Why Firms Want to Organize Efficiently and What Keeps Them from Doing So: Inappropriate Governance, Performance, and Adaptation in a Deregulated Industry

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This paper integrates content-based predictions of transaction cost economics with process-based predictions of organizational change to understand adaptation to deregulation in the for-hire trucking industry. We predict and find that firms whose governance of a core transaction is poor (according to transaction cost reasoning) will realize lower profits than their better-aligned counterparts and that these firms will attempt to adapt so as to better align their transactions. Results show that several organizational features affect the rate of adaptation: (1) firms with large investments in specialized assets adapt less readily than firms that rely on generic assets, (2) firms with unions adapt less readily than firms without unions, (3) firms that must replace employee drivers with owner-operators adapt less readily than firms that must replace owner-operators with employee drivers, and (4) entrants adapt more quickly than incumbent carriers. There is evidence of institutional isomorphism in that although carriers move systematically to reduce misalignment, they do so less assiduously when this will make their governance of drivers look less like that of nearby, similar carriers. Finally, our results indicate that firms that ultimately exited adapted more quickly than firms that survived.•

Why and in what direction do organizations change? Responses to these questions generally fall into two camps. Adaptation theories of organizational change contend that organizations are able to change in the direction dictated by their environment or by the choices of organizational decision makers, although there is wide variation in beliefs regarding the degree to which such change constitutes rational action (e.g., Lawrence and Lorsch, 1967; Williamson, 1985) as opposed to blind action (Weick, 1979). In its extreme form, the adaptationist view implies that firms can and do adapt nearly frictionlessly to attain greater economic efficiency, suggesting that if there is a performance penalty associated with inappropriate governance of transactions, misaligned firms will change so as to reduce or eliminate this misalignment. Alternatively, selection-based theories, notably structural inertia theory within organizational ecology, contend that "although . . . efficiency arguments [to explain organizational change] are plausible, it is not obvious that they are correct" and that inertial forces vitiate attempts at organizational change (Hannan and Freeman, 1984: 152). The selectionist view in its extreme form implies that firms can rarely change successfully and that few firms will successfully realign their improperly governed transactions; instead, if there is a performance penalty associated with misalignment, these firms will be "selected out" of the population.

Recent research provides a middle ground between these two views by exploring how some firms do change under certain environmental conditions (Delacroix and Swaminathan, 1991; Kelly and Amburgey, 1991; Haveman, 1992, 1993). Yet this literature tends to focus on the process of change and rarely predicts whether the content of a particular change will generate beneficial or harmful effects (Barnett and Carroll, 1995; for an exception, see Zajac, Kraatz, and Bresser, 2000). For example, most studies of organizations' expansion of product lines or alteration of publication fre-

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quency remain agnostic about the underlying value of these content changes. The content effect of change is evaluated after the fact (if at all) by the organization's performance after the change (Amburgey, Kelly, and Barnett, 1993; Baum, 1996). As Barnett and Carroll (1995) argued, this ad hoc approach to defining the content of organizational change ignores the potential for applying organization theory to make predictions about the costs and performance effects of the change itself and hence the potential for predicting why and whether firms change.

This paper attempts to address this issue by theoretically linking transaction cost economics and the literature on organizational change. Both approaches allow for costly adaptation, although the two theories accord different weights to these costs. We develop a model of organizational change in which the impetus for change is the inappropriate governance of a core transaction: managers want to organize efficiently to realize survival and performance benefits from doing so, however, firms are constrained in their efforts to realign because of "adjustment costs." Firms with large adjustment costs will tend to delay adaptation, whereas firms with small adjustment costs will be able to adapt quickly. Thus, adjustment costs, which vary with organizational features, will affect the rate and level of adaptation.

INAPPROPRIATE GOVERNANCE, PERFORMANCE, AND THE IMPETUS FOR CHANGE

Transaction cost economics' primary hypothesis is that organizational actors attempt to economize on transaction costs by "assigning transactions (which differ in their attributes) to governance structures (the adaptive capacities and associated costs of which differ) in a discriminating way" (Williamson, 1985: 18). Resting on the behavioral assumptions of bounded rationality and opportunism, transaction cost economics asserts that transactions will be organized in governance structures based on their characteristics, chiefly uncertainty, frequency, and asset-specificity. Of these, the most important is asset-specificity, or the degree of specific investment associated with a transaction. An asset is specific to a particular transaction if its value in its next-best use and user (i.e., in a transaction with a different party) is less than its use in this transaction. The greater the difference between the value of an asset in its first-best and its next-best use, the more specific that asset is to the transaction (Klein, Crawford, and Alchian, 1978; Williamson, 1979).

When exchange hazards are negligible—broadly, when the assets supporting a transaction are generic—spot markets offer the least-cost form of governance. Such markets provide strong incentives for effort, and parties incur few if any set-up costs for spot market transactions. At the same time, relying on generic assets means that disputes between transacting parties can be resolved at low cost by exiting the exchange. At a high level of hazard, when assets are transaction-specific, hierarchy is the least-cost governance solution. Although hierarchy involves muted incentives and high fixed set-up costs, it can support coordination of investments and activities that are difficult to coordinate through markets.

Within a hierarchy, authority rather than legal recourse ultimately can resolve disagreements, which provides tighter control over specific investments. These different governance arrangements are also supported by different dispute-settlement regimes, ranging from court-enforced contract law for market governance to internal enforcement for hierarchy (Masten, 1988), and different patterns of claims to assets if an exchange breaks down (Baker, Gibbons, and Murphy, 2002). In equilibrium, organizational actors are predicted to choose the appropriate organizational form to govern each transaction.

But what happens to an organization whose transactions are not properly aligned with appropriate governance structures? The theory presumes that such an organization will suffer performance consequences. Transaction cost economics "relies in a general, background way on the efficacy of competition to perform a sort between more and less efficient modes and to shift resources in favor of the former . . . over intervals of five to ten years" (Williamson, 1985: 22–23). Thus, organizations (or other actors) whose transactions are inappropriately governed are more likely to display poor financial performance, and to eventually exit or adapt, than those whose transactions are properly governed. In a study of 93 sales districts of 11 electronic component manufacturers, Anderson (1988) found that, in uncertain environments, organizations whose integration of their sales forces corresponded more closely to the level of integration predicted by transaction cost economics—based on characteristics of the organizations, the market, and the components they sold—enjoyed efficiency benefits in terms of the ratio of sales to selling cost compared with those whose integration corresponded less well.[1] Armour and Teece (1978) found that large petroleum companies organized in a multidivisional structure, which is predicted to be superior for managing diversified corporations (Williamson, 1975), posted higher rates of return than their non-multidivisional counterparts between 1955 and 1964, benefits that disappeared during the 1965–1973 period, by which time virtually all of the firms had adopted the multidivisional form.[2] In a previous study of motor carriers, Silverman, Nickerson, and Freeman (1997) found that inappropriate governance of certain labor and capital market transactions increased a carrier's failure rate. If it is true that appropriate governance of transactions provides performance benefits, then those organizations conforming to transaction cost prescriptions will enjoy superior performance as compared with those that do not:

Hypothesis 1 (H1): Those organizations that govern transactions appropriately (i.e., in accordance with transaction cost economic prescriptions) will exhibit higher profitability than those that do not govern transactions appropriately.

If a primary goal of an organization is to achieve profitability or, ultimately, survive, then poorly performing organizations will initiate a program of actions to remedy poor performance (March and Simon, 1993: 197). Should poor performance stem from misalignment between organizational form and the underlying activities, then actors will initiate a program to redress misalignment. To be sure, not all managers will

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The importance of environmental uncertainty in Anderson's study leaves open the possibility that these findings may reflect institutional isomorphism effects, which are likely to be stronger in uncertain environments, as well as (or instead of) transaction cost economizing.

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Extant cross-sectional transaction cost economics studies have also investigated alignment and comparative negotiation costs (Walker and Poppo, 1991) or customer satisfaction levels (Mohr and Spekman, 1994; Goodman et al., 1995; Poppo and Zenger, 1998), using Likert scales or internal management costs (Masten, Meehan, and Snyder, 1991), but none of these studies links alignment to long-term financial or economic performance. These authors did not study the degree to which carriers adapted over time toward proper governance or the extent to which inappropriate governance affected profitability.

unerringly discern the source of poor performance (Meyer, 1982). To the extent that an organization accurately processes information, however, the performance penalties associated with misalignment will on average trigger efforts by inappropriately aligned organizations to reduce their degree of misalignment.

Hypothesis 2 (H2): Organizations will change so as to reduce the degree to which their transactions are inappropriately aligned.

Selection, Adaptation, and Constraints on Organizational Change

Organizations whose transactions are inappropriately governed may not be able to change immediately to an appropriate governance form. In their development of structural inertia theory, Hannan and Freeman (1984) proposed several forces that constrain adaptation. In fact, adaptationist theories propose a similar range of constraints on adaptation (Baum, 1996), which can be loosely grouped under the term "adjustment costs." Generally speaking, as adjustment costs go up, the rate and overall amount of change decline (Haveman, 1992). For instance, a misaligned firm with high adjustment costs would change slowly and ultimately remain substantially misaligned, whereas a similarly misaligned firm with lower adjustment costs could change quickly, with little residual misalignment.

Prior research has identified several sources of adjustment costs. Sunk investments in durable, idiosyncratic assets raise the cost associated with altering or abandoning the activities in which these assets are used (Hannan and Freeman, 1984; Williamson, 1985; Ghemawat, 1991). Decisions to replace durable investments by making new investments are based on a comparison of the variable cost delivered by the existing assets and the total costs of new investments. Existing investments in the short run may yield economic returns in excess of those provided by new investments, even though the latter may offer a lower variable cost. Eventually, these existing assets depreciate or competitive pressure will become sufficiently severe that the expected gain from adapting and investing in new assets exceeds the benefit of stasis. In other words, although in the long run these assets are subject to strategic choice, existing investments constrain managerial choices in the short run. Thus, in the face of a changing environment, a firm with a significant investment in durable specialized assets configured for the old environment is likely to adapt more slowly, and less completely (if some assets are long-lived), than a firm without such investments.

Hypothesis 3 (H3): The rate and amount of organizational change in the governance of a particular transaction decreases with the degree to which the transaction is characterized by investment in specific assets.

Similarly, long-term contractual commitments can slow the rate of organizational change. Formal contractual commitments constrain an organization from switching to an alternative trading partner or organizational form until the contract expires (Argyres and Liebeskind, 1999), unless the firm is willing to pay appropriate compensation to break its contract (otherwise known as "efficient breach"). Such contractual commitments thus create adjustment costs that delay organizational change (Bercovitz, 2000). Card (1986) found that union contract terms raised the costs of adjustment and hence slowed adaptation in airlines' use of mechanics. Informal commitments ("informal contracts"), such as normative standards and political coalitions, also constrain organizations. Hannan and Freeman (1984: 149) argued that as normative standards and political coalitions emerge within organizations, an organization's inertia increases, which increases adjustment costs and slows the rate and amount of organizational change.

Hypothesis 4 (H4): The rate and amount of organizational change in the governance of a particular transaction decreases with the degree to which the transaction is characterized by deep contractual commitments.

The implication of the foregoing is that a firm whose transactions are inappropriately governed will adapt its organizational structure to reduce misalignment but that the rate and level of this adaptation will be constrained by the attendant costs of adjustment, which vary with a variety of organizational factors. Firms that do not adjust, or that adjust too quickly in the face of such costs, will either exit or persistently realize low profits.

We tested these hypotheses in a study of interstate for-hire motor carriers following deregulation of the U.S. trucking industry in 1980. Trucking deregulation was a largely unanticipated event that significantly altered the competitive landscape of the industry (Rose, 1985; Robyn, 1987). Hence, many previously aligned trucking firms found themselves inappropriately aligned for the unexpectedly deregulated environment after 1980. By studying the deregulated trucking industry, we were thus able to take advantage of the natural experiment associated with a deregulatory "shock," which both ensures unusually high environmental change (and consequently a presumed need for organizational change) and addresses traditional concerns about unobserved organizational heterogeneity in studies that relate a firm's choices to its performance (Hamilton and Nickerson, 2003).

The U.S. Interstate For-hire Trucking Industry

With the development of larger and more reliable vehicles, the U.S. interstate for-hire trucking industry grew dramatically during the 1920s and early 1930s. Railroads (and incumbent motor carriers), threatened by the growth in the trucking industry during this period, lobbied intensely for regulatory constraints on price and entry at both the state and federal levels (Stigler, 1971). This request was received favorably by the Roosevelt administration, and the interstate for-hire trucking industry was placed under the regulatory supervision of the Interstate Commerce Commission (ICC) in 1935. Charged with the responsibility to "promote market stability," the ICC severely restricted entry of new firms and expansion of existing motor carriers. At the same time, regional price bureaus set route- and freight-specific price floors for motor carriage, thus facilitating cartelization in the industry. Under regulation, motor carriers earned significant rents, a large portion of which were extracted by unionized drivers (Rose, 1987).

This arrangement persisted until the Carter administration pushed regulatory reform through Congress in 1980. The reform legislation essentially deregulated both entry and price, which consequently led to tremendous increases in the entry of motor carriers, severe downward pressure on prices (Robyn, 1987; Corsi et al., 1992), and a dramatic drop in the union wage premium (Rose, 1987), as well as extensive concessions from the Teamsters to motor carriers (Perry, 1986). Whereas the number of ICC-certified carriers hovered around 16,000 between 1960 and 1975, by the end of 1991, some 47,890 ICC-certified carriers were in operation. Further, the explosion in entry was matched by a similar burst of exits: between 1983 and 1990, nearly 1.5 percent of motor carriers failed each year, almost double the failure rate of all U.S. businesses during the same time period (American Trucking Associations, 1991). For the first time since 1935, a competitive market penalized inefficient organization and operations.

Three features of trucking firms are salient for the purposes of this study. First, for-hire motor carriage is generally divided into two types, each of which requires significantly different types of investment and organizational resources. Truckload (TL) carriage involves the movement of shipments of 10,000 pounds or more, directly from origin point to destination point. Less-than-truckload (LTL) carriage involves the movement of shipments of under 10,000 pounds; Overnite is a familiar example of this type of transport. LTL carriage typically uses a hub-and-spoke system to consolidate and distribute freight efficiently from multiple origin points to multiple destinations. This network frequently requires specialized investments in a network of "breakbulk" facilities—large, specially designed warehouses to allow rapid unloading, sorting, and reloading of freight onto trucks. While breakbulk facilities can be redeployed for other uses such as manufacturing, the idiosyncrasies of their construction have little value outside of LTL carriage, which translates into a high degree of industry-specific and site- or route-specific investment. By contrast, the door-to-door nature of TL carriage obviates the need for much of this investment.

The second feature, related to the first, centers on the different logistics in LTL hauls as compared with TL hauls, a difference that requires different degrees of coordination by motor carriers. At its most basic level, TL carriage requires little more than a truck and a telephone: a dispatcher gets a call from shipper X requesting carriage of freight from point A to point B and dispatches a truck and driver to undertake the haul. The driver need not interact with any other coworkers to complete the assignment. For LTL carriage, however, a truck not only carries shipper X's freight from point C to point D but also carries freight from many other shippers with origins near point C to destinations possibly quite distant from point D. The hub-and-spoke nature of LTL carriage requires the timely coordination of truck arrivals and departures at breakbulk facilities. The late arrival or departure of a truck into or out of a breakbulk facility can cause a costly ripple effect throughout the entire LTL network; a problem with one LTL haul imposes externalities on other hauls—externalities that are difficult to foresee (since each LTL haul will impose different externalities depending on what freight it is carrying on a given day) and to measure. The condition that gives rise to these externalities is typically referred to as temporal specificity (Masten, Meehan, and Snyder, 1991), which exerts a strong influence on the ownership of assets in the transportation industry, including steamship carriers (Pirrong, 1993) and truck tractors (Hubbard, 2001; Nickerson and Silverman, 2003). In contrast, TL carriage imposes no such externalities on other hauls and therefore reflects an absence of temporal specificity. The ability to control and coordinate drivers is therefore significantly more important for LTL than for TL activities.

Third, motor carriers can rely on company drivers, for whom the carrier owns or leases vehicles that the carrier maintains, or on independent owner-operators to haul their freight. A large number of firms use a mixture of the two employment modes. Much as franchisees in a franchise system are highly motivated to expend effort, owner-operators are believed to be attractive because, among other things, they have strong incentives to work hard—to drive more, take shorter breaks, treat their vehicles more gently, etc. (Nickerson and Silverman, 2003). Relying on owner-operators, however, raises control problems for carriers. First, when one haul imposes externalities on another haul, the incentive for an owner-operator to maintain his or her vehicle diverges from that of the carrier. The owner-operator's maintenance decision is based only on the cost of his or her ruined haul should the truck break down, whereas the carrier also considers the spillover costs associated with other hauls that are delayed or otherwise disrupted from a breakdown. Similarly, a carrier that invests in a reputation for on-time delivery risks the loss of this investment—that is, the tarnishing of its reputation—while an owner-operator will not internalize this risk. Thus, the owner-operator will underinvest in vehicle upkeep from the carrier's perspective. This is similar to the problem of shirking on quality inputs in franchising (Lafontaine, 1992). Second, owner-operators are in a better position than company drivers should their contract with the carrier break down, since they retain ownership of the truck. Consequently, owner-operators are willing to haggle more fiercely with the carrier and even to spend effort on unproductive activities that strengthen their bargaining position (Baker and Hubbard, 2003; Nickerson and Silverman, 2003). This temptation will be greater under conditions of temporal specificity, when a carrier requires timely delivery and the next available truck is geographically distant, a condition that is more likely to occur with LTL traffic than with TL traffic, on average, given the coordination challenges of LTL logistics. Third, for trucks that are optimally configured to handle unusual freight characteristics, there will be a thinner market for their use. Conventional transaction cost concerns arise with such idiosyncratic trucks, as temporal specificity again becomes an issue—the next feasible use for an unusual truck may be extremely distant geographically.

A carrier must balance the production-related benefits of owner-operators against these transaction-cost-related challenges. While carriers that focus on TL carriage may be able to reduce costs effectively by subcontracting, carriers that haul LTL loads are less able to do so; even though subcontractors are ostensibly cheaper in production costs terms, the transaction cost problems associated with this governance form are particularly challenging for LTL carriers. Although our archival data offer no evidence of how managers of motor carriers thought about this organizational challenge, anecdotal evidence supports the idea that carrier managers recognized the importance of appropriate organization of drivers, took steps to alter organization appropriately, and encountered adjustment costs in doing so. Siegel (1989: 80) recounts one motor carrier's decision to shift from owner-operators to company drivers in the mid-1980s:

> [As the business grew,] Hale made certain adjustments. One of them was to limit his dependence on owner-operators. "We found that there were not enough owner-operators to provide consistently good service. . . . Now, only 6% of the owner-operators who apply for work actually meet our qualifications." Hale says that making a transition from a 100% owner-operator fleet to a mix of one-third company drivers, two-thirds owner-operators, was not easy.

In a cross-sectional study of employment in the interstate for-hire trucking industry, Nickerson and Silverman (2003) found that, consistent with transaction cost economics predictions, motor carriers that engage in LTL carriage and/or invest in specific assets such as reputational capital or idiosyncratic equipment tend to hire company drivers rather than owner-operators (see the Appendix and Nickerson and Silverman, 2003, for more details). Our empirical analysis investigated whether a carrier's profitability is affected by driver misalignment and whether carriers adapt their organization to reduce driver misalignment. Our analysis allowed us to assess the rate and amount of carrier adaptation with respect to a variety of organizational factors.

METHODS

Data

Thanks to the reporting demands placed on motor carriers by the Interstate Commerce Commission, the data available for an important segment of the trucking industry are unusually detailed. The ICC has required large motor carriers, private and public, to file detailed annual reports, called Form Ms, since at least 1944. Since 1980, "large" motor carriers have been defined as those whose annual revenue exceeds $1 million. The Form M provides a comprehensive income statement and balance sheet, as well as a description of operations and organizational structure. This study used the Form Ms to compile life history information on all large motor carriers that operated in the United States at any time between 1980 and 1991. Our database allowed us to generate measures of the degree to which these motor carriers aligned transactions—notably their truck driver employment relation—according to the prescriptions of transaction cost economics. We did not cover the pre-1980 period because it was characterized by rigid price and entry regulation and described an environment in which competition was severely and artificially curtailed. At the start of 1980, 2,552 carriers existed in the ICC's large-carrier population. By the end of 1991, entry and exit led to a population of 1,651 large carriers. During the 1980–91 period, the number of small (revenue < \$1 million) carriers rose from 15,493 in 1980 to 46,239 in 1991, reflecting the end of regulatory restrictions on entry.

The data used in this study have several limitations that constrained our empirical analysis. First, the data are left-censored. Although we know the dates of founding for most of the carriers that existed before 1980, we lack detailed information on the entire life-history of the motor carrier sample before that date, and thus our data are truncated on the left. The lack of population-wide information for prior years has implications for our study. Such data may introduce a sample-selection bias in that the profitability of motor carriers already existing in 1980 may be different from that of later-founded carriers because not all of the carriers "at risk" of poor profitability prior to 1980 are known. We controlled for left-censoring in our reported models with a categorical variable. Second, the data are biased in favor of large carriers. Given that the ICC does not require carriers with revenues below \$1 million to file comprehensive Form Ms, we lack information on carriers with revenue below the \$1 million floor. Since a truck that is run at average productivity typically generated revenue of between \$100K and \$130K per year in the mid-1980s, a motor carrier must have 8–10 trucks before it will file a Form M. This limits the generalizability of our results to firms of a minimum size.

Dependent Variables

ROA_{it} is an accounting measure that represents annual return on assets for each carrier i in year t. We calculated return on assets by dividing annual earnings before interest, taxes, and depreciation expense by total assets. Ideally, we would have used Tobin's q to measure expected returns, but many of the firms in our database are private, which precludes calculating Tobin's q. In unreported estimations, we replicated our models with return on sales and operating margin, with no substantive change in results.

Driver Misalign$_{i(t+1)}$: As described above and in the Appendix, Nickerson and Silverman (2003) found that the extent to which a motor carrier relies on company drivers rather than owner-operators is largely dependent on characteristics of the carrier's activities and the assets it employs. Their analysis employed a two-sided Tobit model that estimated the degree of a carrier's reliance on company drivers as a function of (1) the proportion of revenue received from LTL carriage; (2) the carrier's advertising intensity; and (3) several haul characteristics, including the average length of haul and average weight of haul; and a series of control variables. The *Driver Misalign* variable for this study was constructed by estimating their model for observations in 1991, applying the resulting coefficients to each year in our sample, and setting Driver Misalign equal to the absolute value of the residual for each firm-year observation.[3] Thus, Driver Misalign ranges

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The ICC did not require the majority of motor carriers to report their advertising expenditures until the end of the 1980s. The reestimation of Nickerson and Silverman's (2003) model in this paper therefore excludes the advertising variable.

between 0, which occurs when the proportion of a firm's total miles driven by company drivers conforms perfectly to the proportion predicted by Nickerson and Silverman's model, and 1, which occurs when a firm's reliance on company drivers is diametrically opposite that predicted by transaction cost predictors. This construction of an absolute value is consistent with Anderson (1988).

Independent Variables

Driver Misalign$_{it}$ was constructed as described above. Hypothesis 1 predicted that carrier profitability will decline with increasing levels of Driver Misalign$_{it}$. Therefore, we included this variable in the profit equation and expected its coefficient to be negative.[4] Hypothesis 2 predicted that firms will adapt so as to reduce their misalignment. Therefore, we also included this variable in the adaptation equation and expected its coefficient to be between 0 and 1; Driver Misalign$_{it+1}$ will be systematically smaller than Driver Misalign$_{it}$.

LTL Share$_{it}$ was measured as the proportion of carrier i's annual revenue derived from LTL carriage. Hypothesis 3 predicted that carriers whose business was more reliant on LTL carriage, with its attendant investment in idiosyncratic assets, would face greater adjustment costs than those whose business was less reliant on LTL carriage. Hence, in the short run, LTL Share represents a constraint on employment mode choice.[5] We included this variable in the adaptation equation and expected that adaptation would be slower and less complete the more a carrier engaged in LTL carriage. We also included this variable in the profit equation to control for any differences in the profitability of LTL vs. TL freight transportation.

Union$_{it}$, is a categorical variable equal to 1 if carrier i contributes money to a union pension plan in year t, and 0 otherwise. Hypothesis 4 predicted that organizational adaptation would decrease as the degree of contractual commitment associated with an organization increases. We interpreted unionization as an example of formal contractual commitment, as union contracts typically constrain carriers' ability to adapt, and unionized workforces can impose costs on carriers by striking or engaging in work slowdowns, which could delay organizational change. Very few firms in the sample changed their union status during the sample period; given our use of fixed-effects models, this precluded us from simply including *Union* in our equation and interpreting its coefficient as a conventional independent variable. Instead, we used this variable to divide our sample into unionized and non-unionized subsamples and explored differences among the two subsamples. We expected to find a lower rate and level of adaptation in the union subsample than in the non-union subsample.

Overinteg$_{it}$ is a categorical variable equal to 1 if carrier i's level of integration is greater than that prescribed by transaction cost economics, and 0 otherwise. *Underinteg*$_{it}$ is a categorical variable equal to 1 if carrier i's level of integration is less than that prescribed by transaction cost economics, and 0 otherwise. To reduce its misalignment, an overintegrated carrier would have to fire employee drivers. In contrast, an

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To ensure that our results were not driven by our use of the absolute value, in unreported models we replaced Driver Misalign with a spline, consisting of *Driver Misalign Under* (which equals Driver Misalign for those observations where the observation's residual is less than 0, and 0 otherwise) and *Driver Misalign Over* (which equals Driver Misalign for those observations where the observation's residual is greater than 0, and 0 otherwise). This did not change our results.

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To evaluate the underlying assumption that LTL Share is appropriately treated as a constraint compared to Driver Misalign, we estimated two elementary adjustment models with random effects. The first model estimated the rate of adjustment for Driver Misalign, and the second model estimated the rate of adjustment for LTL Share. Both models also included a constant. Random effects allow us to investigate within-firm effects. Comparing the adjustment coefficients from these two models provides a first order sense of how rapidly firms adjust their employment relation and their focus on LTL. If our assumption is correct, then both coefficients should be between 0 and 1 and the coefficient for LTL Share, which should adjust more slowly than the level of integration, should be larger than the coefficient for Driver Misalign. Our estimates, which are available from the authors, show that both coefficients are between zero and 1 and that the coefficient for LTL Share is nearly twice as large as the coefficient for the level of integration. Thus, coefficient estimates provide support for our assumption.

underintegrated carrier would have to stop using owner-operators. We interpreted overintegration as generating a higher level of contractual commitment than underintegration, because of the formal and informal constraints associated with employment. Hypothesis 4 thus suggested that *Overinteg* should be negatively related to adaptation, as compared with *Underinteg*. Since these are categorical variables, and they rarely vary over time for a given carrier, we did not include them in our equation. Instead, we used these variables to construct over- and underintegrated subsamples and explored differences among the two subsamples.

Control Variables

Organizational characteristics. A carrier's operating costs are likely to affect its profitability. We controlled for this relationship with *Op. Cost*$_{it}$, measured as carrier i's annual operating costs per mile in year t. Larger and older organizations typically are seen as less able or less willing to undertake change, due to greater buffering from the competitive pressures that spark adaptation or to greater bureaucratic rigidities (Hannan and Freeman, 1984; Delacroix and Swaminathan, 1991). We controlled for firm size in our models of performance and adjustment with *Size*$_{it}$, measured as the natural logarithm of carrier i's revenue at time t. Carrier age essentially is distributed bimodally, with old firms as incumbents and young firms as entrants. We coded for these modalities with the categorical variable *Left Censor*$_{i}$, which identifies those carriers that are incumbents as of 1980.

Leverage, which is one proxy for a firm's slack resources, has been linked theoretically and empirically to profitability. Theorists disagree on the direction of this relationship, however, with some predicting that increased leverage will lead to increased profit by encouraging firms to soften competition (Chevalier and Scharfstein, 1996), and others predicting that increased leverage will decrease a firm's profitability by encouraging rivals to toughen competition (Brander and Lewis, 1986). We controlled for this with *Leverage*$_{it}$, measured as debt/(debt + equity). In addition, the effect of leverage is exacerbated when an organization's assets are idiosyncratic (Williamson, 1988; Silverman, Nickerson, and Freeman, 1997). We controlled for this with an interaction term, *Leverage*LTL Share*$_{it}$.

Environmental characteristics. We controlled for the level of competition with *Comp*$_{it}$, which is a count of the number of interstate for-hire carriers in the U.S. in year t, discounted by their distance to carrier i and weighted by carrier revenue.[6] Formally

$$\text{Comp}_{it} = \frac{1}{\sum_{j=1}^{n_t} (\text{Revenue}_{jt})} \sum_{j=1}^{n_t} \frac{\ln(\text{Revenue}_{jt})}{\text{Distance}_{ij}}, i \neq j$$

where i and j are carriers, n_t is the number of carriers in each year t, and *Distance*$_{ij}$ is the spherical distance in miles between carriers' headquarters. Any distance between carriers less than one (for instance, located in the same city) is set to one. We were unable to identify firm locations for

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In unreported models, we replaced Comp with the conventional count measure of density. Our results were not affected by this change.

approximately 2.4 percent of our sample, which were excluded in the calculation of *Comp.* The organizational ecology literature generally predicts that performance decreases with increased competitive pressure. Thus, we expected a negative coefficient for this variable in the profit model. Baum (1996) proposed that increased competition may spur organizations to change. Thus, we expected higher levels of Comp to be associated with faster and more complete adaptation.

Another environmental factor that may affect firm profitability and adaptation stems from pressures related to institutional isomorphism. Drawing on prevailing conceptions of mimetic isomorphism (e.g., Haunschild and Miner, 1997; Henisz and Delios, 2001), we considered the possibility that motor carriers may be influenced by other motor carriers' decisions about how to organize the driver employment relation. We did this with two variables. First, for each carrier in the population, we constructed $Conform_{it}$, which is a measure of the degree to which carrier i's level of integration conforms with the average level of integration by geographically proximate, similar firms. The primary measure of similarity we used is LTL Share. Our reference set of nearby motor carriers is all carriers whose headquarters were within a 50-mile radius of the focal carrier's. Formally, our measure of conformity is

$$\text{Conform}_{it} = 1 - \left| \text{Integ}_{it} - \frac{\sum_{j=1}^{N_t} (1 - |\text{LTL Share}_{it} - \text{LTL Share}_{jt}|)\text{Integ}_{jt}}{N_t} \right|$$

We took one minus the absolute value so that increasing values of the variable would correspond to increasing conformity by carrier i. Institutional theory suggests that a carrier's profitability is dependent on how much it looks like other carriers on relevant dimensions; if so, then the coefficient for *Conform* should be positive in the profit model.[7]

Second, we constructed *Inst. Isomorph* as a categorical variable that is equal to 1 when carrier i is both overintegrated (or underintegrated) with respect to the transaction cost prescription for integration and overintegrated (or underintegrated) with respect to its reference set of firms, and 0 otherwise. When Inst. Isomorph is equal to 1, carrier i will increase its conformity to other firms as it reduces its degree of transaction-cost-economics-based misalignment. When Inst. Isomorph is equal to 0, carrier i will decrease its conformity as it reduces its degree of misalignment. If it is true that firms face institutional pressure to resemble other firms, then a carrier should reduce its misalignment more readily when this also brings the carrier closer to what other firms are doing; hence, positive values of Inst. Isomorph should be associated with faster and more complete adaptation.[8]

Finally, we included *Year#* (where # represents each year in our study) fixed effects to control for variation in macroeconomic conditions, time since deregulation, and any other year-by-year variations in profitability that would systematically affect the entire sample of carriers. We also included GSP_{it}, a variable for the change in gross state product in

7
In unreported models, we used alternate constructions of Conform, including using different radii as cutoffs and different measures of similarity or prominence to weight the degree of integration. All of these measures generated similar results.

8
In unreported models, we also included Conform as a variable in the adaptation model. This variable was not significant, nor did its inclusion change substantially the results of these models.

year t for the state in which carrier i had its headquarters, to control for local macroeconomic effects.

Table 1 defines the variables used in our study and provides the predicted sign of the coefficient for each independent variable. Table 2 provides descriptive statistics and correlations for these variables. Of the 16,894 carrier-years in our sample, we have complete data for 5,102 carrier-years, which forms the basis of our empirical analysis. Note that the correlations among the main effects are not problematic; although, as expected, the correlations between main effects and interaction terms are occasionally high.

Model Specification and Estimation

We analyzed firm profitability and organizational adaptation by simultaneously estimating two equations via a three-stage-least-squares approach. Profitability was estimated using a linear model. Adaptation was estimated using a partial (dynamic) adjustment model. Our simultaneous equation model estimated profitability and the rate and amount of carrier adjustment in Driver Misalign as a function of our covariates. We estimated this system of equations using STATA's reg3 procedure, a 3SLS estimation approach.[9] In both models, we included only those variables that exhibited substantive temporal variation. A fixed-effects model assumes that

9
In unreported models, we replicated these estimations via seemingly-unrelated regression and via ivreg, with essentially identical results.

Table 1

Variable Definitions

Dependent variables	Definition	Prediction: Profit	Prediction: Adapt
ROA_{it}	EBITDA / assets.	Dep. var.	
Driver $Misalign_{i(t+1)}$	Absolute value of (Company Driver Miles – predicted Company Driver Miles) for carrier i for year t+1 (see Appendix for details on Company Driver Miles).		Dep. var.
Independent and control variables			
Driver $Misalign_{it}$	Absolute value of (Company Driver Miles – predicted Company Driver Miles) for carrier i for year t.	H1: –	H2: > 0 and < 1
LTL $Share_{it}$	Proportion of revenue received from LTL hauls for carrier i in year t.		H3: +
$Union_{it}$	1 if carrier i contributes to union pension plan; 0 otherwise.		H4: +
$Overinteg_{it}$	1 if carrier i's Company Driver Miles > predicted Company Driver Miles for year t, 0 otherwise.		H4: +
Op. $Cost_{it}$	Carrier i's average annual operating cost per mile for year t.		
$Size_{it}$	Natural log of revenue for carrier i for year t.		
$Leverage_{it}$	Debt/(debt + equity) for carrier i at end of year t–1.		
Leverage*LTL $Share_{it}$	Product of Leverage and LTL Share.		
Left $Censor_{it}$	1 if carrier i existed before 1980; 0 otherwise.		
$Comp_{it}$	Sum of log of carrier j revenue divided by the spherical distance between carrier j and i where i ≠ j for each year t / 1000.		
Conform	Degree to which carrier i's level of driver integration resembles that of all competitors within 100 miles in year t, weighted measure (see Conform equation in text).		
Inst. Isomorph	1 if carrier I can simultaneously increase its conformity to competitors within 100 miles and reduce its degree of transaction-cost-based misalignment in year t, else zero.		
Year#	1 if t = Year#; 0 otherwise.		
GSP_t	% change in U.S. gross state product between t-1 and t (year-end).		

Table 2

Descriptive Statistics and Correlations

Variable	Mean	S.D.	Min.	Max.	1	2	3	4	5	6
1. Misalign	.51	.29	0	1						
2. Conform	.59	.21	0	1	–.14					
3. ROA	.05	.17	–3.3	2.06	–.06	.02				
4. Size	2.2	1.42	–1.95	7.74	–.02	–.07	.06			
5. LTL Share	.4	.39	0	1	–.26	–.21	–.03	.18		
6. Leverage†	.55	.5	–18.46	11	.01	.00	–.28	–.01	–.03	
7. Lev.*LTL Share†	.22	.27	–2.93	2.26	–.19	–.15	–.17	.13	.76	.37
8. Comp	.86	.2	.28	1.1	.03	–.13	.01	.02	.00	–.01
9. DM*Conform	.29	.2	0	1	.80	.38	–.04	–.05	–.31	.00
10. DM*ROA	.02	.1	–2.76	.89	.12	–.00	.83	.06	–.03	–.30
11. DM*Size	1.11	1.01	–1.17	6.06	.56	–.15	.01	.74	.04	–.01
12. DM*LTL Share	.18	.2	0	.8	.11	–.24	–.02	.29	.80	–.02
13. DM*Leverage†	.28	.31	–1.01	9.95	.53	–.11	–.32	–.02	–.16	.61
14. DM*Comp	.44	.28	0	1.1	.91	–.20	–.06	–.00	–.23	.01
15. Inst. Isomorph	.87	.33	0	1	.44	–.30	–.06	.04	.25	.01
16. GSP	.07	.04	–.14	.3	–.01	.04	.07	.02	.08	–.01
17. Op. Cost	2.51	1.62	.34	9.98	–.07	–.16	–.06	.13	.64	–.02

Variable	7	8	9	10	11	12	13	14	15	16
8. Comp	–.02									
9. DM*Conform	–.23	–.05								
10. DM*ROA	–.13	.00	.11							
11. DM*Size	.03	.04	.42	.13						
12. DM*LTL Share	.61	.04	.00	.02	.34					
13. DM*Leverage†	.09	.02	.41	–.30	.28	.03				
14. DM*Comp	–.17	.38	.69	.11	.53	.11	.49			
15. Inst. Isomorph	.20	.05	.27	.06	.29	.31	.22	.42		
16. GSP	.04	–.06	.01	.07	.02	.05	–.02	–.03	.05	
17. Op. Cost	.48	–.13	–.13	–.04	.08	.62	–.06	–.10	.20	.06

† Book equity can be negative.

the effects of independent variables are the same for all firms but that the intercept can differ for each firm. This model corrects for potential bias introduced by analyzing panel data in which having multiple observations for each organization violates the assumption of independence required for ordinary least squares (OLS) regression, but a fixed-effect model makes it difficult to estimate coefficients for independent variables that do not vary over time. Thus, as discussed below, we reestimated the model for different subsamples of our data to evaluate the rate and level of adjustment relating to those variables that do not display much temporal variation. Our fixed-effects profitability equation takes the following form:

$$\begin{aligned} ROA_{it} = {} & \alpha_0 + \alpha_1\text{*Driver Misalign}_{it} + \alpha_2\text{*LTL Share}_{it} + \alpha_3\text{*Leverage}_{it} + \\ & \alpha_4\text{*Leverage}_{it}\text{*LTL Share}_{it} + \alpha_5\text{*Size}_{it} + \alpha_6\text{*Op. Cost}_{it} + \\ & \alpha_7\text{*Comp}_{it} + \alpha_8\text{*Conform}_{it} + \alpha_9\text{*GSP}_t + \alpha_\Gamma\text{*Year\#} + \varpi_i + \gamma_{it} \end{aligned}$$

where γ_{it} is the error term, and ϖ_i is a fixed effect. Our profitability model allowed us to evaluate hypothesis 1, which predicted a negative relationship between profitability and the degree to which transactions are misaligned.

Our adaptation equation is a fixed-effects discrete partial-adjustment model similar to those employed by Haveman (1992, 1993). The model takes the following form:

$$\begin{aligned}\text{Driver Misalign}_{i(t+1)} = {} & \delta_0 + \delta_1\text{*Driver Misalign}_{it} + \delta_2\text{*ROA}_{it} + \\ & \delta_3\text{*LTL Share}_{it} + \delta_4\text{*Leverage}_{it} + \delta_5\text{*Size}_{it} + \\ & \delta_6\text{*Comp}_{it} + \delta_7\text{*Inst. Isomorph}_{it} + \delta_8\text{*DM*ROA}_{it} + \\ & \delta_9\text{*DM*LTL Share}_{it} + \delta_{10}\text{*DM*Leverage}_{it} + \\ & \delta_{11}\text{*DM*Size}_{it} + \delta_{12}\text{*DM*Comp}_{it} + \\ & \delta_{13}\text{*DM*Inst. Isomorph}_{it} + \eta_i + \nu_{it}\end{aligned}$$

where η_i is a firm fixed effect, and ν_{it} is a normally distributed error term.[10] In addition to our dependent variables, we specified Driver Misalign_{it} and DM*ROA_{it} as endogenous variables in this system of equations.

We evaluated hypotheses 2, 3, and 4 with coefficients estimated by the partial adjustment model. Our independent variables are a subset of previously defined variables, and those variables interacted with Driver Misalign_{it}, which we indicate with the prefix DM applied to the variable's name. The above model evaluates the extent to which a carrier's attributes at time t affect both the rate and level of adjustment in Driver Misalign at time t+1. To better understand the range of potential parameter estimates, consider the model with no interaction terms. If adaptation is unconstrained, then a carrier would quickly reorganize so as to be perfectly aligned in t+1 regardless of its degree of misalignment at time t. Hence, the coefficient for Driver Misalign_{it} would equal 0. Conversely, if adaptation is highly constrained, then a carrier at time t+1 would continue to be as misaligned as it was at time t. Hence, the coefficient for Driver Misalign_{it} would equal 1. Thus, the closer the coefficient for Driver Misalign_{it} is to 0, the faster adaptation occurs. Also, a positive coefficient for LTL Share (or size, leverage, etc.) in a model that excludes the interaction terms would indicate that the long-run level of misalignment is larger, the more heavily a carrier concentrates on LTL carriage (or the greater is its size, etc.). In the full model with interaction terms, positive coefficients for the interaction terms indicate slower rates of adjustment, whereas negative coefficients indicate faster rates of adjustment. To ease the interpretation of coefficients and reduce potential multicollinearity, we means-centered our variables in the adaptation models. Below, we identify those coefficient estimates that are significant and then graphically simulate their effect on the rate and amount of change in Driver Misalign.

RESULTS

Table 3 presents three models containing the estimates of the profitability and adaptation models for large interstate motor carriers. The primary differences among the three models are that we successively add terms to the adaptation model, which results in few changes to our profitability model, as the R^2 (.45), the χ^2 statistic (between 4185 and

10
As Haveman (1993: 37–38) noted, although the equation that derives directly from theories of change is defined in terms of rate of change (i.e., the dependent variable is dY(t)/dt), "this equation cannot be tested directly. Instead, it must be integrated to produce a form of the model that includes terms that are directly observable." Following Haveman's integration approach, we get a reduced-form model that can be estimated with panel data.

Table 3

Profitability and Adaptation Models*

Profitability	Model 1	Model 2	Model 3
Driver Misalign	–.022•••	–.021•••	–.021•••
	(.008)	(.007)	(.007)
Leverage	–.046•••	–.046•••	–.046•••
	(.004)	(.004)	(.004)
LTL Share	.007	.007	.008
	(.009)	(.009)	(.009)
Leverage*LTL Share	–.034•••	–.033•••	–.034•••
	(.012)	(.012)	(.012)
Size	.004•••	.004•••	.004•••
	(.001)	(.001)	(.001)
Comp	.001	.001	.000
	(.010)	(.010)	(.010)
GSP	.133••	.133••	.133••
	(.057)	(.057)	(.057)
Op. Cost	–.003•	–.003•	–.003•
	(.001)	(.001)	(.001)
Conform	–.006	–.006	–.006
	(.009)	(.009)	(.009)
Constant	.100•••	.100•••	.101•••
	(.016)	(.016)	(.016)
R^2	.45	.45	.45
χ^2	4185	4187	4187
Adaptation			
Driver Misalign	.380•••	.451•••	.471•••
	(.047)	(.061)	(.062)
ROA		.022	.071••
		(.016)	(.031)
Size		–.001	–.004••
		(.001)	(.001)
LTL Share		.014••	.015••
		(.006)	(.007)
Leverage		–.006	.013
		(.004)	(.011)
Comp		.011	.011
		(.008)	(.009)
Inst. Isomorph		–.029•••	–.037•••
		(.011)	(.015)
DM*ROA			.596•
			(.323)
DM*Size			.005
			(.006)
DM*LTL Share			.102•••
			(.026)
DM*Leverage			.060••
			(.030)
DM*Comp			.000••
			(.000)
DM* Inst. Isomorph			–.030
			(.027)
Constant	.000	.000	.006••
	(.002)	(.002)	(.003)
R^2	.84	.84	.83
χ^2	26917	26490	24778
N	5102	5102	5102

• $p < .10$; •• $p < .05$; ••• $p < .01$.

* t-statistics are in parentheses. Profitability models include year dummies.

4187), and virtually all coefficients remain essentially unchanged across all three models.[11]

Profitability. In all three profitability models, the coefficient estimates for Driver Misalign, which are stable at –.021 or –.022, are negative and significant. This provides support for

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We additionally ran several robustness checks on our analysis. One concern is that firms likely to exit in the next period may have especially high profitability in the current period. We corrected for possible sample selection bias due to attrition, following the 2SLS procedure devised by Lee (1983). Our results were qualitatively unchanged. We also re-ran our model including lagged ROA in the profitability model to account for serial correlation. Again results were qualitatively unchanged.

hypothesis 1: after controlling for a wide range of firm and environmental characteristics, the more a carrier deviates from transaction cost prescriptions for organizing its employment relationship, the lower is its profitability. These coefficient estimates indicate that a firm whose misalignment is one standard deviation above the mean will earn a return on assets of 1.2 percentage points lower than an otherwise identical firm whose misalignment is one standard deviation below the mean (that is, 4.6 percent vs. 5.8 percent). This is substantial considering that the carriers in our sample have an average return on assets of roughly 5 percent.

Several other firm characteristics also have an effect on ROA. Notably, Op. Cost is negatively related to ROA, although weakly statistically significant. The greater a carrier's operating cost per mile, the lower is its return on assets. A carrier whose operating cost is one standard deviation above the mean will earn an ROA of about one percentage point lower than an otherwise identical carrier whose operating cost is one standard deviation below the mean. This is consistent with conventional economic predictions that firms with inefficient operations will underperform relative to their efficient rivals. One-standard-deviation changes in DM and Op. Cost have similar-sized effects on ROA, which highlights the economic importance of efficient governance. Size is positively related to ROA; consistent with prior research on other types of organizations, larger motor carriers enjoy greater profitability than their smaller counterparts. A carrier whose revenue is one standard deviation above the mean will enjoy an ROA of about one percentage point higher than an otherwise identical carrier whose revenue is one standard deviation below the mean. Leverage is negatively related to ROA, although the exact mechanism behind this relationship is not clear. Firms with high leverage may attract aggressive actions by rivals who hope to drive them out of business (Chevalier and Scharfstein, 1996). Alternatively, high leverage may be an indication of past poor performance (Hambrick and D'Aveni, 1988), possibly signaling that the carrier is poorly managed. Consistent with Williamson (1988) and Silverman, Nickerson, and Freeman (1997), LTL Share*Leverage is also negatively related to performance. The more idiosyncratic a firm's assets, the more negatively its performance is affected by increased leverage. Finally, the coefficient for the remaining firm control, LTL Share, is insignificant.

In addition, some environmental characteristics also affect carrier profitability. GSP is positively associated with ROA. Not surprisingly, when the economy grows more rapidly, motor carriers enjoy higher levels of profitability. The coefficients for Conform and Comp are insignificant. Neither the presence of rivals nor the degree to which a carrier's organization of its driver force resembles that of nearby, similar rivals influences ROA, after controlling for the other effects in the model.

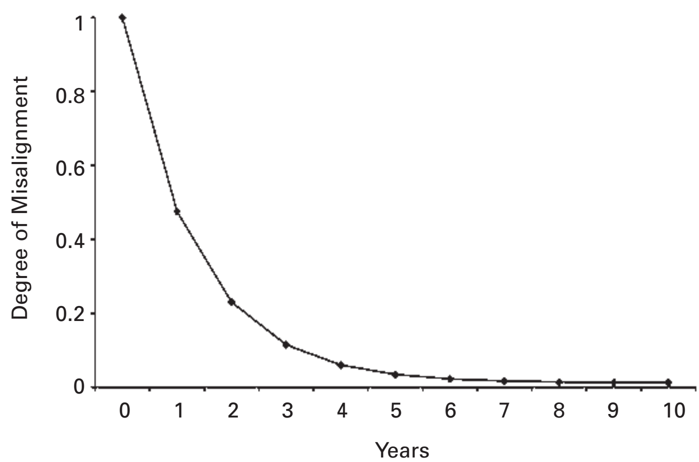
Adaptation. In model 1, Driver Misalign is positive and significant. At .380, its coefficient is significantly different from both 0 and 1. This coefficient estimate indicates that carriers do adapt to reduce their driver misalignment, albeit gradually. This result is consistent with hypothesis 2: carriers adapt so as to reduce the degree to which they deviate from transaction cost prescriptions for organizing their employment relationship. This result also lends support to our assumption that the observed misalignment in the deregulated trucking industry is not a result of unobserved heterogeneity. If firms that we perceive as misaligned were in fact properly aligned, given some unobserved characteristic, then the coefficient for Driver Misalign should be close to 1.

Model 2 introduces several other firm and environmental characteristics that we expected to influence the amount of adaptation. Given the structure of our reduced-form model, positive coefficient estimates for these characteristics indicate a lower amount of ultimate adjustment, whereas negative coefficients indicate a greater amount of adjustment. When we include these variables, the coefficient for Driver Misalign increases in magnitude but remains significantly different from both zero and one. Thus, model 2 supports hypothesis 2 even after controlling for these other characteristics. LTL Share is positively related to Driver Misalign_{t+1}. Thus, firms that focus more heavily on LTL carriage undertake less change than those that focus more on TL carriage. This provides initial support for hypothesis 3: carriers whose operations rely on more idiosyncratic assets undertake less change than those whose operations rely on more generic assets. Finally, the coefficient for Inst. Isomorph is negative and significant. This implies that a carrier will reduce its misalignment more when doing so will enable its organization of drivers to resemble that of nearby, similar carriers. Consistent with institutional theory, then, a carrier will reduce misalignment more when institutional pressure is pushing it in the same direction as transaction cost efficiency prescriptions. The other independent variables have no effect on adaptation in this model.

One challenge in interpreting model 2 is that its use of main effects for the variables does not consider how these covariates, except for Driver Misalign, may affect the rate of adaptation. In model 3, we investigate both rate and level of adaptation through interaction terms between Driver Misalign and other relevant characteristics of carrier j. In this model, the interaction terms demonstrate how various characteristics affect the rate of adjustment, and the main effects, in conjunction with the interaction terms, demonstrate how these characteristics affect the long-run level of adjustment by carrier j. Given the structure of our reduced-form model, positive coefficient estimates for the interaction terms indicate a slower rate of adjustment, whereas negative coefficients indicate a faster rate of adjustment. The χ^2 and adjusted R^2 statistics decline somewhat for models 2 and 3, which suggests that the terms added in these models do not add much explanatory power. This is driven, at least in part, by the increased endogeneity in each model (as explained in the methods section, we account for such endogeneity by declaring in our econometric specification those variables that are endogenous across our system of equations). Since model 3 is consistent with our theory, however, we are interested in the statistical significance of our coefficient estimates rather than the overall fit of the model.

In this model, the coefficient for Driver Misalign remains significant and essentially unchanged compared with model 2, again consistent with hypothesis 2. Given the specification of this model, however, determining the overall rate of adjustment involves assessing coefficients from both Driver Misalign and the interaction terms simultaneously. To facilitate this, we calculated simulated responses for our carriers based on the coefficients estimated in model 3. To evaluate a mean carrier's characteristic response, we assumed that driver misalignment at year = 0 is 1 (the maximum possible level of misalignment given the construction of Driver Misalign) and simulate the mean carrier's dynamic response for the ensuing years.[12] Figure 1, which displays the effect of our parameter estimates on the rate and amount of change in Driver Misalign, reports the baseline characteristic response for the average firm in our sample. This figure indicates that the typical carrier does adapt its organizational structure by reducing misalignment, which is consistent with hypothesis 2. Adaptation takes about three to four years.

Figure 1. Baseline model of rate of adjustment in driver misalignment.



In this model, the coefficient for LTL Share remains significant, positive, and essentially unchanged, again indicating that a greater focus on LTL freight is associated with less overall change. Of particular interest, the coefficient for DM*LTL Share is positive and significant. This coefficient implies that the more a carrier focuses on transporting LTL freight, the more slowly it will adjust. Figure 2 compares the adaptation of fully LTL to fully TL carriers with all other parameters reflecting the average firm. The top curve in figure 2 displays carrier adaptation for the mean carrier in all respects except that it is fully dedicated to LTL carriage, whereas the bottom curve displays carrier adaptation for the mean carrier in all respects except that it is fully dedicated to TL carriage. LTL firms adapt more slowly and less completely than TL firms. Along with the coefficient estimates for LTL Share, this provides further evidence supporting hypothesis 3: the more a carrier focuses on LTL carriage, which is characterized by investments in idiosyncratic assets, the more slowly it will adapt the organization of its driver force.

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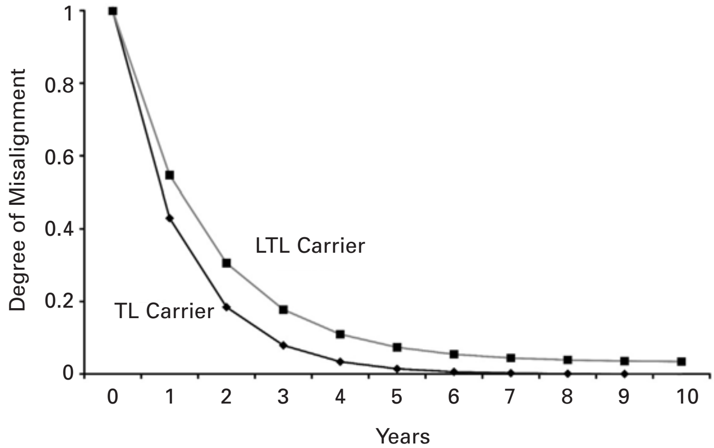
Although setting the initial misalignment to one is admittedly arbitrary, any reasonable value for initial misalignment will yield identical characteristic responses once appropriately scaled. Also, since we means-center our data in the adaptation models, Driver Misalign asymptotes to zero. This asymptote should be thought of as the long-term mean level of driver misalignment.

Figure 2. Effect of LTL Share on rate of adjustment.



The coefficient for ROA is now positive and significant, indicating that carriers with higher levels of ROA do not adjust their level of misalignment as much as those firms with lower ROA. In addition, the coefficient for DM*ROA is positive and weakly significant. Figure 3 displays carrier adaptation for carriers with different levels of profitability. The top curve displays carrier adaptation when ROA is one standard deviation above the mean, whereas the bottom curve displays carrier adaptation when ROA is one standard deviation below the mean. This figure, along with the coefficient estimates for ROA, indicates that firms that enjoy higher profits adapt more slowly and less completely than those with lower profits.

The coefficient for size is now significant and negative, indicating that larger firms reduce their driver misalignment more completely than smaller firms. The coefficient for DM*Size is not significant. Figure 4, which displays the effect of carrier size on adjustment, suggests that deviation above or below the mean carrier size yields little difference in the rate or level of adaptation. Taken together, these results indicate that although the overall reduction in misalignment increases with

Figure 3. Effect of ROA on rate of adjustment.

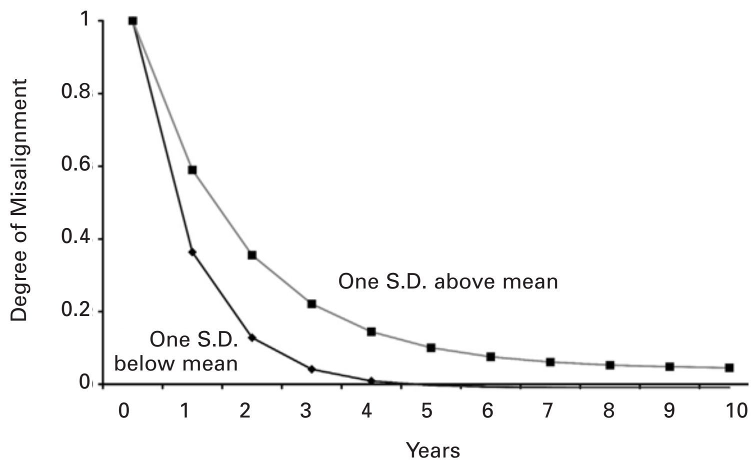
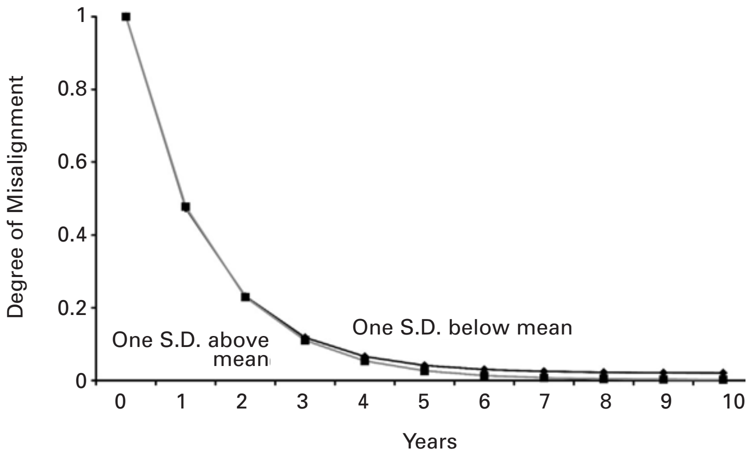


Figure 4. Effect of size on rate of adjustment.



carrier size in a statistically significant sense, this reduction is not economically significant.

As in model 2, the coefficient for Inst. Isomorph is negative and significant, again indicating that a carrier will reduce its misalignment more when doing so will enable its organization of drivers to resemble that of nearby, similar carriers. The coefficient for DM*Inst. Isomorph is negative but is not significant. As figure 5 indicates, carriers that increase their resemblance to neighbors when they reduce misalignment undertake more adaptation than those that decrease their resemblance to neighbors when they reduce misalignment.

Finally, the coefficients for Leverage and Comp, graphed in figures 6 and 7, respectively, remain insignificant in this model, and the coefficients for DM*Leverage and DM*Comp are positive and significant. The result for DM*Leverage indicates that highly leveraged carriers adjust at a slower rate than less leveraged firms. The result for DM*Comp suggests the curious effect that competition slows the rate of adjustment, although, at .000, this coefficient is not economically significant.

Figure 5. Effect of institutional isomorphism on rate of adjustment.

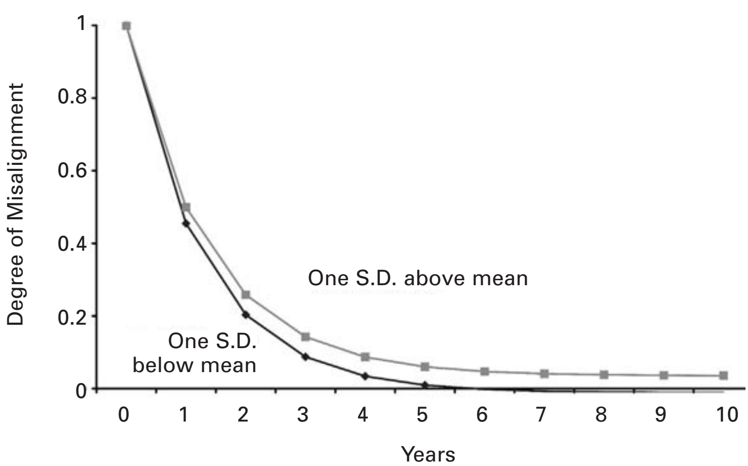


Figure 6. Effect of leverage ratio on rate of adjustment.

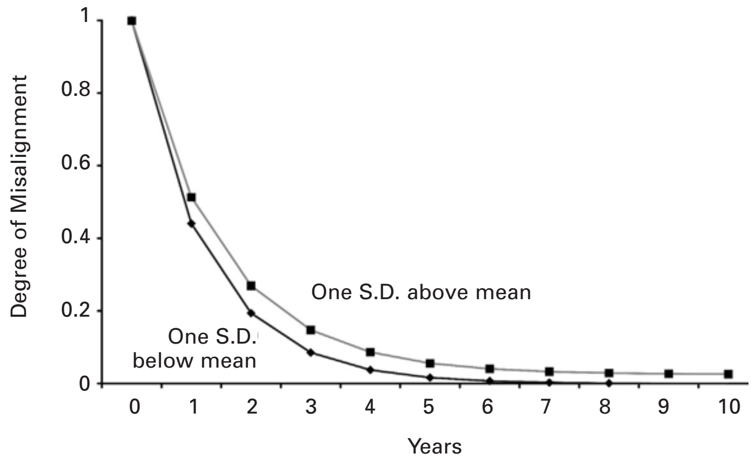
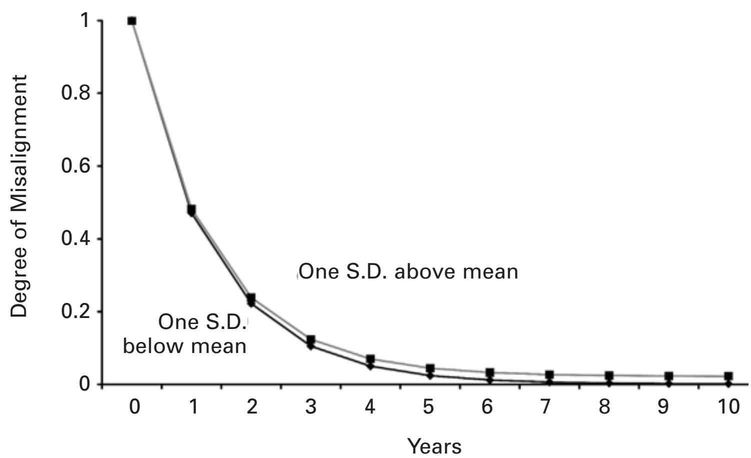


Figure 7. Effect of competition on rate of adjustment.



Our analysis thus far has not evaluated the effect on adaptation of contractual commitments (H4), nor of several time-invariant characteristics of interest. As noted above, we interpreted unionization as one proxy for formal contractual commitments and overintegration, defined as misalignment that entails excessive reliance on company drivers, to involve deeper informal contractual commitments than underintegration, or misalignment that entails excessive reliance on owner-operators. We were also interested in the control variable Left Censor, which identifies incumbents and entrants and is an indirect proxy for age. As described above, we could not directly incorporate these variables into our model because their effect is absorbed by the fixed effects—union status and over- vs. underintegrated status for each firm vary little across time and firm; our data are effectively bimodal in terms of age, with entrants under 10 years old and most incumbents more than 35 years old; and Left Censor does not vary. We analyzed the effect of these variables by separating our data sample into appropriate subsamples and re-estimating the partial-adjustment model for each subsample. Table 4 presents our results for each pair of subsamples. Since we were primarily interested in the effects that these

Table 4

Adaptation Models of Various Subsamples*

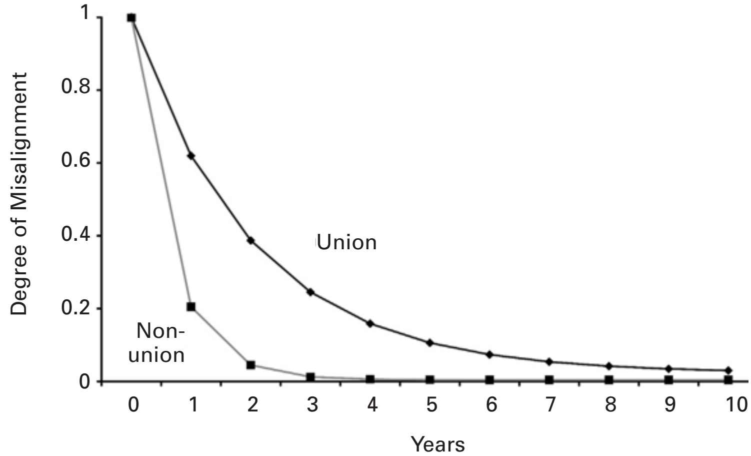
Variable	Model 4 Nonunion	Model 5 Union	Model 6 Under	Model 7 Over	Model 8 Entrant	Model 9 Incumbent	Model 10 Survivor	Model 11 Exiter
Driver Misalign	.202•••	.611•••	–.808•	.426•••	.424•••	.474•••	.504•••	.327•••
	(.075)	(.081)	(.432)	(.058)	(.072)	(.099)	(.065)	(.122)
ROA	.005	.063	–.141	.035•	.041•	.094•	.036	.116
	(.033)	(.049)	(.826)	(.020)	(.025)	(.055)	(.027)	(.073)
Size	–.001	–.006•••	–.028	–.003••	–.005•••	–.002	–.003••	–.001
	(.002)	(.002)	(.024)	(.001)	(.002)	(.002)	(.002)	(.002)
LTL Share	.004	.030•••	.094	.020••	.012	.016•	.009	.021•
	(.008)	(.011)	(.075)	(.009)	(.009)	(.009)	(.008)	(.012)
Leverage	–.005	.017••	.062	.006	.006	.013	–.001	.017
	(.015)	(.008)	(.121)	(.009)	(.007)	(.015)	(.010)	(.013)
Comp	.011	.000	.247	.012	.017	–.005	.012	.002
	(.013)	(.013)	(.187)	(.009)	(.012)	(.014)	(.011)	(.013)
Conform	–.003	–.082•••	.132	–.033••	–.005	–.055•••	–.014	–.065••
	(.016)	(.028)	(.164)	(.015)	(.022)	(.019)	(.016)	(.028)
DM*ROA	.100	–.718	–.672	.369	–.377	.596	.154	.596
	(.324)	(.790)	(2.294)	(.297)	(.587)	(.390)	(.256)	(.508)
DM*Size	.007	.012	–.069	.011••	.012	.009	.006	.012
	(.007)	(.016)	(.065)	(.005)	(.009)	(.008)	(.008)	(.009)
DM*LTL Share	.006	.037	–.077	.047••	.068•	.099••	.067••	.124••
	(.041)	(.044)	(.244)	(.021)	(.032)	(.042)	(.027)	(.059)
DM*Leverage	.005	–.102	.187	.037	–.067	.054	.038•	.072
	(.035)	(.110)	(.318)	(.026)	(.095)	(.033)	(.023)	(.068)
DM*Comp	.000	.000	.001	.000	.000	.000•	.000••	.000
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
DM*Conform	.002	–.110••	–.020	.001	.005	–.079••	–.013	–.082•
	(.032)	(.054)	(.333)	(.025)	(.052)	(.035)	(.032)	(.047)
Constant	.003	.009•	–.286•••	.002	.001	.009••	.002	.011••
	(.003)	(.005)	(.111)	(.002)	(.003)	(.004)	(.003)	(.005)
R^2	0.86	0.80	0.02	0.84	0.84	0.83	0.83	0.86
χ^2	15202	9912	169	24653	13475	12329	14530	12298
N	2606	2496	374	4728	2622	2480	3106	1996

• $p < .10$; •• $p < .05$; ••• $p < .01$.
* t-statistics are in parentheses.

variables have on the rate and amount of adjustment, we present results for only the partial adjustment equation and not the profitability equation. Results for the profitability estimations for these subsamples are available upon request.

We evaluated the effect of union status by reestimating the partial-adjustment model first for the subsample of non-unionized carriers (model 4) and then for the subsample of union carriers (model 5). The coefficient magnitudes and levels of statistical significance indicate that non-union carriers are substantially different from union carriers. The most striking difference is that the coefficient for Driver Misalign is substantially smaller for non-union than union carriers. This difference indicates that non-union carriers adapt their organizational structures quickly, whereas unionized carriers adjust their structures slowly. Figure 8 displays the adaptation response for a typical carrier with a union compared with one that has no union, which highlights the different rate at which the two prototypical carriers adapt. This result is consistent with hypothesis 4 with respect to union relationships. Although there is evidence that union power in the trucking industry declined precipitously after deregulation, both in terms of wage premia (Rose, 1987) and in terms of "give-backs" on other contractual provisions (Perry, 1986), our

Figure 8. Rate of adaptation of union vs. non-union carriers.

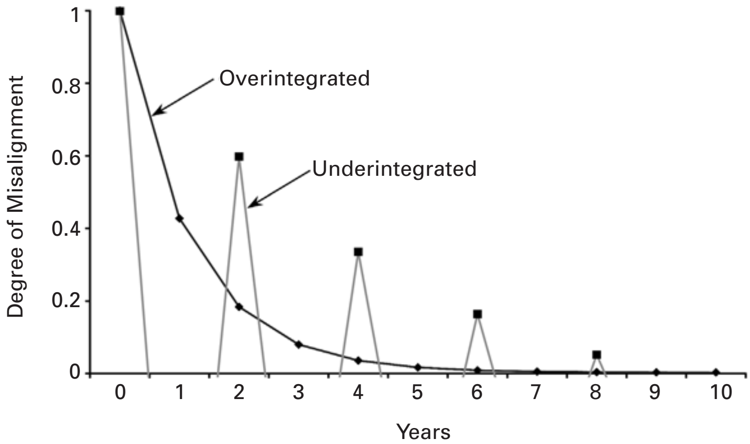


results suggest that union carriers were more constrained in their adaptation than those without unions.

These models indicate two other differences between unionized and non-unionized carriers' adaptation processes. First, non-unionized carriers' adaptation is not significantly influenced by any other firm or environmental characteristic included in our model. In contrast, unionized carriers' adaptation is affected by LTL Share: the more a unionized carrier relies on LTL freight, the less overall adaptation it undertakes. This may indicate that the constraints associated with idiosyncratic assets are compounded by other constraints on the organization, such as the presence of union contracts. Second, whereas unionized carriers' adaptation is affected by institutional isomorphism—unionized carriers adapt more rapidly and more completely when doing so enables them to conform more closely to geographically proximate firms—non-union carriers' adaptation is not. This may indicate that unionized carriers are better able to persuade unionized employees to allow organizational changes when they can invoke similarities to other organizations, whereas non-union carriers face fewer persuasion challenges.

Table 4 also shows some surprising results for our other measure of contractual commitment. Model 6 reports coefficient estimates for the subsample of underintegrated carriers, and model 7 reports coefficient estimates for the subsample of overintegrated carriers. The levels of significance for coefficient estimates are vastly different between the two models. Again, the most striking difference between the two subsamples relates to the coefficient for Driver Misalign: for overintegrated carriers, it is significant and positive, while for underintegrated carriers, it is barely significant and, surprisingly, negative. As figure 9 shows, this leads to a response curve that oscillates, with the amplitude diminishing over time. We interpret this response to indicate that underintegrated carriers adapt very quickly. This rapid speed of adjustment in conjunction with the small N in this subsample and the structure of our econometric model may have led to the unanticipated negative coefficient estimate. To the extent that these results indicate a faster adaptation rate for under-

Figure 9. Rate of adaptation of over- vs. underintegrated carriers.

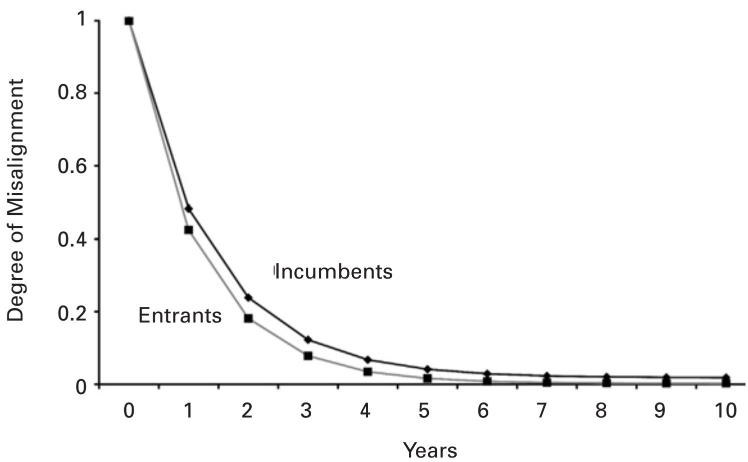


integrated carriers, they provide some additional support for hypothesis 4.

Several other differences between underintegrated and overintegrated carriers' adaptation processes mirror those of the non-union and union subsamples. In particular, overintegrated carriers' adaptation is reduced by increased reliance on LTL carriage and is increased by institutional isomorphism, whereas underintegrated carriers' adaptation is unaffected by these. This may indicate that informal constraints associated with overintegration have effects similar to the formal constraints of unionization in the adaptation process.

Model 8 in table 4 presents the results of the model for the subsample of entrants, and model 9 does so for incumbents. As displayed in figure 10, which compares the mean firm as an entrant and an incumbent, entrants adjust their driver misalignment somewhat faster than incumbents. Once again, the coefficient estimates indicate differences between incumbents and entrants that largely parallel those of the other subsamples. In particular, increased LTL carriage is associated with less adaptation, and institutional isomorphism is associated with more adaptation for incumbent car-

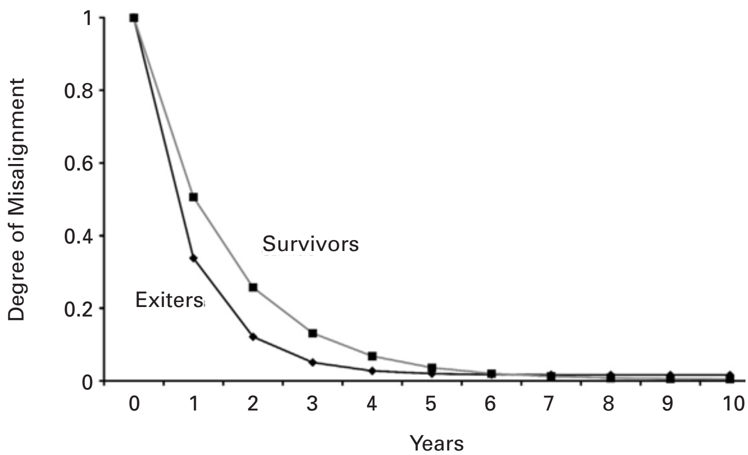
Figure 10. Rate of adaptation of incumbents vs. entrants.



riers, while newly founded carriers' adaptation is unaffected by these features. To the extent that older firms are characterized by deeper internal constraints (due to bureaucratization, political agreements, etc.), this may indicate that such constraints operate much like formal and informal contractual constraints in the adaptation process.[13]

Finally, we compared the dynamic response of carriers that survived through 1991 to that of carriers that exited by 1991. To do so, we estimated the partial-adjustment model first for the subsample of survivors (model 10) and then for the subsample of exiters (model 11). The adaptation response for the mean carrier is shown in figure 11. Here again, we find substantial differences in the magnitudes and statistical significance of coefficient estimates. Of particular interest, exiters' adaptation rate is notably faster than that of survivors, although survivors ultimately adapt as much as exiters.

Figure 11. Rate of adaptation of exiters vs. survivors



One other difference in coefficient estimates between the exiter and survivor subsamples is the effect of institutional isomorphism. As indicated by the significant, negative coefficients for Inst. Isomorph and DM*Inst. Isomorph in the exiter model, the extent to which exiters change more completely and more rapidly when doing so brings them into closer conformance with geographically proximate firms. In contrast, survivors' change was unaffected by isomorphic pressures.

DISCUSSION AND CONCLUSION

This paper was motivated by our desire to generate content-based predictions about why organizations want to organize efficiently and why it is difficult to do so. Our theoretical story is straightforward: firms want to organize efficiently because they reap performance benefits from doing so, but firms that are inefficiently organized cannot immediately shift to efficient organization because of adjustment costs associated with such shifts, adjustment costs that vary with characteristics of the relevant transactions. We examined organizational alignment of a core transaction—the driver employment relation—in the for-hire interstate trucking indus-

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One concern about this comparison is that the subsamples of unionized and overintegrated carriers might be essentially identical. This is not the case. Of the 4,728 carriers that are overintegrated, 2,335 are unionized and 2,393 are non-unionized. Similarly, of the 374 carriers that are underintegrated, 161 are unionized and 213 are non-unionized. The cross tabulations comparing union/non-union carriers with entrants/incumbents and entrants/incumbents and overintegrated/underintegrated also are fully populated, indicating that the subpopulation results are not the result of substantially overlapping subpopulations.

try. Taking advantage of a natural experiment in this industry, deregulation, we found empirical evidence consistent with our predictions. Our analysis showed that misaligned firms underperform relative to better-aligned rivals. These findings are consistent with our hypothesis that those organizations that govern transactions in accordance with transaction cost economic prescriptions will exhibit higher profitability than those that do not govern transactions appropriately. These results persist even though we empirically examine alternative explanations stemming from variation in production costs and institutional isomorphism. Moreover, our analysis accounts for pre-change performance of organizations, as well as the level of competition they face. As such, this analysis specifies change processes in greater detail than much prior research (Baum, 1996) and begins to answer the call for research that can bridge content and process models of organizational change (Barnett and Carroll, 1995).

For our sample of carriers, our analysis indicates that these firms systematically adapt their organizational structures in the direction of reducing transaction costs. We further found that the rate and amount of such adaptation is constrained by organizational features that we predicted would raise the cost of adjusting a firm's governance structure. The rate and amount of adaptation declined with the share of hauls that are LTL, which, we maintained, indicates the presence of specific investments. Specific investments appear to slow and lessen the amount of adaptation. Our results also showed that contractual commitments generate inertia that slows and limits adjustment. Unionized firms adapted less quickly and completely than non-unionized carriers. Overintegrated carriers adapted less quickly and completely than underintegrated carriers, although a literal interpretation of the coefficient estimates for underintegrated firms indicates a pattern of vacillation. We interpret these two results to indicate that contractual commitments do generate inertia that slows and limits adjustment. Finally, in virtually all of these simulations of carriers' dynamic response functions, it took approximately three to five years for adaptation to be completed. Given our theory, the length of time required for adaptation suggests that adjustment costs are substantial and will increase with increases in the rate of adjustment. It is interesting that strategic planning in firms has historically entailed planning over a three-to-five-year time period (Jaques, Bygrave, and Lee, 2001), which may imply that such planning horizons are derived from adjustment costs rather than from socially constructed views of what "strategic plans" should look like. This three-to-five-year period for completing organizational change may also suggest limits on recent prescriptions to undertake frequent, rapid, and endemic change (Brown and Eisenhardt, 1997), at least as it applies to changes in organizational structure. Our key conclusion is that change in a transaction cost economizing direction is desirable, but managers must balance the benefits from the rate at which the organization changes against the costs of adjustment.

Several of our findings resonate with prior research in the organization theory literature. Carriers with higher profitability adapted more slowly and less completely than carriers with low profitability. These results are consistent with insights from the behavioral theory of the firm (March and Simon, 1993), in that successful performance appears to diminish the need (or desire) of a firm to pursue organizational change as assiduously as those firms whose performance is less satisfactory. Also, firms are slower to change the organization of their driver force when such changes will result in their looking less like nearby, similar firms in terms of their organization of drivers, which is consistent with institutional theory.

Consistent with ecological predictions, motor carriers that ultimately exited tended to undertake far more rapid change than firms that ultimately survived. This finding is consistent with recent research suggesting that the more an organization attempts to change during a given time period, the higher its risk of failure (Barnett and Freeman, 2001). It is also consistent with prior economic research on adjustment costs, which both assumes theoretically (Hause and Du Rietz, 1984) and typically finds empirically (Hammermesh, 1995) that adjustment costs increase exponentially as a function of the amount of adjustment attempted (Nickerson and Zenger, 2002). This does not imply that motor carriers would be better off undertaking no change, as firms that remain misaligned likely face reduced profitability, all else being equal. Rather, we interpret this result as additional evidence of the importance of adjustment costs as a constraint on the amount of organizational change that can be safely pursued during a given amount of time and the risk associated with pursuing "excessive" change in the face of such costs.

Although the exiter vs. survivor results are by no means definitive, they do suggest that from a carrier's perspective, a key managerial challenge is to choose an appropriate path of adaptation with respect to the firm's attributes. Adapting rapidly increases the risk that a firm will fail and thus exit the market. Adapting slowly or not at all leads to a risk of earning consistently low profits, which places pressure on managers to better align the organization of their drivers. Our paper suggests that understanding how carrier attributes affect the costs and risks of organizational adaptation is central to achieving long-run superior profits by navigating between exit and low profitability. Notably, exiters' rate of adaptation is significantly increased when such adaptation will allow them to look more like nearby, similar firms, while survivors' adaptation rate is unaffected by institution isomorphism. These results raise the possibility that firms that succumb to isomorphic pressure, and thus attempt to change more rapidly or more completely than they should, increase their risk of failure. Although this is admittedly highly speculative, it suggests a way in which institutional isomorphism may be detrimental to an organization.

The contributions of this study are threefold. First, it extends the literature on organizational adaptation and selection by theoretically grounding predictions of the direction and incidence of change. Second, it extends the transaction cost empirical literature by explicitly studying the dynamic performance consequences of both inappropriate governance itself and organizations' attempts to reduce this misalignment.

Although there is an extensive empirical literature that supports the structural regularities that transaction cost economics theory predicts (Shelanski and Klein, 1995), this literature has been virtually silent on the issue of the performance consequences of alignment (Silverman, 2002), so much so that some critics of transaction cost economics have charged that the lack of research on the performance-alignment relationship is a severe shortcoming of that literature (Winter, 1990; Gulati, 1999). Third, this study overcomes two drawbacks in the prior empirical literature on organizational change. Baum (1996) noted that most studies of change do not control for pre-change performance differences across organizations. To the extent that underperforming organizations are more likely to attempt change (Cyert and March, 1963), a relationship between change and poor post-change performance (i.e., failure) may result from spurious correlation. In addition, Barnett and Carroll (1995) noted that most studies of change do not control for the competition experienced by organizations, even though theoretical research on organizational change suggests that competitive pressure is an important stimulus to change (Hannan and Freeman, 1989). By controlling for both competition and pre-change performance, we were able to specify and test more precise models of organizational adaptation and selection than generally found in the literature.

In addition to using transaction cost economics to inform the literature on organizational change, this paper is among the first to extend our understanding of transaction cost economics by exploring the actions over time of inappropriately aligned organizations. Our finding that misaligned firms attempt to adapt toward the alignment prescribed by transaction cost economics complements the cross-sectional empirical transaction costs literature. In particular, it provides some evidence as to how the empirical regularities identified by cross-sectional studies arose in the first place. Heterogeneity in transaction alignment may be due to heterogeneity in path-dependent firm attributes that affect adjustment costs and hence constrain an organization's ability to keep all transactions in alignment at all times. These findings suggest that linking transaction cost economics and structural inertia theory potentially offers a more complete and predictive theory of environmentally induced organizational change than either literature alone. An important lesson of our paper is that far-sighted managers should consider an enlarged view of the costs and competencies of alternative organizational modes so as to incorporate in their organizational decisions the implications of adjustment costs associated with different organizational forms.

Why, and in what direction, do organizations change? Our theory provides a response that departs from extant approaches. Instead of either adaptationist or selectionist views, we argue that managers want to organize efficiently to realize survival and performance benefits from doing so but are constrained in their capacity to adapt because of adjustment costs. Whether firms adapt or are selected out depends on the adjustment costs associated with each firm. Our theory thus implies that viewing organizational change strictly through either an adaptationist or a selectionist lens is overly restrictive. Although our theory resonates with recent research that argues that some firms change under certain environmental conditions, our theory focuses on the heterogeneity of firms' adjustment costs rather than on variation in environmental conditions. More importantly, our research highlights the importance of understanding why and in what direction firms want to change; transaction cost economics provided the content predictions in our analysis. With few exceptions, such content predictions rarely appear in the literature on organizational change and are even more rarely linked to process-based predictions. Only by better understanding this linkage will we gain a more full understanding of why and in what direction organizations change.

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APPENDIX: Calculation of Residuals from Nickerson and Silverman (2003)

In a cross-sectional study of the U.S. interstate for-hire trucking industry, Nickerson and Silverman (2003) investigated whether transaction cost economics principles could explain the varied use of company drivers and owner-operators. They found that the more that motor carriers engaged in LTL carriage rather than TL carriage, the more they relied on company drivers rather than owner-operators. In addition, the more that carriers invested in firm-specific reputational capital, the more they relied on company drivers rather than owner-operators. Finally, carriers whose hauls were likely to require idiosyncratic vehicles (e.g., very light or very heavy hauls) tended to hire company drivers rather than owner-operators. According to Nickerson and Silverman, and as described in the body of this paper, these results are consistent with transaction cost predictions. Nickerson and Silverman tested their predictions by estimating the following model:

$$\begin{aligned}\text{Company Driver Miles}_i = {} & \beta_0 + \beta_1{*}\text{LTL Share}_i + \beta_2{*}\text{Advertising}_i + \\ & \beta_3{*}\text{Short Haul}_i + \beta_4{*}\text{Long Haul}_i + \\ & \beta_5{*}\text{Light Weight}_i + \beta_6{*}\text{Heavy Weight}_i + \\ & \beta_7{*}\text{Hauls}_i + \beta_8{*}\text{Union}_i + \beta_\Phi{*}\text{Freight}_{\iota\Phi} + \\ & \beta_\vartheta{*}\text{Region}_{\iota\vartheta} + \varepsilon_i.\end{aligned}$$

where the variables are defined as shown in table A.1. They also used an alternative dependent variable, *Company Trucks,* which was calculated as the proportion of a carrier's trucks and tractors that were company-owned as of the first day of business in 1991. Results were essentially equivalent for both dependent variables. Here we employ *Company Driver Miles,* because it is more consistent with our unit of analysis, which is the carrier-year.

The dependent variable of this model is a proportion. As such, it is bounded at 0 and 1, by definition, and nearly two-thirds of the observations in the sample are censored at either 0 or 1. To correct for censoring, Nickerson and Silverman (2003: 108) used a two-sided Tobit model to generate their results; in unreported models, they used grouped-data logistic analysis, with essentially identical results. The sign and significance of Nickerson and Silverman's results are presented in the fourth column of table A.1.

For the purposes of this study, the most important element in Nickerson and Silverman's model is the residual or error term, ε_i. Given the coefficients estimated for the above model, it is feasible to construct the residual for each carrier i in a given year. We interpret this as the degree to which carrier i's governance of its driver force deviates from the prescriptions of transaction cost economics. If transaction cost economics is correct in its prescriptions, and if the theory has any consequence, then we expect larger deviations to be associated with diminished performance. This approach is conceptually consistent with that of Anderson (1988), who investigated the performance consequence of deviations in firms' integration of their sales force from the level of integration predicted by transaction cost economics. Anderson found that deviation from the predicted level is negatively associated with efficiency in unpredictable selling environments, but not in predictable selling environments. In this study, then, we constructed an explanatory variable, Driver Misalign, which, following Anderson (1988), was operationalized as the

Table A.1

Variable Definitions

Variable	Definition	Predicted sign	Result
Company Driver Miles$_i$	Proportion of a carrier i's miles driven by company drivers in 1991.	NA*	NA*
LTL Share$_i$	Proportion of annual revenue received from LTL hauls for carrier i.	+	+
Advertising$_i$	Advertising expenditures as a percentage of total revenue for carrier i.	+	+
Haul Length$_i$	Average haul length for carrier i, in hundreds of miles.	NA†	NA†
Short Haul$_i$	Median Haul Length for sample minus Haul Length$_i$, if Haul Length$_i$ < median Haul Length, else 0. Reported in hundreds of miles.	+	N.S.
Long Haul$_i$	Haul Length$_i$ minus median Haul Length for sample, if Haul Length$_i$ > median Haul Length, else 0. Reported in hundreds of miles.	+	N.S.
Haul Weight$_i$	Average haul weight for carrier i, in tons.	NA†	NA†
Light Weight$_i$	Median Haul Weight for sample minus Haul Weight$_i$, if Haul Weight$_i$ < median Haul Weight, else 0. Reported in tons.	+	+
Heavy Weight$_i$	Haul Weight$_i$ minus median Haul Weight for sample, if Haul Weight$_i$ > median Haul Weight, else 0. Reported in tons.	+	+
Hauls$_i$	Total number of hauls by carrier i, divided by 100,000.		N.S.
Union$_i$	1 if carrier contributes to a union pension plan in 1991, else 0.		N.S.
Region#$_i$	A set of nine regional categorical variables.		Signif.
Freight#$_i$	A set of 17 freight categorical variables.		Signif.

***** Dependent variable.

† This variable is not included in the analysis. It was constructed to facilitate the construction of other explanatory variables: *Short Haul, Long Haul, Light Weight,* or *Heavy Weight.*

absolute value of the residual. Taking the absolute value of the residual implicitly assumes that overintegration and underintegration of the employment relation is equivalent. While this assumption greatly facilitated our analysis, we also explored this issue in our adaptation models.