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Firm boundaries matter: Evidence from conglomerates and R&D activity[☆]

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ABSTRACT

This paper examines the impact of the conglomerate form on the scale and novelty of corporate Research and Development (R&D) activity. I exploit a quasi-experiment involving failed mergers to generate exogenous variation in acquisition outcomes of target firms. A difference-in-differences estimation reveals that, relative to failed targets, firms acquired in diversifying mergers produce both a smaller number of innovations and also less-novel innovations, where innovations are measured using patent-based metrics. The treatment effect is amplified if the acquiring conglomerate operates a more active internal capital market and is largely driven by inventors becoming less productive after the merger rather than inventor exits. Concurrently, acquirers move R&D activity outside the boundary of the firm via the use of strategic alliances and joint ventures. There is complementary evidence that conglomerates with more novel R&D tend to operate with decentralized R&D budgets. These findings suggest that conglomerate organizational form affects the allocation and productivity of resources.

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1. Introduction

Do firm boundaries affect the allocation of resources? This question had spawned significant research in economics since it was raised in Coase (1937). A large body of work has focused on comparing the resource allocation in conglomerates relative to stand-alone firms to shed light on this issue. Theoretically, there are competing views on this aspect. On the one hand, Alchian (1969), Williamson (1985), and Stein (1997), among others, have put forth the view that conglomerates, by virtue of exerting centralized control over the capital allocation process, may do a better job in directing investments than the external capital markets. On the other hand, the “dark side” view of internal capital markets argues that problems of corporate socialism are more prevalent in conglomerates making

them less efficient in resource allocation (Rajan, Servaes, and Zingales, 2000; Scharfstein and Stein, 2000).

Estimating the effects predicted by these theories has proven challenging. On the one hand, there is a broad brush approach that argues that efficiency of conglomerates can be compared to stand-alone firms by examining their relative market values. This approach has, however, been criticized as being indirect and tainted by endogeneity bias which is hard to account for.¹ The other, more direct approach, has been to examine the productivity differences across organizational forms to make assessment about resource allocation (Maksimovic and Philips, 2002; Schoar, 2002). In this paper, I extend the latter by focusing on one activity and demonstrating that a causal link exists between R&D productivity differences and organizational form. By doing so, I hope to provide evidence that firm boundaries can matter for allocation of resources.

I choose to focus on innovative activity following the argument made in Williamson (1985) that "... in the presence of asset specificity, uncertainty, and opportunistic behavior—differences in internal organization may impact innovative behavior ...". The intuition behind this idea is simple. Novel research projects are especially characterized by significant informational asymmetries between researchers and outside evaluators. This may provide researchers in divisions leeway to manipulate the information they transmit to corporate bosses, especially if they are faced with the possible threat of reallocation of resources by corporate headquarters. Recognizing this problem, high-level managers may be reluctant to embark on novel projects in the first place. Thus, it is precisely those organizations that attempt to exploit the efficiencies of a centralized resource allocation process that may end up fostering mediocrity in their divisional R&D activities.²

I use information in the Compustat files and from the 423,640 patents granted by the United States Patent and Trademark Office (USPTO) during the sample period to shed light on this question. I measure the scale of a company's R&D output by the number of patents its research generates. In addition, I measure the novelty of its research program by the average number of citations its patents receive in subsequent patent applications. I start by providing some suggestive evidence by evaluating these measures for Compustat firms over 1980–1998. In particular, an average patenting single-segment firm produces patents that generate more citations than those obtained by the multi-segment firms. In addition, conglomerates with more active internal capital markets and higher implied competition for R&D resources do, on average, conduct less-novel research.

¹ See Villalonga (2004), Chevalier (2004), and surveys by Stein (2003) and Maksimovic and Philips (2007) for extensive discussion.

² A similar argument was noted by Porter (1992) who pointed out that conglomerates may not be as conducive for innovative projects when he claimed that "... the decline in rate of return to R&D spending in the United States in the 1980s is rooted in the large, diversified American corporations."

These results, however, only show an association between internal capital markets and research output. There may be a concern that these effects are driven by endogenous selection rather than the impact of organizational form on R&D activity. For instance, many conglomerates may have grown by acquiring firms that have the potential to come up with novel ideas in the future. Alternatively, they may acquire firms with one big idea which has already been developed. Both these arguments would lead to different biases in estimates that compare the average R&D productivity of conglomerate firms relative to stand-alone firms. The main identification strategy of the paper accounts for these selection concerns by exploiting a quasi-experiment.

The experiment constructs two groups of firms: a "treatment group" comprised of firms taken over in a friendly merger and a "control group" that is assembled from a sample of targets whose mergers failed to go through. The important consideration for empirical design is that the reasons for failure of the friendly merger of the control group be unrelated to R&D policy of the target. I read news articles for each of the failed mergers in my sample and select only those to be a part of the control group where one can argue this to be the case (e.g., deals around 1987 crash). The two groups then comprise a sample where I claim that the assignment of a firm into an acquirer is random. Under this assumption, I can difference out any selection concerns by comparing the R&D productivity of the firms in the treatment group pre- and post-merger with those of the control group.

This research design allows for two tests. The identification of the main estimate comes from the unsuccessful targets that were going to conglomerate acting as a counterfactual for how the successful targets would have performed R&D after the merger, had they not been acquired by conglomerates. In addition, the research design allows me to conduct a placebo test that involves targets in non-conglomerating mergers.

I employ a difference-in-differences specification which exploits within-firm variation and find that, relative to the control group, firms in the treatment group suffer a significant decline (about 60%) in novelty of their research output after the merger. This drop is driven by diversifying mergers with targets involved in non-conglomerating mergers not exhibiting any change in their R&D output. What is more, I find that the drop in novelty is significantly more in treatment firms that were acquired by diversified firms which already had an active capital market in operation. These results suggest that the very internal workings of a conglomerate bring about a reduction in the novelty of research conducted there and confirm the 'new-toy' effect in diversified firms documented in Schoar (2002).

These findings also alleviate concerns that my results are driven by firms in the control group being more productive after the event, due to elevated market pressure after the unsuccessful merger. If it was the case, I would have also found similar effects for firms that were involved in unrelated mergers. As well, it would not immediately follow that market pressure would intensify for firms where I find the strongest results—i.e., in firms

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