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What Are Over-the-Road Truckers Paid For? Evidence from an Exogenous Regulatory Change on the Role of Social Comparisons and Work Organization in Wage Determination

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ABSTRACT

What Are Over-the-Road Truckers Paid For? Evidence from an Exogenous Regulatory Change on the Role of Social Comparisons and Work Organization in Wage Determination

Using evidence from recent work on truckers and disaggregated older data prior researchers did not have, we revisit a classic topic and find some new answers. We focus on differentials in average annual earnings at the firm level among mileage-paid over-the-road tractor-trailer drivers ("road drivers") employed by US for-hire trucking companies, before and after economic deregulation. Road driver output is individualized, and pay is on the basis of a piece rate (mileage). However, road drivers work under two distinct logistical systems – less-than-truckload [LTL], and truckload [TL] – associated with two different forms of work organization. We find that – contrary to the predictions of Rose (1987) – not only are road drivers for LTL companies paid more than those for TL companies, but in LTL the union earnings premium was maintained following deregulation and union coverage fell slowly, while in TL both the union differential and union coverage fell sharply. We review relevant theoretical explanations: payment for cognitive abilities or non-pecuniary disamenities; standard efficiency wage models based on independent utilities; sharing of product market rents; equity concerns resulting from social comparisons between employee groups; and differences in work organization as a source of union rents or quasi-rents. Only equity concerns, for the LTL earnings differential, and quasi rents (but not a union threat effect, contrary to Henrickson and Wilson (2008)), for union coverage and premium in LTL, are consistent with our empirical results. Both earnings differentials are based on differences in work organization, rather than differences in the workers or the work itself.

JEL Classification: J31, J42, L92

Keywords: fair wage, equity, compensating differential, cognitive ability, quasi-rent, rent-sharing, work organization, trucking, trucker, less-than-truckload (LTL), truckload (TL), regulation, deregulation, union premium

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1. Introduction[1]

In this paper we study the annual earnings of truck drivers who drive truck tractors pulling long semi-trailers—the "tractor-trailer" or "18-wheeler"—over medium to long distances in the continental US, and who are paid on the basis of mileage. We use earnings differences within this apparently homogeneous group of employees (known as "road drivers") to shed some light on theories of wage determination.

Our data come from reports filed by US trucking companies with the Interstate Commerce Commission (ICC) between 1977 and 1986. This period begins with the final two years of the federal regulatory regime, dating from 1935. Under this regime, entry to inter-city trucking was restricted: firms were granted the authority to haul particular commodities over particular inter-city routes, and the prices charged for freight services were controlled by "rate bureaus," which were essentially legally sanctioned cartels (Rothenberg 1994). The years immediately following deregulation (1979-86) are unique in that they saw the combination of intense competition with the continuation of a high level of compliance with the ICC's extensive public reporting requirements—hence our data, which is drawn from the ICC's "Form M" (for "motor carrier"). One feature of this data, unexploited in previous studies of driver pay, is that it reports the proportion of the company's shipments which are smaller, less-than-truckload (LTL) ones, as opposed to larger ones making up a full truckload (TL); differences on this dimension are associated with different internal firm logistics. A second feature of our data is that we have access to a breakout of earnings by employee type during this time period, unlike other investigators who have used similar information, and so are able to separate road drivers from others. We use these data to examine how the differences in the work organization of the relevant firms affect earnings.

Companies which haul a high proportion of LTL shipments (high LTL) tend to have a distinctly different pattern of work organization from those that are TL specialists because of the different logistical systems used. A high LTL carrier will operate a network of freight re-handling terminals; at each terminal small shipments picked up from customers within a certain geographical area are aggregated into full truckloads. These truckloads are then moved (by the

[1]We are grateful to seminar participants at Luiss University (Rome), Daniele Nosenzo, Mitch Hoffman, Eric Beshers, and Kristen Monaco for helpful comments, and Burks gratefully acknowledges the assistance of Tom Corsi and Ed Welkener in the original acquisition of different parts of the data utilized.

road drivers we study here) to other terminals of the same company, where they are broken down for delivery to customers in the areas served by the receiving terminals.

LTL specialists also employ local pickup-and-delivery drivers, who work in the vicinity of a particular terminal, and who generally drive smaller trucks; some have specialized dock workers. These employee groups (who are normally paid by the hour, instead of by the mile) are not our direct focus, but they turn out to play a central role in the organizational story developed below.

TL specialists, by contrast, have a simpler form of work organization: their primary business consists of hauling truckload-sized shipments between points for various customers. This is what almost all of their drivers, studied here, do on the job. Most TL specialists also haul some smaller (LTL) shipments, but do so to a limited extent as they do not have the benefit (nor the expense) of a network of terminals.[2] These organizational differences reflect the fact that it is not cost-minimizing to move high capacity vehicles over long distances partially loaded: LTL specialist firms have freight-handling terminals to make up (and break down) full loads, but firms which haul primarily TL shipments—which come as full loads—do not.

Most aspects of the jobs done by road drivers in TL and LTL firms are identical: tasks, skills required, licensing, insurability, monitoring, and the form of compensation. Yet there are significant differences in the pay of road drivers working for companies which are TL specialists and companies which are LTL specialists. Our aim here is to use what we know of the differences in work organization, together with data on the evolution of these pay differentials over the divide between regulated and deregulated eras, to shed some light on different theories of wage determination.

The balance of the paper is organized as follows. Section 2 reviews institutional changes in the trucking industry in the period studied, and the effect this had on work organization. Section 3 discusses theories of wage determination as they apply to the companies and drivers studied here. Section 4 presents the data. Regression specifications are discussed, and regression results presented, in Section 5. Section 6 concludes by discussing the implications of our findings.

[2] For instance, a TL specialist firm might accept a load with one or two small shipment drop-offs en route to the final destination, which could delivered by a single road driver. However, relatively few LTL shipments come with such pre-arranged "delivery density." Competing for more general LTL business between these points would require terminals near each city.

2. Work organization, market structure and regulation in the US trucking industry

We described above the two basic technologies, or overall ways of organizing production, in the long distance transportation of general commodities, truckload (TL), and less than truckload (LTL).[3] In the US trucking market today, most companies specialize in either TL or LTL (Burks, Belzer et al. 2010). However, this differs from the situation that prevailed when market entry and prices in for-hire trucking were regulated, as they were from 1935 until 1980. Under the Motor Carrier Act of 1935, market entry was sharply restricted, and rates were set by "rate bureaus" which were effectively state-sanctioned cartels (Moore 1978; Judiciary Committee 1980; Rothenberg 1994).

Market entry restrictions also shaped the organization of production within trucking firms. Because entry into most markets which already had incumbents was effectively blocked by ICC policies, the primary way firms could expand was by buying an authority from an existing firm; these in turn became scarce assets. Details are beyond the scope of this paper, and we will simply note that ICC policies made it far more difficult for TL specialists to expand by combining authorities than for LTL specialists (Rothenberg 1994). As a result, a much larger amount of full truckload freight was hauled by carriers that used the LTL-type organization of production, with local freight-handling terminals and fixed inter-terminal routes, than would have been optimal in the absence of these constraints.

When deregulation removed barriers to entry and route adjustments, and made individual pricing possible, the industry underwent a sharp restructuring (Perry 1986; Campbell 1987; Glaskowski 1990; Corsi and Stowers 1991; Burks 1999). Incumbent TL-type firms expanded, and thousands of new small TL firms entered. Without the overhead costs of a terminal system, and paying lower wages, these firms sharply cut the cost of TL transportation. Increased competition and lower costs were reflected in freight rates: Moore (1983) finds that TL rates fell 25%, LTL rates 11%, in real terms during only the first three years of deregulation. The average value of operating authorities traded fell correspondingly, from over a half million dollars each to the few thousands it now took to acquire one from scratch (Moore 1986).

The new TL segment took most of the truckload freight that firms using LTL type production had been hauling, and then began taking market share from both railroads and private carriage

[3] This omits the intercity parcel segment (e.g. UPS or FedEx Ground). See Burks, et al. (2010).

(Campbell 1987).[4] There was very little *de novo* entry into LTL, and that which occurred was at small geographic scope, but existing firms scrambled to rationalize and expand route structures (Moore 1986; Perry 1986), while coping with the loss of TL freight, and many incumbents failed. The result was a transformation of the technology mix, with the emergence of the focused specialization of individual carriers into TL and LTL types which is reflected in the way the North American Industrial Classification System (NAICS) categorizes trucking firms today (Burks, Monaco et al. 2004b; Burks, Belzer et al. 2010).

The market structures of the two segments that resulted from this transformation are quite different. Because of the lack of entry barriers, the TL segment is effectively perfectly competitive; a firm with a single truck can compete, on a trip-by-trip basis with the largest TL carrier. Returns to scale are essentially constant (Grimm, Corsi et al. 1989), and size provides few non-cost advantages. While a large TL firm can provide coordination among multiple trips that a small one cannot, this function is also available through the market from third party logistics (3PL) firms, who subcontract individual trips to small fleets (Burks, Belzer et al. 2010). According to the 1997 quinquennial Economic Census, the first to directly categorize firms into these two segments, the long distance general freight TL segment contained 20,061 firms, more than half of which had 9 or fewer employees. The most telling fact is that the biggest firms had a very modest share of the market: the 4-firm and 8-firm concentrations ratios were, respectively, 11.4% and 15.9% (US Census Bureau 1997a).

By contrast, there are entry barriers to the LTL segment. Substantial sunk costs are required to establish sufficient shipment flow density over new links in the terminal network to make average shipment costs competitive (which is why there was little *de novo* entry in LTL after deregulation). In 1997 there were 2,413 firms in this segment, or one-tenth as many in TL. Only 60 LTL firms had 10 or more establishments in 1997. Since an inter-city LTL firm with a small to medium terminal network can serve only the specific geographic region defined by the network, for the most part it competes directly only with other firms serving the same region (Corsi, Grimm et al. 1992; Burks, Belzer et al. 2010). Thus, 1997 national 4-firm and 8-firm concentration ratios in LTL that were qualitatively higher than those for TL, at 39.3% and

[4] Private carriage is the transportation of freight that is owned by the firm doing the hauling, e.g. when a truck owed by Wal-Mart hauls goods from a Wal-Mart warehouse to a Wal-Mart store. Private carriers produce about half of U.S. trucking services (Burks, Monaco et al. 2004a).

57.9%, respectively (US Census Bureau 1997b), actually understate the effective concentration of the LTL segment. The highly competitive structure of the TL market appears to offer little scope for product market rents, while the more concentrated structure and higher sunk costs of entry could theoretically produce such rents in LTL. However, the only direct test of market power found no evidence that LTL firms have any (Nebesky, McMullen et al. 1995), suggesting that if such rents exist, they can't be very large. In the absence of market power, the sunk cost in organization and facilities represented by the terminal network, and the near absence of *de novo* entry, suggest Marshallian quasi-rents, a point we will return to below in Section 3.3.2.

3. Driving work and theories of wage determination

How can we explain differences in mileage pay rates, leading to differences in earnings, between the TL and LTL road drivers? The available answers fall into five classes: a) compensating differentials, due to differences in non-pecuniary amenities and disamenities; b) differences in the intensity of job demands, providing a return to worker quality in the form of cognitive ability; c) different reference points for what is perceived as a fair wage; d) differences in the structural affinity for unionization, which could affect the ability of the union to enforce rent- or quasi-rent sharing; or differences in the sharing of product-market rents with employees more generally.

3.1. Compensating Differentials

Most road drivers face significant non-pecuniary disamenities on the job. The typical weekly hours are long: as are all other workers engaged in interstate transportation, road drivers are exempt from the Fair Labor Standards Act and do not earn overtime rates, the Hours of Service regulations permit up to 60 hours per seven-day week (Federal Motor Carrier Safety Administration 2011), and the piece rate pay system incentivizes high miles and hence long hours. In addition, the time of day each tour of duty begins can vary over the work week, depending on the needs of shippers and receivers; since road drivers travel relatively long distances, they are often uncertain about when they will return home, and often spend significantly less time at home than workers in other blue collar jobs (Belzer 1995; Burks, Belzer et al. 2010).

Viewed across TL versus LTL specialist firms, these disamenities are far greater in the TL segment (Burks, Belzer et al. 2010). This is due to differences between the logistical systems of the two types of operation. LTL road drivers move primarily between the firm's own terminals; this makes the number of origins and destinations limited, reducing the uncertainty about routes and work weeks and permitting drivers more and more regular time at home. Further, TL road drivers frequently have to supervise loading or unloading to verify that door seals are unbroken or that piece counts are correct, and for freight that can be handled, when customers require it they must physically load or unload the freight on their trailers; these activities are much rarer for LTL road drivers, since origins and terminations of their runs are at the firm's own terminals, at which local employees do most freight handling work. The differential rates of turnover in TL and LTL firms (see section 3.3, below), are strong evidence in this regard. Thus, if there are compensating differentials they should increase earnings in TL firms.

3.2. Cognitive ability

There is good reason to believe that the typical TL job is more cognitively demanding than the typical LTL one. Because LTL drivers move primarily between their firm's own terminals, they face a restricted set of origins, destinations, and routes. But TL drivers serve a much more varied set of shipper and receiver locations, spread as far as all the way across the 48 states of the continental US. For each load they must select and travel over routes hundreds or thousands of miles long subject to potentially conflicting constraints that include shipper and consignee day and time requirements at the endpoints, a limited set of available fuel stops, possible restrictions on toll road use, weight limits and overhead height limits that block particular bridges or highway segments, congestion and weather conditions which can change over the course of a trip (the latter especially important during winter), and daily and weekly limitations on driving and total work hours from the Hours of Service regulations. The sequential nature of trips means that small errors or delays early in a dispatch sequence can strongly affect total miles per week, as the loads available for later trip segments may depend on the timeliness with which earlier ones are completed. With pay based on a predetermined road distance between points the driver's effective hourly wage depends on solving this ongoing two-to-three day planning puzzle well.[5]

[5] For a successful versus an unsuccessful TL driver see Di Salvatore's (1988) description.

Burks et al. (2009) study 1,065 new TL road drivers during their initial training, in a context in which completion of a year of employment after training cancels the several-thousand-dollar training debt. They find that among all the *ex ante* characteristics they measured, the strongest predictors of completing the debt-cancellation period are measures of cognitive ability (nonverbal IQ, numeracy, and a planning ability measure, with the last of these being the most predictive). The differences are large: the retention of the top quintile by nonverbal IQ was twice that of the lowest quintile. Since it is unlikely that lower IQ is correlated with better fallback options, this suggests that variations in cognitive skills within the population of prospective drivers are an important determinant of successful matching with a TL job (Burks 2009). This may also be true for LTL road drivers, but for the reasons discussed above the effect should be stronger in TL; if there is a premium paid for scarce cognitive skills it should raise earnings in of TL drivers relative to LTL drivers.

3.3. Rents and rent sharing

Differentials may also be the consequence of drivers' sharing product market rents captured by their employers, or through cost-minimizing rents in the form of efficiency wages; we consider both below. But first we note that rents, from whatever source, imply job queues (Katz and Summers 1989; Holzer, Katz et al. 1991; Dickens and Lang 1993). The TL segment, in the fully competitive form that emerged in the 1980's, not only has no queues, but has driver turnover rates that are extremely high during non-recession periods. The emergence of a "driver shortage" was widely noted in the trade press soon after the economy recovered from the 1981-82 recession (Lemay and Taylor 1988; Southern, Rakowski et al. 1989; Glaskowski 1990). The American Trucking Associations began surveying its member firms quarterly in the late 1990's, and during periods of economic growth mean turnover rates for large TL carriers have persistently been on the order of 100%-140%, with LTL firms having rates on the order of 5% - 20% (Economic and Statistics Group 2007; Watson 2009; Burks, Belzer et al. 2010). That is, TL firms have annualized turnover rates two to three times the 35% that is typical for transportation and warehousing as a whole (SHRM 2008), while LTL firms have half this rate. Thus, we can rule out *any* significant labor rents at the margin in the TL segment following deregulation.

3.3.1. Efficiency wages, fair wage reference points and internal equity

When information about effort is asymmetric, and the employer's measures of both output and effort are noisy or costly, the employer may not be able to directly contract for either effort or output. This leads to efficiency wages, in which is profit maximizing for the employer to pay more than the employee's next best option in order to incentivize effort.

However, road driving work provides individualized outputs that are measurable. Despite the sometimes hard-to-monitor inputs (the sequence of judgments to be made and effort at multiple tasks; see section 3.2), at the end of the run one driver has moved a rig over the road from point A to point B safely and on time (or not). For this reason it is possible to pay road drivers on piece rate—by the mile, for the standard number of miles attached to each specific trip segment—and in so doing align driver incentives with firm objectives, to a good first approximation.[6] Thus, in a world of independent utility functions, there is little scope for efficiency wages in road driving; this applies both to standard labor discipline models (Shapiro and Stiglitz 1984; Bowles 1985; Gintis and Ishikawa 1987), and to simple reciprocity or "gift-exchange" models (Akerlof 1982; Fehr, Kirchsteiger et al. 1993).

However, the possibility remains that workers may withhold effort if they do not perceive their wage to be fair by comparison with relevant reference workers (Frank 1985; Akerlof and Yellen 1990; Fehr, Gachter et al. 1997; Fehr, Götte et al. 2009; Gächter and Thöni 2010). The literature suggests that the most relevant reference groups are composed of co-workers within the same firm, especially when those making the comparisons have some knowledge of their co-workers' circumstances and pay (Bewley 1999; Falk and Knell 2004; Clark and Senik 2006). Fairness generally requires similar pay for similar workers doing similar work, but pay differences may be seen as justified when they reflect differences in circumstances or merit (Adams 1966; Konow 2003). How might this be relevant to difference in road driver pay between TL and LTL firms?

Except for driver teams (which generally receive similar pay rates unless one driver is a trainee) road drivers work alone. TL drivers have less contact with other employees than do LTL

[6] Thus, mileage pay is more correctly called "pay per trip." Most firms also provide secondary incentives for fuel economy or safe driving, but these are small in comparison to the base rate, and often take the form of an *ex post* addition to the mileage rate, not a lump sum.

drivers. Due to the differences in route variety and length described above (section 3.2), even though they have a specific home terminal, TL drivers start from that point and return to it only when they are due time off, which could be every few days but more commonly would be every two to three weeks. They have little or no regular workplace interaction with anyone at their home terminal other than their dispatchers and/or supervisors, and sometimes with the mechanics who repair their tractors. Thus, there is little scope for relevant pay comparisons.

In LTL firms, however, the firms' terminals host stable work groups of city pickup and delivery (P&D) drivers, and in fact such drivers are usually larger in number than road drivers. P&D drivers might naturally form part of the road drivers' reference group. P&D drivers are not on piece rates, but are generally paid by the hour, and at an hourly rate that generates earnings above those of the typical blue collar worker, and job queues (Burks 1998; Burks 1999). The outputs of P&D drivers, who handle many distinct small shipments during each shift, are not transparent in the same way the outputs of road drivers are, and given their relatively high earnings, this suggests that efficiency wages may be in play.[7] However, for present purposes what matters is not why P&D drivers have high earnings, but rather that they have high earnings and also form a relevant reference group for road drivers in the same firm. If social comparisons were irrelevant and there were any reason to pay P&D drivers more, LTL firms could just use a two-tier system and pay road drivers less. But if social comparisons are relevant, since road drivers historically have a higher status position than P&D drivers (they operate the largest tractor-trailers an LTL firm has, and do less handling of freight (Levinson 1980; Perry 1986)), this may be precluded (Akerlof and Yellen 1990; Fehr and Kirchsteiger 1994; Gächter and Thöni 2010). Thus, if equity rents are involved in road driver pay, they should be higher in LTL firms.

3.3.2. Product market rents, quasi-rents and the union premium

Rent sharing is the appropriation, by employees, of some portion of a firm's rents or quasi-rents. Rent-sharing is assumed to occur because employees have some measure of bargaining power. Between 1935 and 1980 the regulatory system created rents at the industry level, and rent-sharing also operated at that level: the International Brotherhood of Teamsters (IBT) came to represent most of the drivers in for-hire trucking; wages were determined through industry-wide wage agreements (the National Master Freight Agreement, or NMFA, plus various

[7] An argument to this effect is offered by Burks (1999).

supplementary agreements for specialized areas of trucking (Levinson 1980; Perry 1986; Belzer 1994)). There is no reason to expect any relationship between wages and profitability within the set of firms covered by the NMFA under regulation, while between union firms and non-union firms we would expect the former to be less profitable unless we believed both that the unionization process tended to occur in more profitable firms in the industry, and that post-unionization wage increases did not exhaust or exceed the above-average profits.

Deregulation was an exogenous shock to the product and labor markets in for-hire trucking, a shock which was moderated by the differing market structures of the TL and LTL segments, and the differing nature of union power under the two forms of work organization implied by the two distinct logistical systems. We consider the case of the LTL segment first.

Barriers to entry in LTL grow from the need to achieve flow density over network nodes (section 2, above). The nature of this sunk cost means that it is very expensive to enter with a big network; the only firm that tried it, Leaseway Express, started up in 1982 and failed within two years (Wong 2001). A less risky strategy was to extend an existing network at its boundaries. Almost every incumbent firm tried this strategy, as they expanded beyond the restricted networks bequeathed by regulation (section 2). The few successful cases of *de novo* entry began with very limited geographic scope; two noteworthy examples were Arkansas Freightways, and Con-Way Central Express.

The union did not have an effective response to the changes brought by deregulation, and devoted almost no resources to trying to newly organize non-union firms and was ineffective with those it did devote (Belzer and Hurd 1999). But though union coverage in LTL declined steadily with the successive failure of unionized LTL firms and the more rapid growth of non-union ones, the union was not driven out of the LTL segment (Perry 1986; Glaskowski 1990; Belzer 1994; Belzer 1995; Belzer 2002).

This is because of the same organizational fact that underlies the potential equity premium for LTL road drivers discussed above (section 3.3.1): the role of local employees. In the integrated and complex logistical system used to handle LTL shipments in a terminal network much of the knowledge needed for cost-competitive operations resides in the tacit knowledge of individual employees, especially local freight handlers and local pickup and delivery drivers (Swan 1997; Burks 1999). This makes breaking the union prohibitively costly in LTL; to shut down and reopen with only those employees willing to work non-union at lower wages would

lose too much critical knowledge, and using a strike or lockout to remove union representation risks negative reciprocity from employees whose on-the-job behavior is critical to productivity and customer satisfaction (Fehr, Götte et al. 2009) (see, for example, the case of tire manufacturing (Krueger and Mas 2004)).

In sum, due to the key organizational role of local employees in LTL, the union had asymmetric power: it offered no credible threat of further unionization, but it could force unionized firms to share the quasi-rents resulting from the sunk costs of being in the LTL business and having invested in the tacit knowledge of their employees. Union firms that survived were likely to be those which focused on the economical use of higher cost but low turnover and highly experienced labor.[8] Meanwhile non-union firms grew far more rapidly—of the two small entrants mentioned above, one, Arkansas Freightways eventually grew to become the core of FedEx Freight (FedEx's division in the LTL segment), while the second (Con-Way Central Express) ultimately became Con-Way Freight, the largest LTL firm in the nation (Transport Topics 2011).

In the perfectly competitive TL segment, by contrast with LTL, entry was rapid, with thousands of new firms, mostly small (section 2, above), and the expansion of the industry had an immediate and strong downward effect on freight rates (Moore 1986). The effect on TL unionization was even more dramatic: union coverage and driver wages dropped sharply. Based on survey evidence Belzer (1994) argues that by 1991 union coverage was only 25%, less than half its former level, and that the implied average hourly wage in TL (union and non-union combined) was only 73% of that in LTL.

The organizational reason for these declines is straightforward: TL's simpler logistical system uses only road drivers. By comparison with local LTL employees, road drivers have less specialized tacit knowledge and less need for effectively coordinating their work effort with other employees, and are therefore more easily replaceable. Thus, a TL firm could close and restart under a new operating authority, taking none of the prior employees, or only those who were willing to work under the new conditions, without losing much productivity. It was also

[8] Thus, for instance, it is common for non-union LTL dockworkers to clean their dock area, but at unionized LTL firms dockworkers seldom clean; if contract cleaners (at lower wages) are prohibited by the local union the dock just stays dirty (Burks 1998).

more feasible than in LTL to break the union and operate with only those members of the existing work force willing to stay.

There is substantial evidence that union TL firms behaved differently than LTL ones in the manner these facts suggest. While literally hundreds of incumbent unionized LTL firms failed after 1980, the most aggressive action most took was to ask the union to bargain wage and benefit concessions (Belzer 1995). By contrast, while many of the unionized TL firms under the main Midwestern TL rider to the NMFA agreed to a new contract through their employer's association after a strike in 1979, many individual firms simply never signed the contract while continuing to operate, and there was little response from the union (Belzer 1994). A TL exception was Schneider Transport, which was signed to a contract rider more important to the union because it covered mostly LTL firms; even there, after two difficult strikes, the firm won the right to make all expansion through its new non-union arm, Schneider National, which grew eventually to became second largest firm in for-hire TL (Belzer 1994; Transport Topics 2011).

The trajectory of the union premium is contested. Rose (1987) and Hirsch (1988), using CPS data, both find that the union wage premium for drivers declined following deregulation, although this may be confounded by a change in the CPS treatment of non-responses in 1979 (Henrickson and Wilson 2008). The CPS lumps all for-hire firms together, but on the basis of her earlier finding (Rose 1985), Rose infers the largest drop should be in LTL. Henrickson and Wilson(2008), using Form M data, find an increase in the premium for employees of unionized trucking companies following deregulation. However, they use a version of Form M with two significant problems: later data definitions are imposed on earlier data (see section 4.1, below); and the average earnings of all employees (including white collar and managerial employees) are used as a proxy for driver earnings; in addition, they do not use the LTL versus TL distinction (and had they done so it is coded in a more limited way in the later years of their panel). They posit a union threat effect to explain the apparent increase in the premium. We will address both the Rose and Henrickson and Wilson accounts below (sections 5 and 6).

3.4. Summary of predicted effects

Based on the discussion above we now have the following list of predicted effects for the potentially relevant causal factors affecting the pay of road drivers.

Factor	Effect on road drivers
Compensating differentials	Higher pay in TL, both union and non-union
Returns to cognitive skills	Higher pay in TL, both union and non-union
Efficiency wages–assuming independent utilities	Unlikely to matter, but if this factor is relevant: no difference in the effect on pay by segment
Efficiency wages–perceptions of fairness with respect to relevant reference group	Higher pay in LTL, both union and non-union
Post-regulation change in union coverage	Decline of union coverage, but less rapidly in LTL because of quasi rents there
Post-regulation change in union premium	Same pattern as coverage for the same reason: decline overall, but less rapidly in LTL

4. Data

4.1. The Source: the ICC's "Form M"

We use data from the Interstate Commerce Commission's "Form M". Our version of this data set is unique providing a breakdown of employee earnings by category for this time period, thus allowing us to examine the influence of carrier financial performance, size, shipment-size (LTL versus TL) specialization, and unionization, on the pay of specific employee groups.[9]

During the years 1935-1980 the ICC required all trucking firms engaged in interstate freight transport (whether publicly or privately held) to file an annual report (Form M) for regulatory oversight purposes, and the contents of these reports were a matter of public record. Data originating from these forms are a unique panel data source on the operations and finances of a key set of firms in the trucking industry.

The requirement to report outlived regulation, but in the absence of regulation compliance—and hence, data quality—declined. The annual information from the paper Form M's was keypunched both by the ATA, which gave the data set its most commonly used name, the "Motor Carrier Financial and Operating Statistics (MCF&OS)," and by the ICC. Most scholars use the ATA version, which is available for more years and had better quality control over the keypunching process, but which omits some information. The ICC's version of the Form M electronic data set, which was more complete, albeit with lower quality control, vanished when the agency was "sun-setted" in 1995. But before that happened, one of us (Burks) obtained an extract from it which includes the breakouts of employee earnings and hours by employee category for 1977-1987, items which are missing from the ATA's version until 1988. We have

[9] In Burks, et al. (2004) these data are used to address the effects of deregulation on the compensation of trucking firm executives.

merged this extract with the more standard version of the Form M information from the ATA, which includes a large subset of the other data items of interest, but which contained only the total number of employees and their total annual earnings.

There are two main limitations to data originating in the Form M. First, there was a size threshold below which reporting was not required (annual revenues for three successive years of $.5 million per year until this level was raised to $1 million in 1980), so there is no information on small incumbents, and also none on most of the new post-regulation entrants in TL, who generally were too small to meet the reporting requirement initially. Second, the ICC relied on voluntary compliance; once the economic regulations that made it in the interest of firms to report were lifted, this became less effective. Many of the new TL entrants either did not know of the reporting threshold, or simply ignored it, when they became large enough to cross it. In addition, a few (mostly TL) incumbents that had been reporting began to withdraw from doing so towards the end of the 1980's.

As a result, up to the dawn of deregulation, the data set gives an excellent picture of the entire population of medium and large-sized incumbents. It also provides a good picture of the attrition and transformation of those incumbents under the impact of deregulation, especially in the earlier years of the process. However, it tells us very little about the new firms that entered the industry at small scale (although it does capture some that entered at larger scale). And its reliability as a picture of the overall population of medium and large firms slowly decreases with time.[10]

We use the years 1977 through 1986. This is a period in which the reporting form and the data definitions were kept constant and reporting compliance remained high (thus avoiding the problems faced by Henrickson and Wilson (2008)), and also allows us to compare our results with those of Hirsch (1988) and Rose (1987), who study the earnings of drivers in this same period using CPS data. We stop in 1986 rather than 1987 (the year before the first large reduction in the reporting format and corresponding change in variable definitions) because the latter year saw a sharp decrease in the number of firms for which the ICC entered the employee earnings information; a similar omission occurs in the 1981 data, but we correct for this problem by interpolating between 1980 and 1982 for those firms that appear in both years.

[10] In addition, the reporting requirements were downsized, changing the definitions of important variables in 1988 (and then again in 1994 and 1999), limiting accurate comparisons over time.

The quality control limitations on all the electronic data from the Form M, but especially keypunch and processing omissions and errors in the ICC's version, make extensive data cleaning efforts (such as the interpolation just mentioned) necessary before the data can be considered reliable. Fortunately, some systematic redundancies in the variable definitions (which are greatest in the version collected through 1987), plus the panel nature of the data set, make it possible to correct many, perhaps even most, of the errors.

4.2. Observations and Variables Used

The entire data set contains observations on firms of many types, including local and special commodity haulers. We restrict our attention to those meeting the definition of the ICC's "Instruction 27," which applies to firms obtaining at least 75% of their revenues from the intercity common carriage of general commodities (CFR 1992). We use this subset because we are interested in long distance freight transport, and in firms that use general purpose equipment and therefore compete directly with each other.

Under economic regulation common carriers were required to publish their rates through rate bureaus, and to offer their services at those rates to all customers; firms in the contrasting category, contract carriers, were permitted to have individualized and confidential contracts with shippers, but were limited to eight customers in total, and no firm could offer both types of pricing and service. Deregulation abolished the limitation on the total number of contract customers for contract carriers. Also, all firms could easily obtain both types of authority, and nearly all did so: thus, many of the "new" entrants in the Instruction 27 dataset after 1980 are actually contract carriers that acquired common carrier authority and began to compete more widely for customers. Thus, the Instruction 27 subset captures the relevant set of firms—those that competed with each other to serve the general shipping public—across the regulation/deregulation divide.

The 1977-1986 Form M (in our version, which includes the break out of earnings by employee category) uses two categories for employee drivers, line-haul (over-the-road) drivers that are paid on a mileage basis, and employee drivers who are paid on some other basis. The latter heading lumps together two disparate categories: the larger of these consists of local, or city pickup-and-delivery, drivers, who are generally paid by the hour; the smaller consists of road drivers who are paid a percentage of the revenue generated by each load they transport.

Since we do not know the mix of these two types, either overall or for any particular observation, we focus our study on mileage-paid line-haul drivers.

Form M requires the firm to report the number of line-haul drivers employed, and the total compensation paid to line-haul drivers in the year. We divide total compensation by number employed to obtain average annual road driver earnings. For estimation purposes, we use natural log of the real (1982-84) dollars (**EARNINGS**).

Among the Instruction 27 carriers, some do not employ mileage-paid road drivers (those which do not generally rely on owner-operators for truckload haulage). Restricting our sample to firms which do, and deleting observations with obvious data problems, we have 2,191 observations on 462 firms, an average of 4.7 per firm, from 1977 to 1986.

Form M does not tell us whether or not a firm's drivers are represented by a union; in the vintage used here it does, however, tell us the proportion of total firm expenses for employee health care and retirement that goes to union-affiliated health and welfare funds. Since most firms in the industry are essentially either union or non-union where drivers are concerned and drivers make up a large share of their workforce, this measure is bi-modally distributed. For estimation purposes, we create a binary variable, **UNION**, where UNION = 1 when the union-affiliated fund proportion is greater than 0.35. This cut-off may seem low, but Belzer's (1995) survey finds that within the small number of partially-union trucking firms, non-union and union drivers wages differ little – a fact that he attributes to a union threat effect within such firms (distinct from a threat across firms, discussed in section 3.3.2). While the precise level of any cut-off is arbitrary, we believe that for this reason a relatively low cutoff is reasonable.

With the 0.35 cut-off, 435 of the 462 firms in our sample keep the same union status for all observations in our dataset. This poses a practical problem for panel estimation, because UNION is nominally time-varying but only superficially so: a fixed effects estimate of a union wage effect, for instance, would rest entirely on the internal ("within") variation in 27 of the 462 firms. We also doubt that these 27 give an accurate or representative measure of firms that switched in union status (meaning, in practice, from union to non-union): at least some other firms made this switch by shutting down, and then re-opening with the same ownership but a new name and new ICC registration number, but any such cases in our data set are recorded as two separate firms. To resolve both of these concerns, we treat each firm that switches between union and non-union as two different firms for estimation purposes.

Form M treats any shipment of over 10,000 lbs. as "truckload" and anything below that as "less than truckload." The exact location of the division is to some degree arbitrary, especially as the maximum cargo weight for a full truckload shipment approximately doubled between the 1930's, when this number was selected, and the period studied here. However, as long as the division is made consistently, and at a level above the average weight of an LTL shipment at firms that are highly LTL-specialized (which is about 1,000 lbs. in our data), it is a useful measure. The variable **LTLShare** is the proportion of the firm's total operating revenue which is generated by LTL shipments; the balance is due to TL shipments.

Our measure of firm size is the natural log of real total operating revenue (**REVENUE**). The Form M data includes balance sheet information from which it would in principle be possible to construct a measure of current return on either equity or on total capital employed. However, a large percentage of our firms are privately and closely held, and case study work on the industry suggests that tax considerations, unchecked by the public reporting requirements for stock exchange listing, affect the asset values reported to the ICC by firms of this type (Burks 1998). As a measure of financial performance (and, implicitly, of product market rents) we use the ratio of operating profit (before interest payments and income taxes) to total operating revenues, labeled **MARGIN** in the models below.

Table 1 shows descriptive statistics for the variables used. These are decomposed into within-firm and between-firm elements.

###Table 1 about here###

The number of firms in the sample, and the number of road drivers employed by these firms, both decline over time. This is not surprising considering the combination of the entry of small truckload firms falling below the ICC's reporting threshold, reduced compliance with the reporting requirement, and increased productivity in the deregulated, de-unionizing market. Considering the discussion in section 3.3.2, note in particular the decline in unionized firms; union decline occurs both the TL and the LTL segment, but in the TL segment it leaves very few unionized firms by the mid -1980s (Figure 2).

###Figure 2 about here###

5. The empirical model, and estimation results

The model we wish to estimate takes the general form:

(1) $\text{DRIVER}_{i,t} = f(\text{LTLSHARE}_{i,t}, \text{LTLSHARE}^2_{i,t}, \text{UNION}_i, \text{REVENUE}_{i,t}, \text{MARGIN}_{i,t}, \text{YEAR DUMMIES}, \text{INTERACTION TERMS}, \alpha_i + \varepsilon_{i,t})$

We have unbalanced panel data, with panels ranging from one to ten observations and a mean of 4.7 observations. The longer panels (8-10 years) account for a little over half of the observations; these are firms that tend to be larger, and which are predominantly LTL specialists; the firms in the short-panel population are smaller on average, and are more heterogeneous (Table 2). We could get something close to a balanced panel by restricting our sample to the firms with 8-10 years of observations only, but this would come at the cost of restricting ourselves to an unrepresentative sub-sample with relatively little variation in **LTLSHARE**, one of the principal variables of interest.

###Table 2 about here###

We cannot use a fixed effects estimator because one of our variables of interest (**UNION**) is time-invariant; even if this were not an obstacle, the number of very short panels would exacerbate that estimator's problems of inefficiency and errors-in-variables bias (Hausman and Taylor 1981). Use of a random effects estimator, however, raises the question of correlation between the individual effects and the group means. The standard Hausman test for this problem would require fixed effects estimates, which we don't have; even if we did, the test is not valid with time dummies in the model (Imbens and Wooldridge 2007).

Following Imbens and Wooldridge, we use instead an approach based on Mundlak (1978): we first add to the model the group (i.e., firm) means for each time-varying variable, and obtain GLS (random effects) estimates. Including the firm mean for a variable takes out the "between" effect, so that the coefficients on the individual variables are the same as those produced using the within, or fixed-effects, estimator. The test for then using the GLS estimator *without* some or all of the group means is then simply a chi-square test of the restriction that the coefficients are jointly zero on those group means that would be excluded. The inclusion or exclusion of group means is not an all-or-nothing choice: just as we retain the time-invariant **UNION**, we may choose to retain one or more group means if our tests reject the null hypothesis that they are uncorrelated with the individual effect.

Model 1, is the most general, containing interaction terms of **LTLSHARE** and its square with **UNION**, and with a dummy for **REGULATED** (1977-1978) versus deregulated (1979-1986)[11]; firm means are also included for all variables. The restriction that all of the coefficients on the group means are zero is not rejected (Table 4). We see no significant effect of **MARGIN** on earnings in Model 1, whether in the within- or the between effect. The absence of any statistically significant effect continues when we drop either the individual observations or the group means for **MARGIN** (Table 4). (Similarly, there is no statistically significant effect of margin within subgroups defined by interactions with **UNION**, **LTLSHARE**, and **REGULATED;** details are not reported here, but are in an appendix available from the authors.) The coefficient on **REVENUE** is a firm size effect, and as expected is positive.

Table 3 about here

Table 4 about here

Model 2 reports estimates with the group means removed. It still includes a full set of interactions between **LTLSHARE**, **UNION**, and **REGULATED**, allowing us to get separate estimates for the effect of **LTLSHARE** (in quadratic form) on earnings in four different regimes (union-regulated, non-union- regulated, union-de-regulated, non-union-de-regulated). The only statistically significant coefficients are for the first of these four cases (regulated union). A zero restriction on the interactions which distinguish between the other three categories is not rejected; if we go back to Model 1, and combine these new restrictions with the previous restrictions that got us from Model 1 to Model 2, we still fail to reject this larger set of restrictions. Incorporating the new restrictions, we obtain Model 3.

Figure 3 shows the marginal effect, from Model 3, of **LTLSHARE** on earnings for the union-regulated case, and for the other three cases (called here the general case). We see no statistically significant effect of **LTLSHARE** on earnings for union drivers under regulation, while in the general case the marginal effect of increased **LTLSHARE** is positive until **LTLSHARE** reaches 0.8,

[11] Consistent with most of the literature, we treat 1978 as the last year of regulation. It is not obvious that this is the correct approach: the onset of de-regulation was much discussed, and thus presumably had some effect on markets in previous years; it was not in fact a single event; and, after it had occurred, it may have taken some time for its effects on union power, employment relationships, market structure and the organization of production to work themselves out. We tested this by replacing **REGULATED** with year dummies in the key interactions, and find that there is indeed a step change in the union premium between 1978 and 1979. Details are in an appendix available from the authors.

which is roughly the 75th percentile of the **LTLSHARE** distribution in the data. Beyond this the point estimate of the effect is negative, but small in size and statistically insignificant. Figure 4 shows the fitted earnings estimates, for road drivers, union and non-union, as functions of **LTLSHARE**, for the years 1978 and 1984; 1978, of course, is regulated, and 1984 is de-regulated; the **REVENUE** variables are held at their sample means. The vertical distance between the curves in each panel represents the union premium. From Figure 4, we can see that the fall in the premium following deregulation (the positive coefficient on **UNION*REGULATED** in Model 3) is due largely to a deterioration of the relative position of unionized drivers in truckload firms.

Figure 3 about here

Figure 4 about here

Model 4 estimates of the effect of **UNION** on driver's earnings, without **LTLSHARE**, to ask a question that parallels that of Henrickson and Wilson (2008) with our model, but focusing on road driver earninings. We interact the **UNION** dummy with one for **REGULATED** (1977-1978; **REGULATED** does not appear on its own, as it is colinear with the year dummies). The coefficient on **UNION*REGULATED** is negative: that is, if we omit **LTLSHARE,** the estimated union premium rises following degregulation, consistent with the finding of Henrickson and Wilson. Omiting **LTLSHARE** has this effect because, following deregulation, the lower-paid TL segment becomes predominantly non-union, while the union holds on, despite a declining share, in LTL.

Figure 5 shows the difference in the union premium, across the range of values of **LTLSHARE,** between 1978 and 1984: the union premium does fall sharply in TL companies, but holds up in LTL companies.

###Figure 5 about here###

6. Discussion and conclusion

Using data disaggregated by employee group that was not available to prior researchers, we find that—except in unionized companies under regulation—road drivers are paid more in companies with higher proportions of their business in LTL: this holds for union drivers post-regulation, and for non-union drivers both in both regulated and de-regulated settings. We therefore take an LTL earnings premium to be the prevaling circumstance in competitive labor and product markets; the lack of such a premium for unionized drivers under regulation is

attributable to the IBT's ability, through the NMFA, to enforce industry-wide near-uniformity in the earnings of unionized road drivers across the LTL and TL segments.

Unionized road drivers are also paid a premium throughout the period studied, and our disaggretated data also allow a new look at this fact. Under regulation, this premium was greater for TL road drivers, but that is just another way of saying that the NMFA did not differentiate between road drivers in TL and LTL. After de-regulation, the union premium for TL and LTL road drivers become comparable; in both TL and LTL, the union share of employment shrinks, but it shrinks far more rapidly in TL. As shown by the test in Section 5, the post-regulation rise in the union premium found by Henrickson and Wilson is spurious, due to an un-modelled composition effect: the rapid de-unionization of the lower-paid TL firms (where the union premium actually declined), and the continued union presence in the relatively well-paid LTL firms.

The lower road driver earnings in TL come despite what appear to be greater cognitive demands of work in that segment of the industry, and also despite working conditions which should, if anything, bring forth higher compensating differentials. Road driving in both TL and LTL segments is easily monitored, for which reason we rule out standard efficiency wage arguments in both segments (in the TL segment, the extremely high turnover also rules this out). In both segments, drivers' earnings are independent of the firm's operating margins in comparable firms, whether measured by the firm's mean performance or its deviation from that performance, and—given the argument of Section 3.3.2 that after deregulation any sharing would be firm-specific—we rule out sharing of product market rents.

The LTL premium is consistent with an equity premium for road drivers employed by firms which also employ a large number of local P&D drivers, and in which the form of work organization occasions more regular interaction with other employees. It is because this premium grows out of the production technology, not regulatory rents, that Rose's prediction (1987), that LTL drivers would lose more than TL drivers after deregulation, is not borne out.

The continuing union premium across both segments, together with declining union coverage and the especially rapid decline in TL,taken together suggest that the post-regulation union premium results from the sharing of quasi rents. Unionized firms have three choices: share rents in this way, break the union, or exit. Breaking the union is costly, and where there are significant

quasi-rents (that is, in the LTL segment, as argued in Section 3.3.2) a threat to exit is not credible.

To summarize the theme behind our new findings, if we ask why road drivers in LTL firms have much higher earnings than road drivers in TL firms in this time period, internal equity concerns that affect all LTL firms, together with the greater ability of unions to remain in place due to sunk costs that affects the union premium, are the explanations that are consistent with the data. Both explanations are grounded in a differences in the production technology and consequently in the organization of work, rather than in job demands, worker quality, or monitoring.

Table 1 – Summary Statistics

Variable		Mean	Std. Dev.	Min	Max
EARNINGS	overall	10.3552	.3793903	6.82613	12.87019
	between		.4265173	6.82613	11.92747
	within		.2110324	8.292353	12.42493
UNION	overall	.6947417	.4606239	0	1
	between		.4740619	0	1
	within		0	.6947417	.6947417
LTL	overall	.6530014	.2235427	0	1
	between		.257025	0	1
	within		.0705816	.1788917	1.491797
LTL^2	overall	.4763589	.229107	0	1
	between		.2417048	0	1
	within		.0837756	-.0063347	1.328056
MARGIN	overall	.0226844	.0633947	-.2227717	.2585545
	between		.0561116	-.2227717	.2471036
	within		.0373664	-.2048793	.166136
REVENUE	overall	16.75224	1.490796	13.13445	21.17368
	between		1.432638	13.64636	20.97844
	within		.2201567	14.68326	17.88252

N = 2149
n = 480
T-bar = 4.48

Table 2

Table 2a: distribution of panel lengths

length	Freq.	Percent	Cum.
1	94	4.37	4.37
2	134	6.24	10.61
3	120	5.58	16.19
4	196	9.12	25.31
5	180	8.38	33.69
6	114	5.30	38.99
7	161	7.49	46.49
8	256	11.91	58.40
9	414	19.26	77.66
10	480	22.34	100.00
Total	2,149	100.00	

Table 2b: **LTLSHARE** in long (t>=8) and short (t<8) panels

Variable	Obs	Mean	Std. Dev.	Min	Max
long	1150	.7087176	.1845431	0	.9870326
short	999	.5808128	.2508189	0	1

Table 3
Regression results

	Model 1	Model 2	Model 3	Model 4
UNION	0.220*	0.087	0.190***	0.233***
	(0.10)	(0.11)	(0.04)	(0.04)
UNION*REG	0.341*	0.401**	0.179*	-0.045
	(0.14)	(0.14)	(0.09)	(0.03)
LTL	-0.125	0.346	0.755**	
	(0.65)	(0.33)	(0.28)	
LTL^2	0.179	-0.104	-0.518	
	(0.54)	(0.34)	(0.30)	
REG*LTL	1.215*	0.958*		
	(0.50)	(0.45)		
REG*LTL^2	-1.239*	-0.885		
	(0.50)	(0.46)		
UNION*LTL	1.204	0.627		
	(0.85)	(0.53)		
UNION*LTL^2	-0.960	-0.614		
	(0.77)	(0.54)		
UNION*REG*LTL	-1.766**	-1.649**	-0.592	
	(0.60)	(0.56)	(0.33)	
UNION*REG*LTL^2	1.609**	1.345*	0.374	
	(0.60)	(0.56)	(0.32)	
MARGIN	-0.207			
	(0.19)			
REVENUE	0.143**	0.073***	0.075***	0.083***
	(0.05)	(0.01)	(0.01)	(0.01)
Firm means (“between” effects)				
REVENUE XBAR	-0.087			
	(0.05)			
MARGIN XBAR	0.582			
	(0.37)			
LTL XBAR	1.000			
	(0.82)			
LTL^2 XBAR	-0.869			
	(0.79)			
UNION*LTL XBAR	-1.461			
	(1.08)			
UNION*LTL^2 XBAR	1.190			
	(1.07)			
REG*LTL XBAR	-2.422			
	(1.76)			
REG*LTL^2 XBAR	3.296			
	(2.26)			
UNION*REG*LTL XBAR	2.938			
	(1.80)			
UNION*REG*LTL^2 XBAR	-3.788			
	(2.30)			

Table 3 continued on next page

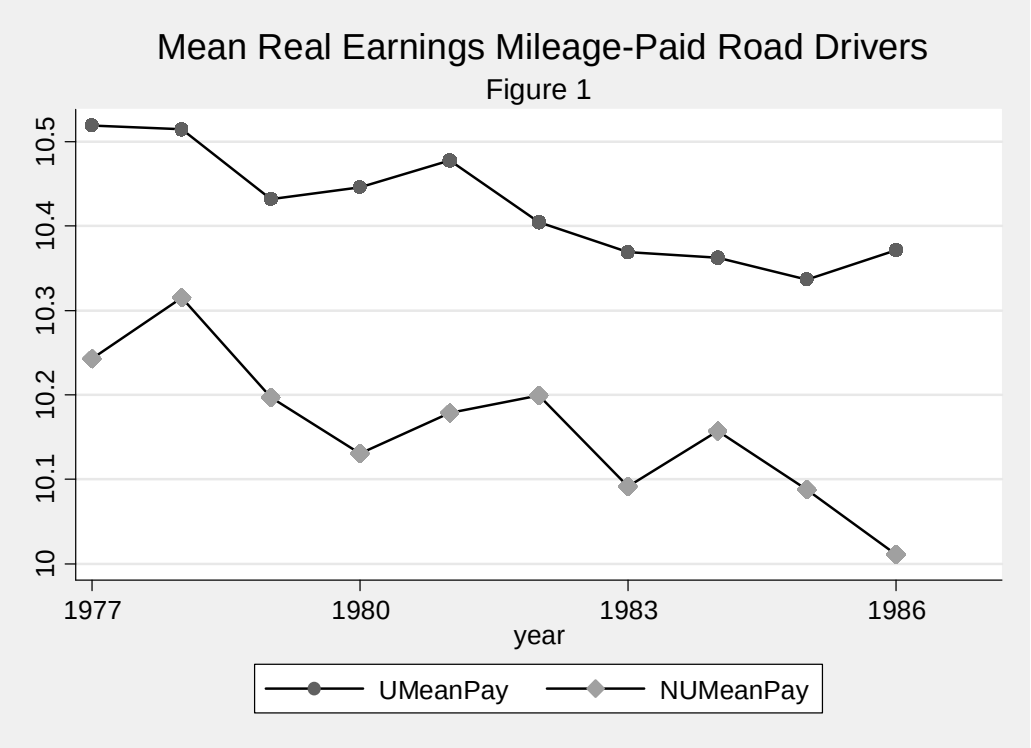
Table 3 (continued)

	Model 1	Model 2	Model 3	Model 4
	Year dummies (1977 omitted)			
1978	0.014	0.016	0.016	0.015
	(0.02)	(0.02)	(0.02)	(0.02)
1979	0.098	0.107	-0.091**	-0.097**
	(0.11)	(0.11)	(0.03)	(0.03)
1980	0.095	0.100	-0.099**	-0.106**
	(0.11)	(0.11)	(0.03)	(0.03)
1981	0.102	0.107	-0.093**	-0.099***
	(0.11)	(0.11)	(0.03)	(0.03)
1982	0.068	0.069	-0.131***	-0.135***
	(0.11)	(0.11)	(0.03)	(0.03)
1983	0.029	0.027	-0.175***	-0.181***
	(0.11)	(0.11)	(0.03)	(0.03)
1984	0.023	0.030	-0.171***	-0.179***
	(0.11)	(0.11)	(0.03)	(0.04)
1985	-0.005	0.009	-0.191***	-0.206***
	(0.11)	(0.11)	(0.03)	(0.03)
1986	-0.014	0.004	-0.196***	-0.216***
	(0.11)	(0.11)	(0.04)	(0.04)
Constant	8.920***	8.703***	8.807***	8.892***
	(0.22)	(0.28)	(0.24)	(0.25)
Observations	2149	2149	2149	2149

*p< 0.05, **p< 0.01, ***p< 0.001
Standard errors in parentheses

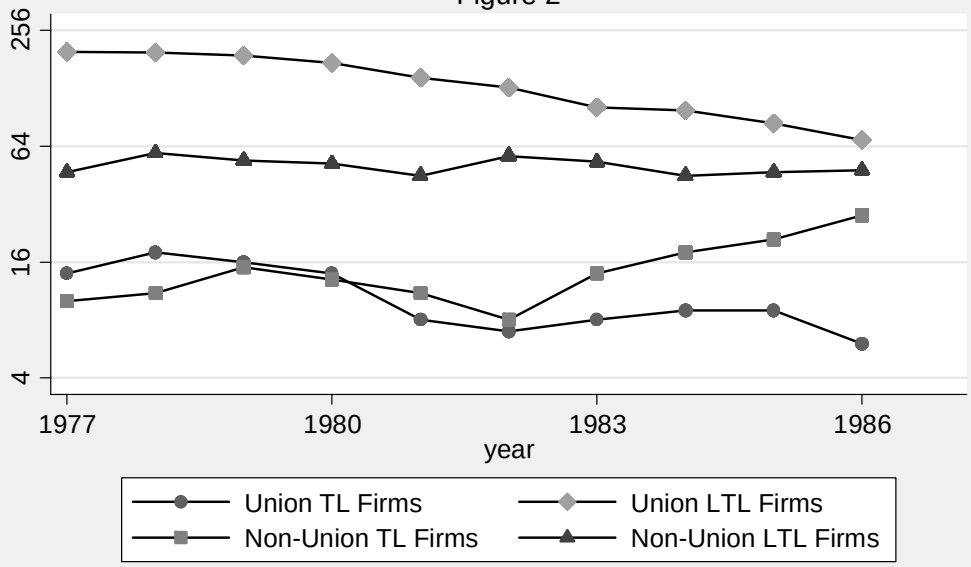
Table 4: Tests of restrictions on regression models 1 and 2

	Model 1	Model 2
LTL XBAR = 0 LTL^2 XBAR = 0 UNION*LTL XBAR = 0 UNION*LTL^2 XBAR = 0 REG*LTL XBAR = 0 REG*LTL^2 XBAR = 0 UNION*REG*LTL XBAR = 0 UNION*REG*LTL^2 XBAR = 0 MARGIN XBAR = 0 REVENUE XBAR = 0	chi2(10) = 11.81 Prob> chi2 = 0.2978	
Adding this restrictions to those above: MARGIN = 0	chi2(11) = 12.64 Prob> chi2 = 0.3173	
Model 2 incorporates all restrictions. Testing these further restrictions on Model 2: UNION*LTL = 0 UNION*LTL^2 = 0 REG*LTL = 0 REG*LTL^2 = 0		chi2(4) = 4.99 Prob> chi2 = 0.2887
Going back to Model 1, and testing all of the restrictions together:	chi2(15) = 17.69 Prob> chi2 = 0.2791	



Count of Union and Non-Union Firms in Sample

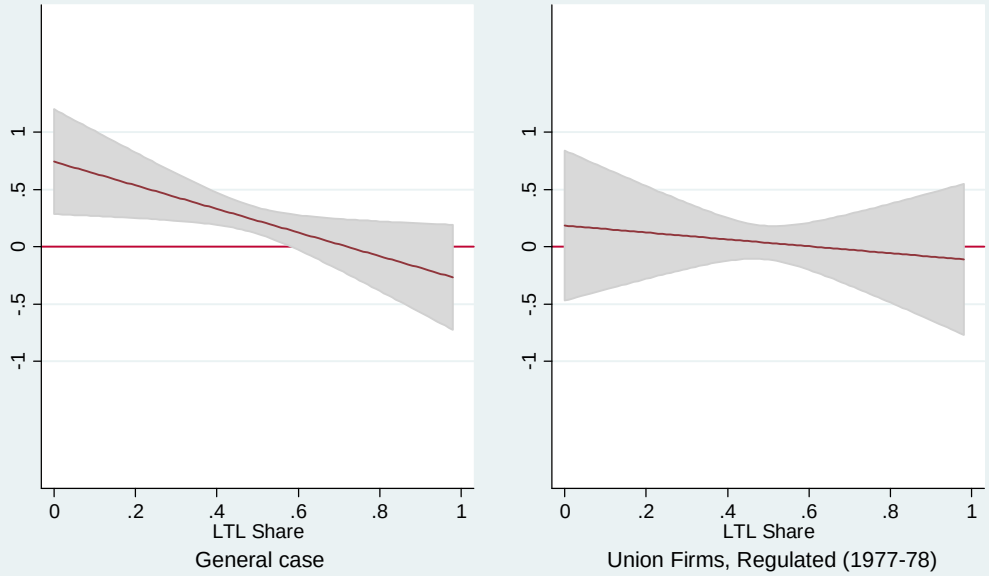
Figure 2



For this graph, LTL is defined as having over 40% of tonnage shipped in loads above the LTL threshold.

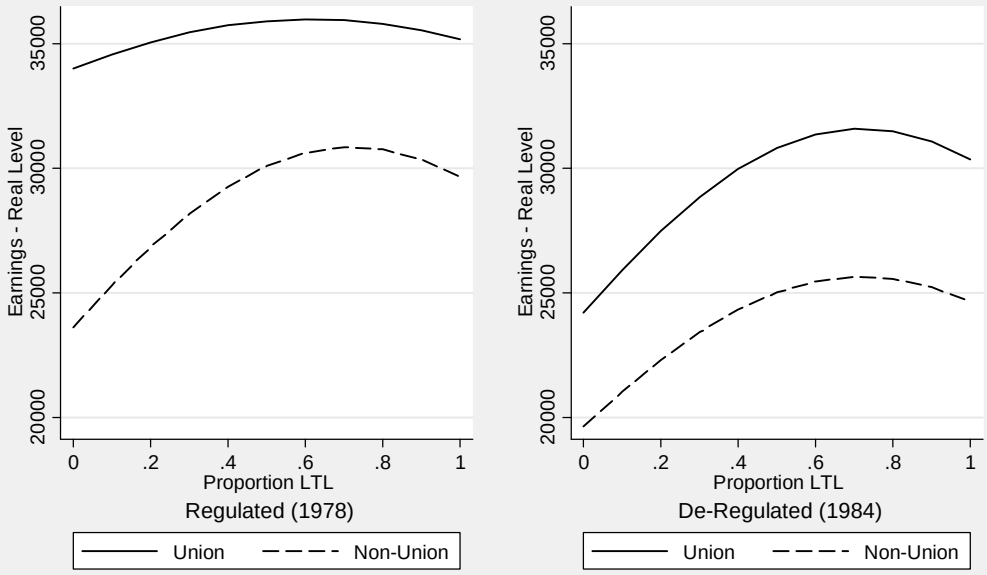
Marginal effect of LTL share on driver earnings, with 95% confidence interval

Figure 3



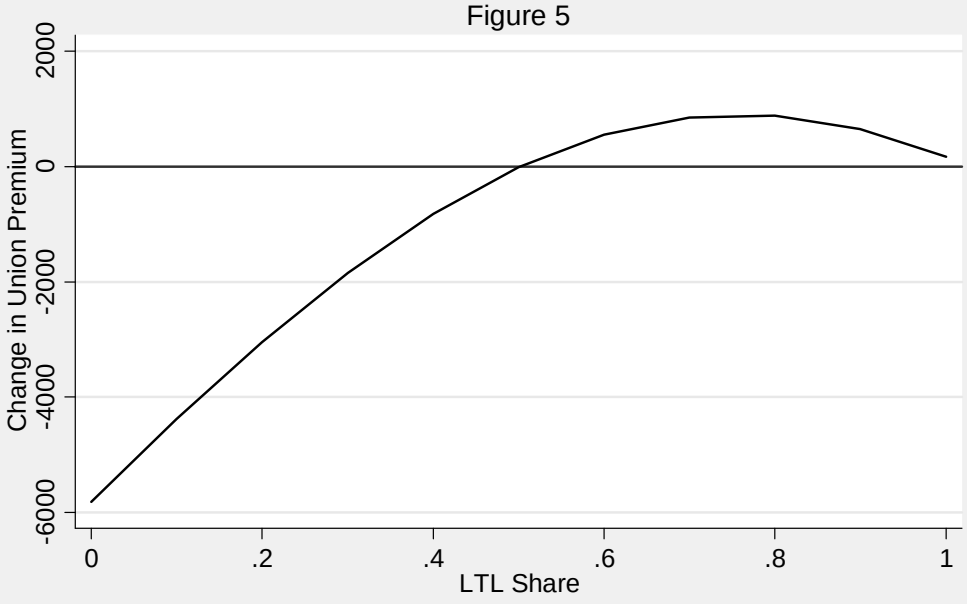
Average Real Annual Earnings of Mileage-Paid Road Drivers

Figure 4



Change in Union Premium, 1978-1984, as a function of LTL Share

Figure 5



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