

Abstract

Organization and Performance: Evidence from Microdata

Evan Rawley

This research examines the relationship between organization and firm performance using the U.S. taxicab industry as the empirical context for the analyses. The research demonstrates that diversification is costly in the sense that it erodes incumbent firms' competitive advantage versus start-ups, because diversification erodes the value of a firm's stock of tacit knowledge by altering the firm's routines. Furthermore, I show that while diversification leads to costly organizational change the organizational adaptations firms make in response to diversification are necessary in the sense that they are productivity enhancing.

Executive Summary

Organization and Performance: Evidence from Microdata

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This research examines the relationship between organization and firm performance in a series of three papers, using the U.S. taxicab industry as the empirical context for the analyses. I focus on three important features of the economic organization of firms: diversification, asset ownership and technology adoption. Performance is measured in terms of productivity, which in taxicab firms is equivalent to ride miles per vehicle. Each paper examines an organizational economics research question that relates features of firm organization to firm performance. The central theme running throughout is that organizations are portfolios of contracts and routines such that shocks to one aspect of the organization lead to changes along other dimensions of the firm.

Understanding why organizational changes are interrelated and how such changes influence subsequent firm performance is of great importance to scholars and practitioners alike. This body of research makes three novel contributions to organizational economics. First, I demonstrate that diversification is costly in the sense that it erodes incumbent firms' competitive advantage versus start-ups, because diversification erodes the value of a firm's stock of tacit knowledge by altering the firm's routines. Second, I show that while diversification leads to costly organizational change, the organizational adaptations firms make in response to diversification are necessary in the sense that they are productivity enhancing. Finally, this research connects vertical

integration decisions, technology adoption and productivity, using a transaction cost economics perspective that underscores the importance of interrelationships in the firms' nexus of contracts.

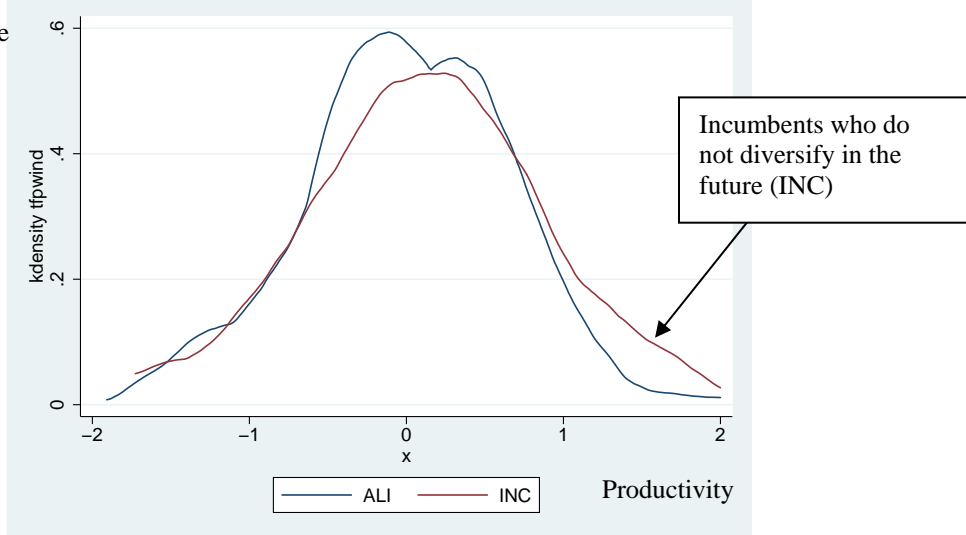
The taxicab industry is particularly well suited for studying diversification, asset ownership, technology adoption and productivity questions. One of the most attractive features of the taxicab industry is that it is a local business with regulated prices. Since taxi markets are highly geographically segmented, the nationwide taxicab industry is actually a collection of hundreds of independent city-level markets, providing considerable variation to measure the effects of interest. I exploit the fact that firms face regulated prices in their local markets to develop an economically meaningful measure of firm performance that can be interpreted as physical output per unit of input. The key organizational features studied are also appealing as they are measurable at an unusual level of detail. For example, taxicabs are owned by either firms or drivers, facilitating analyses creating continuous measures of vertical integration within firms. Similarly, technology (of onboard computers) takes place at both the firm level, which allows the analysis to measure firm-level effects of technology adoption and at the vehicle level, which influences owner-driver choices about whether to join a firm or operate independently. Moreover, horizontal integration between taxis and limousines changed dramatically during the sample period due to widespread regulatory changes, creating a quasi-natural experiment in lateral diversification.

Chapter one of my dissertation proposes that investments in specialized organizational capital constrain firms' future diversification strategies. When firms are constrained in this way, diversification destroys organizational capital by altering firms' routines, formal contract structures and strategies. I test this proposition using rich, novel microdata on taxicab firms from the Economic Census before and after a diversification wave into the limousine industry. The statistical tests exploit characteristics of local taxi markets that vary across markets but which firms cannot control to create a natural experiment in diversification. Consistent with the theory, changes in firm organization and performance following diversification are associated with falling taxicab productivity and changes in formal contract structures governing asset ownership. Diversifying firms appear to achieve economies of scope only by sublimating their taxi business units for the sake of improving coordination across taxicabs and limousines. I find that organizational change itself accounts for an 18% decline in taxicab productivity, eroding the productivity advantage that incumbents have over start-ups.

Figures 1, 2 and 3 demonstrate the effect of diversification on existing firms' productivity. In Figure 1 we see that in 1992 firms that diversify in the future are just as productive as firms that do not diversify in the future; while in Figure 2, we can see that diversified firms' taxi productivity is far below focused taxi firms in 1997. Figure 3 illustrates the key insight in the paper as we can clearly see the productivity gap between start-ups and incumbents shrink when comparing focused firms and diversified firms. While focused incumbents are far more productive than focused start-ups, diversified incumbents are only marginally more productive than diversified start-ups.

Figure 1 1992 taxi-only productivity distributions

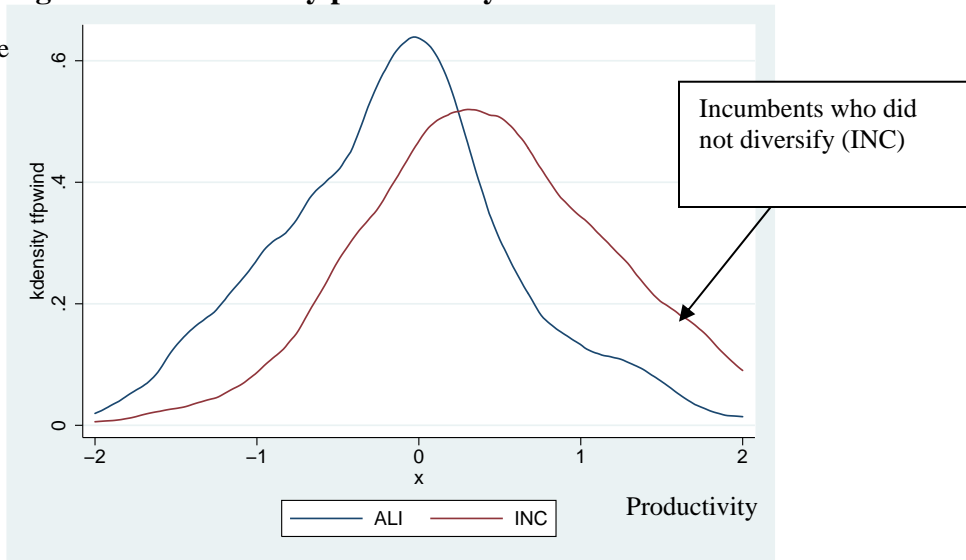
Density of the productivity distribution



n = 560
ALI = Future diversifier
INC = Incumbent that does not diversify

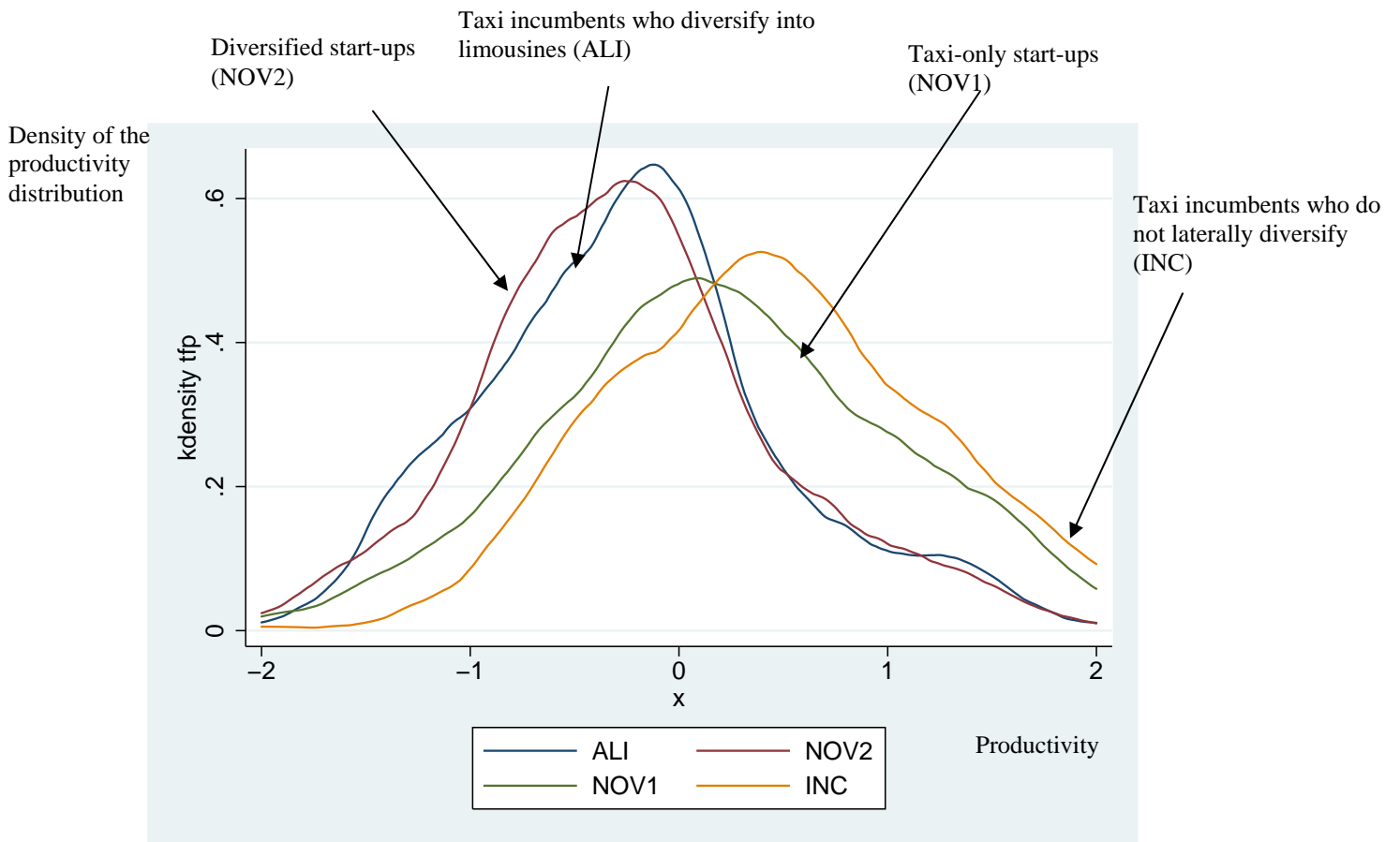
Figure 2 1997 taxi-only productivity distributions

Density of the productivity distribution



n=560
ALI = Diversified firm
INC = Incumbent that did not diversify

Figure 3 1997 taxi-only productivity distributions



n = 1106

ALI = Diversified firm; INC = Incumbent who did not diversify; NOV1 = Taxi-only start-up; NOV2 = Diversified start-up

The results show that diversification is costly in the sense that it destroys organizational capital and erodes the competitive advantages of incumbents relative to start-ups even though it may be rational in the sense that it increases overall firm profits.

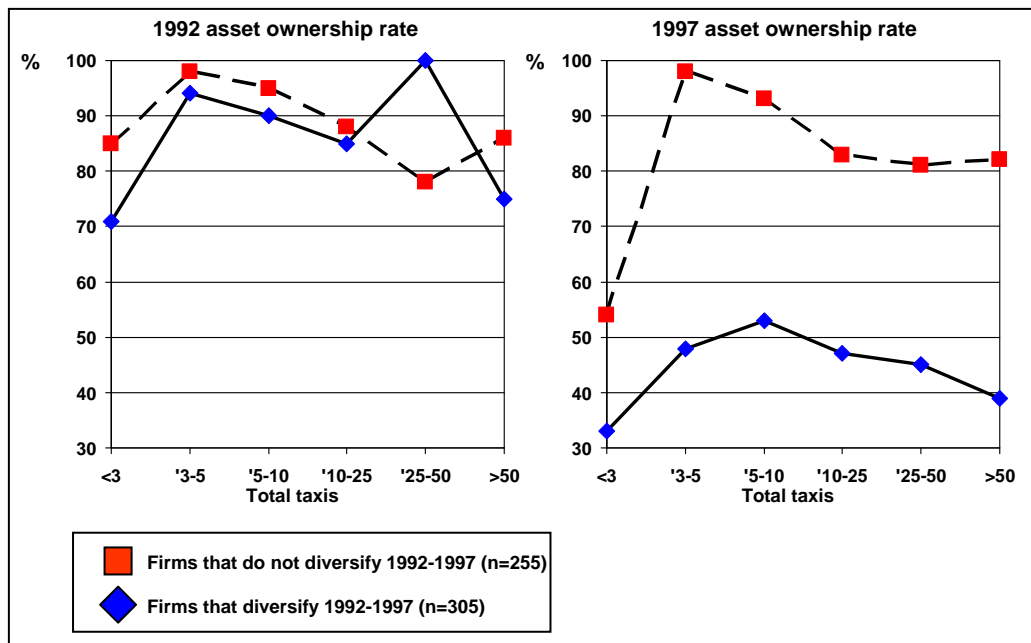
There are implications of these findings for researchers who study entry and diversification and for organizational scholars more broadly. Of particular importance is the finding that organizational adaptation costs erode the advantages of incumbency. This result suggests that organizational rigidity limits the horizontal boundary of the firm,

providing a brake against unbounded economies of scope within the firm. Since firms can always identify businesses that are related to their current activities it is crucial that managers understand the limitations of economies of scope. More generally the paper provides evidence that organizational change itself is costly, which suggests that start-ups have flexibility advantages over incumbents. Although it seems intuitive that start-ups are somehow more flexible than incumbents there has been a paucity of large sample research substantiating this claim statistically. There are prescriptive implications of this research too. When expanding into new markets, existing firms must consider both how applicable their resources are to new businesses and also how efficiently they can adapt their portfolio of organizational routines to manage the new business. Firms cannot simply extend their core competencies into every new business opportunity that presents itself. Prospective entrepreneurs should be particularly attuned to turning incumbent firms' organizational architecture against them by deploying business models that would be difficult or costly for incumbents to pursue due to organizational adaptation costs. Indeed, while the stereotypical view of entrepreneurship assumes entrepreneurs are maverick builders of fundamentally new businesses, this research shows that successful entrepreneurs can work at the margins of well developed business concepts, creating new business models that are incremental improvements on what has come before.

Chapter two of this dissertation examines how firms adapt organizationally to capture synergies from related diversification. I propose and test the joint hypothesis that firms adapt their formal contract structures governing asset ownership in response to related diversification and that this adaptation allows the firms to obtain greater synergies from

unified operations of two related business units. Using rich microdata on taxicab firms from the Economic Census before and after a diversification wave into limousines, I show that diversifying firms shift toward less vertical integration with respect to ownership of taxicabs to improve coordination across business units. Figure 4 clearly shows this result. In 1992 asset ownership rates for firms of similar sizes were almost identical between firms that diversified in the future and firms that did not. By 1997 diversifying firms fundamentally reorganized their taxi business units, shifting toward driver ownership of vehicles.

Figure 4 Diversification and asset ownership by firm size



This figure shows firm asset ownership levels, defined as the percentage of vehicles owned and operated by the firm, as opposed to owned by independent drivers but operated by the firm in 1992 and 1997. n=560.

Furthermore, firms that realign their asset ownership contracts faster following diversification are more productive than firms who are slower to adapt. The tests are

robust to increasingly stringent tests that control for the joint determination of diversification, asset ownership and productivity. The results validate the core contention of the paper that horizontal diversification and vertical asset ownership decisions are complementary. The findings point to the importance of the heretofore neglected role of organizational adaptation in capturing synergies from related diversification. The evidence assembled paints a picture of diversification and organizational change that is far more subtle, but arguably more realistic, than the traditional perspectives on the costs and benefits of diversification. Instead of making a case that diversification routinely increases or decreases firm value as many other researchers have done, I attempt to explain why diversification is difficult for firms and demonstrate how firms respond the challenges diversification presents. The key insight of this research is that diversification is difficult and costly because it creates organizational change, yet firms that fail to change are less able to capture synergies from diversification.

Chapter three of this dissertation examines how the adoption of mobile information technology (IT) networks, comprising a central coordination and communication technology and specialized vehicle-level on-board computers, impacts firm strategy and performance in the U.S. taxicab industry. Using a rich, novel firm-level data set, I test whether the adoption of mobile IT networks leads to shifts in asset ownership patterns toward fleet ownership of vehicles. I then take advantage of the simple production function that characterizes the industry and variation in local market conditions to measure the impact of adoption of mobile IT networks on productivity. I find strong evidence that firms respond to adoption of mobile IT networks by changing their

organizational structure, shifting toward owning a greater fraction of vehicles in their fleets (as opposed to contracting with independent driver-owners for vehicles). I then use a precise and economically meaningful measure of firm performance to show that adoption of mobile IT networks causes firms to become more productive. The results suggest that adoption of mobile IT networks increases asset utilization by improving within-firm coordination but, firms must simultaneously shift toward a more highly vertically integrated structure to fully capture the benefits of mobile IT networks.

This dissertation shows that organizational change is costly even when it is strategic, yet failure to adapt the portfolio of contracts and routines that define the firm in the face of organizational change is even more costly. More generally, the papers provide evidence that firms are interrelated bundles of contracts and routines that are codetermined and complementary such that changes along one dimension of the firm frequently lead to changes along a number of other organizational dimensions.