash through a pyramid by tracking the propagation of exogenous shocks to different firms in that pyramid.

Going back to our example in Figure 1, consider a shock which we expect to raise the profits of a firm X by a hundred dollars (for example, one could build such expectations based on industry-specific exchange rate shocks or on the performance of other stand-alone firms in firm X's industry). By studying the propagation of this shock through the pyramid, we can learn whether and how much tunneling is occurring. First, if money is tunneled out of firm X, we expect firm X's profits to rise by less than 100 dollars, the shortfall indicating the amount of extraction. Second, since tunneling ought to be more prevalent lower down in the pyramid (where cash flow rights are weak), we would expect this shortfall to be larger the lower firm X is in the pyramid. That means, in our example of Figure 1, we would expect a greater shortfall in firm D than in firm A. Third, we would expect other firms in the

pyramid, the recipients of tunneling, to respond to the shock to firm X. In our example, we would expect firm A to respond to firm D's shock. Moreover, we would expect this last relationship to be asymmetric. Firm D should not respond to firm A's shock.<sup>1</sup>

As long as one can observe group membership and position of firms in a group, accounting performance for these firms, as well as compute some expectations of true performance (such as based on industry-specific shocks), one can translate these simple intuitions into an econometric test.

As an illustration, we apply this test on a panel of Indian firms between 1989 and 1999. Our results suggest that tunneling is quite prevalent in India. We find evidence for the full set of predictions outlined above. First, group firms respond less than one for one to annual shocks to their earnings, with firms lower down in a pyramid responding the least. Second, only firms higher up a pyramid show sensitivity to earnings shocks to other firms in their group, and most notably to shocks affecting lower down firms. Moreover, the economic magnitude of these estimated tunneling effects is large. For example, group firms are on average about 30% less sensitive to shocks to their earnings than stand-alone firms are; however, group firms at the top of their pyramid are as sensitive to shocks to their earnings than stand-alones are.

Our ability to empirically isolate tunneling allows us to answer two additional questions. First, through what balance sheet items does tunneling occur? Using various decompositions, we find that most of the tunneling appears on non-operating profits. Thus, for India at least, buying of inputs or selling of outputs at non-market prices does not appear to be an important means of tunneling. Second, does market valuation reflect the extent of tunneling? Using simple Q measures (more specifically, market to book ratios benchmarked against industry, size and time), we find that firms with high Q are more sensitive to both their own shock and shocks to other firms in their group. Moreover, firms whose *group* has a higher Q are more sensitive to their own shock and slightly less sensitive to shocks to the rest of their group. These results suggest that equity prices at least in part reflect tunneling activities.

These results suggest that, despite the empirical hurdles, some progress

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<sup>1</sup>This last distinction will be crucial when considering other theories of why shocks may propagate through a pyramid, most notably risk-sharing theories.

can be made in a fairly intuitive econometric. But they also raise some intriguing questions that are still waiting answers.

### III. Open Questions

Given that their cash flow rights are being violated, why would minority shareholders ever choose to take a minority position in a pyramid? There are several possible answers to this question awaiting further investigation. First, one could argue that minority owners may not fully appreciate the extent of tunneling. While this may not be an equilibrium outcome, it is a plausible explanation given the disclosure environment in many countries. In India, for example, simply obtaining ownership structure data within a pyramid is a difficult process. Shareholders may have no way of knowing whether a given firm is at the top or a bottom of a pyramid. This explanation however seems at odds with the stock price evidence above, which suggests that markets at least partly understand the extent of tunneling.

A second possibility is that groups add value in other ways that counterbalance the inefficiencies tunneling creates. For example, if the benefits of political connections, infrastructure provision or economies of scale are large within a group, then even firms lower down in a pyramid could on net outperform stand-alone firms. Much care will be required in empirically evaluating this possibility since pyramidal firms differ from stand-alones in so many other dimensions.

A third possibility is that minority owners have no other choice. This could happen if pyramids are primarily formed through acquisitions. In this case, the announcement of an acquisition by a pyramid will result in the target's stock price dropping if the acquisition is predicted to be successful and the target will end up lower down in the pyramid: minority owners in the target company will experience a capital loss immediately upon announcement of the acquisition that equals the loss of future profits to be tunneled out. This third possibility highlights why some future research should go into an empirical investigation of how pyramids evolve over time. Are they in fact formed through acquisition?

A second broad area of interest is investment in pyramidal firms. In the discussion so far, we have taken profits as given when in fact they are the result of investment decisions made by the ultimate owner. But when

investment is a possibility, why would ultimate owners decide to tunnel resources out on an annual basis? Wouldn't many annual shocks be reinvested in the firm so as to raise future profits for tunneling in the future? This argument contrasts with the empirical results, where we are finding quite a large amount of immediate tunneling of profits. What is needed is a broader framework to understand how a controlling shareholder who has the long-term ability to tunnel will invest and tunnel profits out of a firm.

Finally, in a related vein, it would be interesting to know how tunneling changes when profits become negative. This is a question we cannot address because our data too imprecise to study in details possible differences in the tunneling of positive and negative profits. The broader question is whether negative profits should be tunneled? Tunneling when profits are negative would actually mean that the ultimate owner is "propping" up lower down firms by putting resources in. But why would he do this? Johnson and Friedman (2000) suggest one intriguing possibility. Since the ultimate owner can tunnel in the future, it is actually in his interest to keep struggling firms afloat even if they are lower down in the pyramid. Clearly, testing this possibility is central to improving our description of how pyramids operate.

## IV. Conclusion

Pyramids are a prevalent way to organize firms across the world but our understanding of their dealings and efficiency implications is quite limited so far. Fortunately, rather comprehensive data sources have recently become available in several countries that might help us substantially improve our knowledge of these organizational structures in the coming years. The questions highlighted in this paper are only a small sample of the many issues that we think should be tackled with these data sources. There is much to be done and we have the means to do it.

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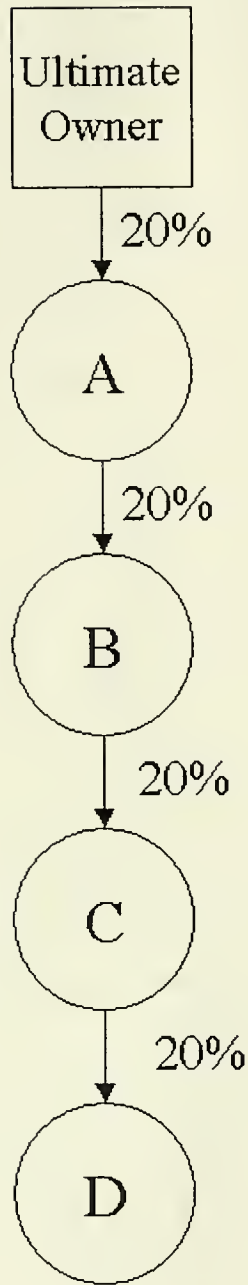


Figure 1: Example of Pyramid  
Arrows indicate direction of ownership





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