Intertemporal and Dynamic Studies of Vertical Integration: An End to the Moratorium?

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ABSTRACT

In 1993, Williamson noted his preference for intertemporal models rather than dynamic models of vertical integration. This paper provides a short review of some of the recent work on governance adaptation. It suggests that while empirical data and methods exist to make headway on the dynamic problems, the theoretical models have not. It concludes that more must be done on the theoretical front if we are to make headway on dynamic issues.

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I. Introduction

In 1993, a group of about 30 Ph.D. students from the Haas School of Business at Berkeley and the Graduate School of Business at Stanford held a conference at Berkeley to discuss their formative ideas for papers and dissertations in strategic management. Students were organized into panels of four papers, with a prominent faculty discussant for each panel. One panel (on which I sat) was entitled, "Dynamic Models of Strategy." Each student on this panel outlined how he was going to develop and test dynamic theories of strategic management. Proposed topics for study included firm birth and survival, organizational change, and corporate vertical integration decisions. Our faculty discussant was Oliver Williamson.

Williamson began his discussion by saying he wanted to impose a moratorium on three topics. First, he asked for a moratorium on "risk aversion." He said that literally thousands of papers had been written on the topic of risk aversion and that there was little more to be said on the subject. Second, he requested a moratorium on "power." Williamson long had disdain for the sociological concept of power; it had little substantive theoretical foundation and even less predictive ability. Finally, he proposed a moratorium on "dynamics." Theoretically, modeling dynamic processes, he argued, involves enormous complexity (such as differential equations, dynamic programming, and Markov models) that was beyond the capabilities of most researchers at this time. Moreover, solid prediction for empirical work is difficult with any dynamic theory.

Williamson favored, instead, "intertemporal" research—that is research that examined discrete slices of time—rather than the dynamic processes that lead to the current temporal state.[1] Indeed, he argued, transaction cost economics (TCE) incorporates intertemporal analysis in which the nature of the relations change over time (such as the Fundamental Transformation), the nature of the hazards change with state realizations, and the lags in bringing the system into adjustment pose avoidable governance costs and may cause path dependency which needs to be assessed with respect to remediableness in an intertemporal way. With Williamson's preference for intertemporal analysis, a moratorium on dynamics was declared.

This short essay has two main points. First, during the time of the "moratorium" the intertemporal research agenda has been pushed empirically to the point where now dynamic empirical models of vertical integration are possible. This is illustrated with two papers in particular. Second, the essay illustrates why it may be time to end the moratorium sought by Williamson ten years ago, and to attempt to model empirically some of the more dynamic aspects of vertical integration. However, it remains, as Williamson noted, that theory will need to catch up with the empirical capabilities of the field if the dynamic agenda is to have real promise.

II. The Current "Intertemporal to Dynamic" Empirical Work on Vertical Integration

Transaction cost economics has a long and vibrant history of empirical research. Over six hundred published empirical studies conducted in a variety of different contracting environments and industries have found results that support the transaction cost hypotheses

(Klein and Shelanski 1995, Boerner and Macher 2002). However, nearly all of these studies have used cross-sectional data and methods to analyze the effect of asset specificity, credible commitments, or other contractual hazards on vertical integration and organizational structure. Despite a lengthy and admirable empirical research program, the research thrust has produced two notable empirical papers that examine the intertemporal and dynamic aspects of vertical integration.

A first paper by Ohanian (1994) is in the spirit of the intertemporal research that Williamson allowed under the moratorium. She examines the degree of vertical integration in the pulp and paper industry at ten-year intervals from 1900 to 1940. Conducting logit and truncated regressions on the vertical integration decisions of firms from pulp into paper and vice versa in each decennial, she finds substantial support for the transaction cost economics asset specificity hypothesis in each cross section. However, her most interesting results are over time. She finds that incumbent paper mills are more misaligned, according to the predictions of transaction cost economics, than are new entrant firms to the paper industry. That is, new entrants into the industry tend to create a structure that is closely matched to the predictions of transaction cost economics, whereas incumbents are more likely to be mismatched. Moreover, she finds that once an integration structure is selected, few mills change—so we get persistence in integration structure.

A second paper by Nickerson and Silverman (2002) uses hazard rate models to predict the dynamic behavior of vertical integration in the truck-driving industry in the 1980s. They are primarily concerned with whether drivers are owners of their trucks, or merely operators of the trucks. They use deregulation of the trucking industry as an exogenous shock by which to have a

[1] Immediately after completing his remarks, and effectively decimating the egos and research plans of the individuals on the panel, Williamson left the conference to attend to another commitment. Thus, he missed the next

natural experiment. They find that firms sometimes try to correct misalignment in governance structures (as predicted by transaction cost economics). That is, as deregulation occurs, many firms with specific assets moved to more integrated structures that were prohibited or uneconomic before deregulation.[2] However, they also find that firms that remain misaligned are more likely to exit the industry. Thus, there is selection of inefficient governance structures out of the industry. Finally, they argue that the size of the firm and the degree of specialized assets affect the speed of realignment of the firm.

Together, these two papers seem to have three main findings: 1) Entrants are more aligned than incumbents, thus entrants are likely to conform to the transaction cost economizing governance structure, 2) Firms try to correct misaligned governance structures, but incumbents with large re-alignment costs may not correct the situation, and 3) Firms with misaligned governance structures have higher failure rates than firms with aligned structures. This last finding provides perhaps the biggest support for transaction cost economics—firms that do not adhere to the logic of transaction cost economics will die over time. The first paper examines discrete slices of time at 10-year intervals; the second paper examines very small periods of time (single year time), and analyzes the patterns of change. Thus, Ohanian's work lines up nicely with the intertemporal approach favored by Williamson; the Nickerson and Silverman paper begins to push the envelope and border on dynamic empirical analysis.

III. Where From Here?

The efforts by researchers to engage in intertemporal and dynamic analysis of vertical integration has made small, but useful headway. Now, it would seem, it is time to lift the ten-

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panel and its discussant, Bill Barnett of Stanford, who engaged in a spirited defense of "dynamic" empirical work.

year moratorium on dynamic research in vertical integration. Empirical methods have advanced to the point where panel data methods, hazard rate models, and dynamic and time series methods are part of the standard toolkit of empirical economists.

As these two papers illustrate, data is now available in a variety of industries to conduct dynamic analyses of entire populations of industries. One concern that may arise, however, is that the data is not fine-grained enough. Ohanian (1994) uses sub-industry classifications at ten-year intervals to characterize the degree of specific investment in the paper industry. Thus, the asset specificity is measured at an industry level. Nickerson and Silverman (2002) measure driver misalignment by taking the absolute value of the residual of a Tobit regression that regresses several covariates on the percentage of a carrier's annual hauls undertaken by company drivers (as opposed to independents). Thus, while using transaction level data, it is aggregated to the "yearly" level of many different types of hauls. However, these early studies illustrate that as time progresses, data is becoming increasingly available that will allow us to measure the dynamics of vertical integration. New and more detailed data sources become available annually. Here I provide two additional examples.

First, a recent data set I have collected contains the characteristics of every desktop laser printer in the U.S. from the inception of the industry in 1984 to 1996 (de Figueiredo and Teece 1996; de Figueiredo and Kyle 2003). For almost of all of the hundreds of different products, I am able to identify whether the firm making the laser printer also makes the printer's key component, the laser engine. Figure 1 shows a summary of the patterns in vertical integration in the industry. This is meant to be merely illustrative, to indicate that very fine-grained measures of vertical integration and product characteristics are available to researchers conducting

[2] This result may be viewed as somewhat contrary to Ohanian (1994). However, this difference may be due to the magnitude of the investment required to come into alignment. A paper mill is much more expensive than a truck.

dynamic empirical research. Moreover, datasets such as this one can also help to enlighten the debate on "directional vertical integration"—that is, do upstream producers of engines integrate downstream or vice versa. Transaction cost economics is relatively silent on this issue, but need not be.[3] Like the Nickerson and Silverman data, this data is available on an annual basis, which may reflect more of Williamson's definition of "intertemporal analysis" than "dynamic analysis."

However, a second recent data set I have collected expands the transaction cost economics realm to non-market strategy, and examines the organization of lobbying by interest groups (de Figueiredo and Tiller 2001; de Figueiredo and Kim 2003). This dataset contains information on whether firms use their own employee-lobbyists, or whether they choose to hire outside lobbyists when lobbying the Federal Communications Commission (FCC). Figure 2 offers an example of an issue area where I have tracked the vertical integration decision for the lobbying firm over time, on a daily basis. This kind of data can be used to examine changes in the governance of lobbying over time. Moreover, we can identify the characteristics of each lobbying contact (the "transaction" or unit of analysis) to determine whether these decisions are independent, or linked to one another across time, through some theoretically specified process. As we move the unit of time from the annual level to the daily level, we begin to approach more closely the data requirements outlined by Williamson for dynamic analysis.

Given that the methods exist and the data is available, the dynamic empirical analysis of vertical integration seems to have had its main hurdles removed. This does not mean there should be a stampede to this agenda. Rather, we still need "slow, molecular, and definitive" theory to proceed in this stream of research. Indeed, it is in dynamic theories that transaction cost economics is woefully inadequate. The theoretical attempts to examine the dynamics of

[3] Grossman and Hart (1986) predict directional integration.

transaction cost economics are primarily discursive in nature (Nooteboom 1992, Langlois and Robertson 1995, Pisano and Teece 1994), and thus fail the Williamson test for dynamic modeling.

In two early (and somewhat buried) papers, Williamson (1965, 1970: Chapter 5) used differential equations to explain the dynamics of interfirm pricing behavior and firm governance. Although these papers are not heavily cited, they are certainly a contribution to the literature. It seems that after a ten-year moratorium, theoretical scholars of transaction cost economics need to follow the lead of the young Williamson and tackle "dynamics." Certainly, empirical researchers are waiting.

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Figure 1: Laser Printers

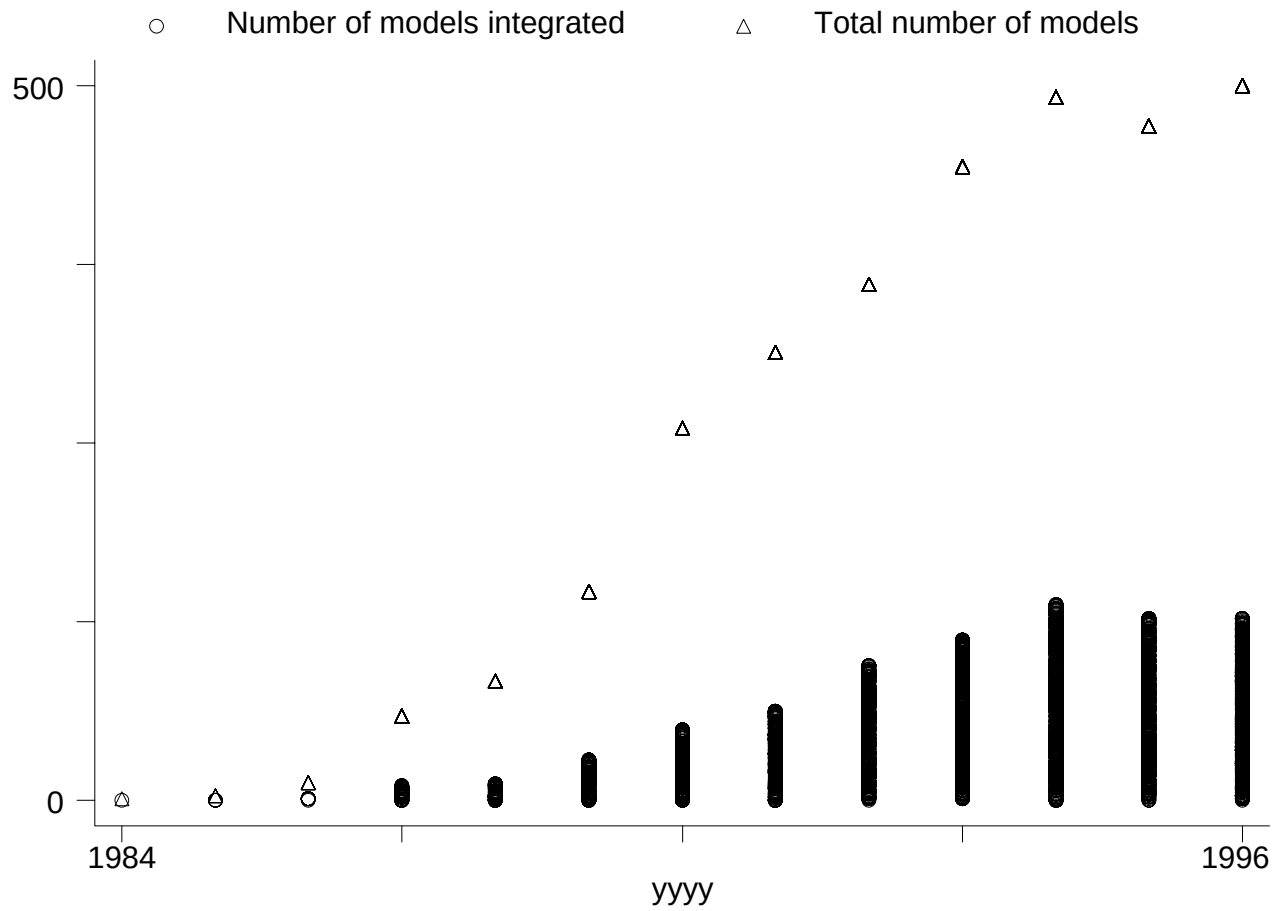

Figure 2: Lobbying