



A BRIEF RESEARCH OVERVIEW

The Economics of Long Work Hours: Using Incentives to Change Behavior

TRB Committee on
Impacts of Alternative Compensation Methods on Truck
Driver Retention and Safety

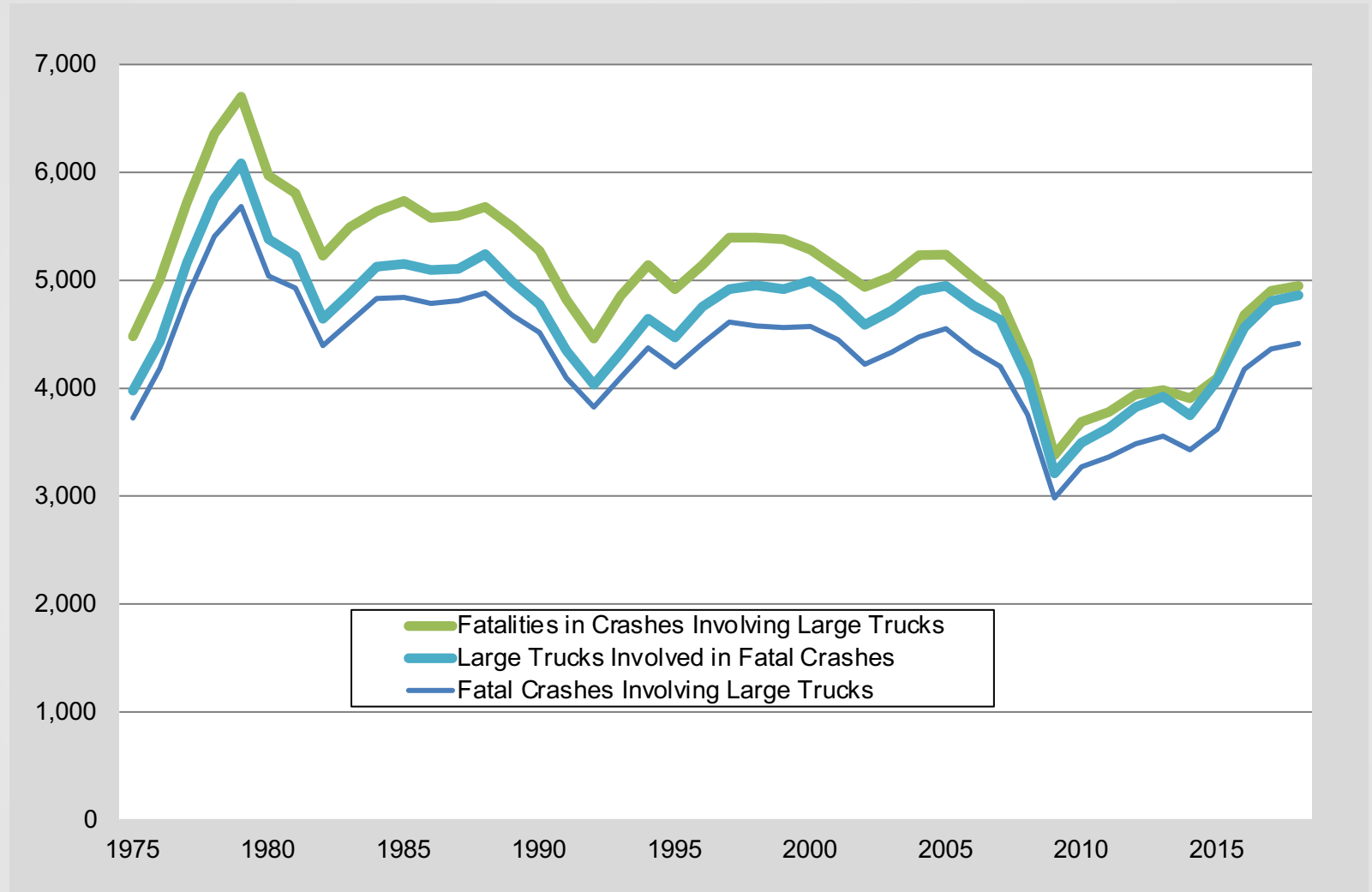
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Washington, DC

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Truck Fatalities Rising



Fatal truck-involved crashes are increasing.



Source: Large Truck and Bus Crash Facts 2018 (September 2020)

Trucking has been on a low road for years.

The Costs of the Low Road Economic Model

- Fatigue-related illness and injury
- Stress-related crashes
- High crash costs
 - For drivers and their families
 - For other road users killed or injured
 - For the supply chain
- Damaged labor market
 - Chronic recruiting and retention problem
 - Supply chain hold-ups due to lack of drivers
- Unpaid employment taxes



Trucking Safety Requires Economic Analysis

Competition drives carriers to lowest price

- Lowest price drives carriers to lowest cost
- Lowest cost drives rates down and squeezes drivers
 - Dangerous workplace pressure
 - Dangerous hours of work
 - Unqualified, dangerous drivers drawn to trucking



Trucking Safety Requires Economic Analysis

Motor carriers outsource to

smaller truckers and individual contractors

- Multilayered subcontracting cuts employment cost while adding layers of overhead
 - Workers' compensation is paid by driver or not paid at all, depending on state
 - Employment taxes (like Social Security and Medicare) are underpaid
 - Training, including safety training, is short-changed
- Eliminates risk that drivers engage in “protected concerted activity”
 - Including but not limited to unionization
- Reduce or eliminate liability for safety risk
 - Liability pushed down to contractor with no resources
- Worst form of contracting is lease-purchase debt peonage
 - Carriers that do this control the drivers like sharecroppers



Can You Pay for Safety?

This starts with a study I began in 1997, funded by the Office of Motor Carriers of Federal Highway, passed on to FMCSA after it was created.

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A Case Study

The Problem

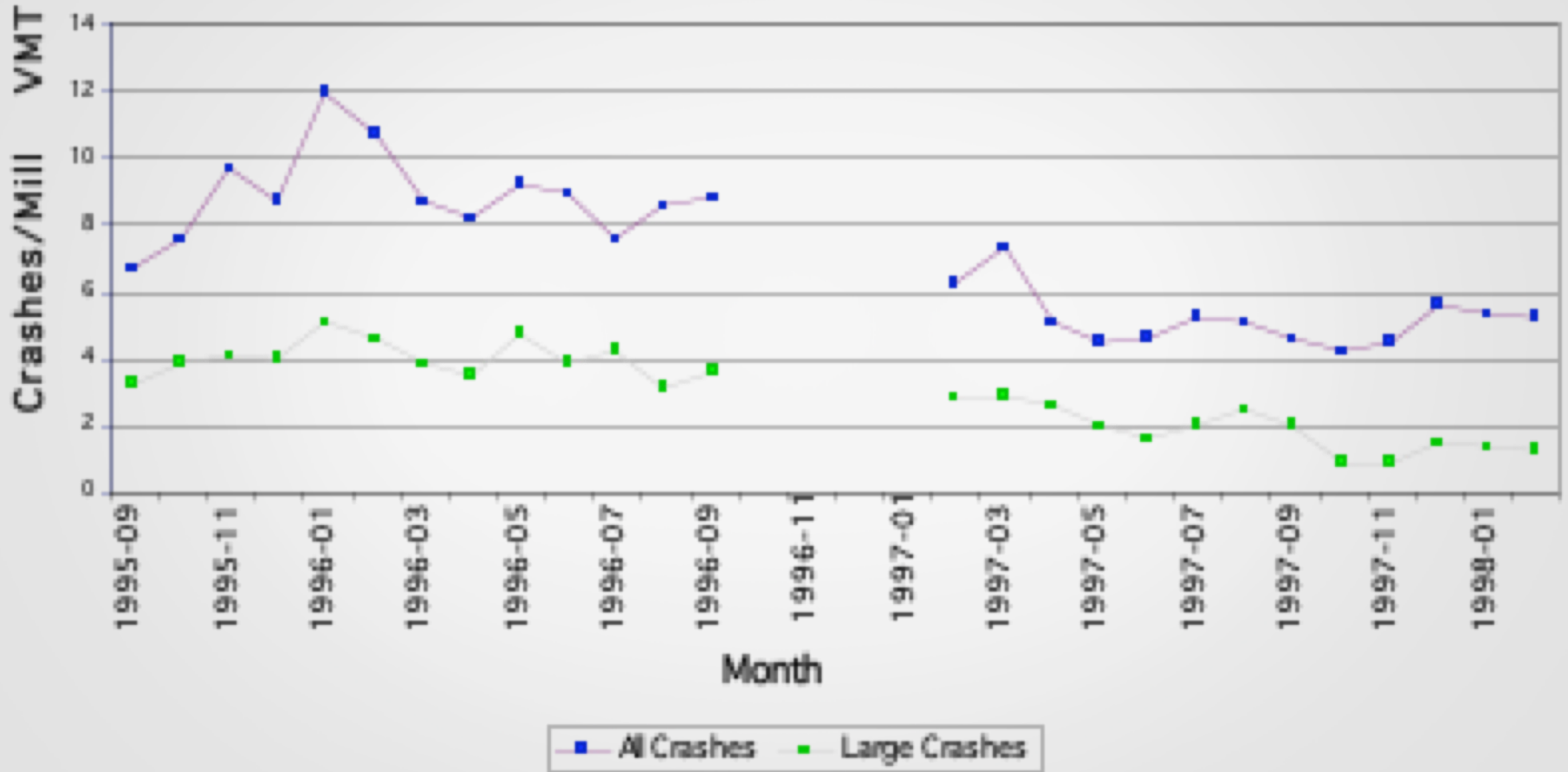
- J. B. Hunt: The nation's second largest truckload carrier in 1995
 - 96% driver turnover
 - Carrier experienced driver safety and driver reliability problems

The Solution

- Raised wages by 38% in one major move
 - Before the raise: 45¢-49¢/mile (in 2022 dollars)
 - After the raise: 71¢-73¢/mile (in 2022 dollars)
- Closed training schools & hired experience
- Focused on driver retention



Higher Pay, Lower Crash Rates



Pay Level Findings

- Overall, 10% higher driver pay was associated with 40% lower crash probability
- Study method: survival analysis (Cox regression).
- At the mean, every penny more in first observed pay led to **11.1% lower crash probability**
- At the mean pay rate of 34¢ per mile (66¢ in 2022), every 10% higher first observed pay was associated with a **34% lower crash probability**
- A **10% pay increase** was associated with a **6% lower crash probability**
- At the mean, each **year of tenure** reduced crash probability by **16%**
- Higher pay reduced turnover (increased tenure) and increased age, experience, and other characteristics



Does Safety Pay?

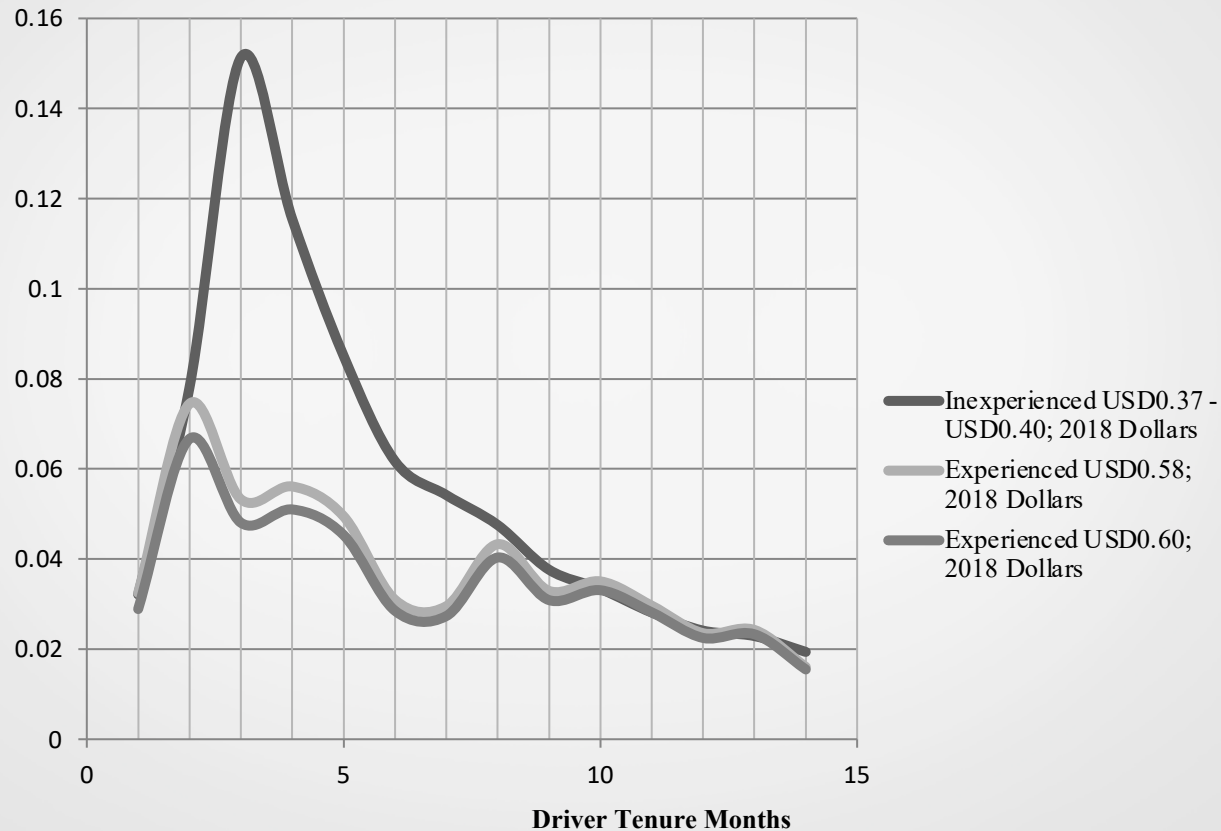
Continued research agenda from original OMC-FMCSA contract

Faulkner MR and Belzer MH. (2019) Returns to compensation in trucking: Does safety pay? *The Economic and Labour Relations Review* 30:2. 262-284.

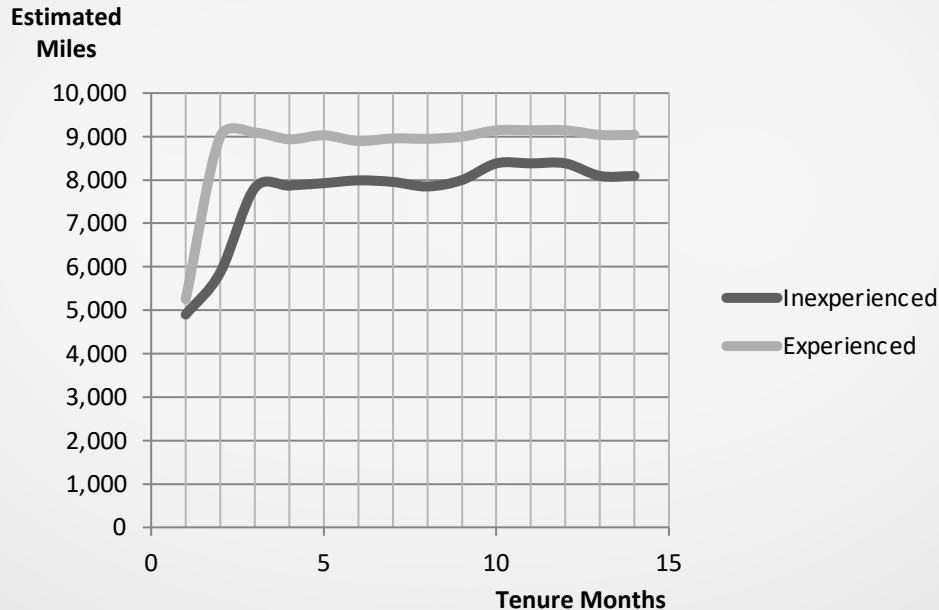


Hazard Rate for Crashes by Driver Experience at Hire

Probability



Predicted Monthly Miles Driven by Driver Experience at Hire



Safe Rates and Return on Investment

- ROI:
 - Lower paid inexperienced drivers: -25%
 - Higher paid experienced drivers: 285%
- Expected Net Present Value in 2018 dollars of higher paid experienced drivers is \$10,474 greater than E(NPV) of lower paid inexperienced drivers, and stable over multiple years.
- Better paid drivers are:
 - More experienced
 - Safer (lower crash cost) and more reliable
 - Substantially more productive
 - 1,268 (16%) more miles per month
 - More stable: stay with the company
 - Lower search, training, hiring cost
 - Lower turnover rates
 - Lower turnover fleets are safer



WHY DOES TRUCK DRIVING INVOLVE LONG WORKING HOURS?

This research agenda also started with the study that began in 1997, funded by the OMC-FHWA and continued by FMCSA.

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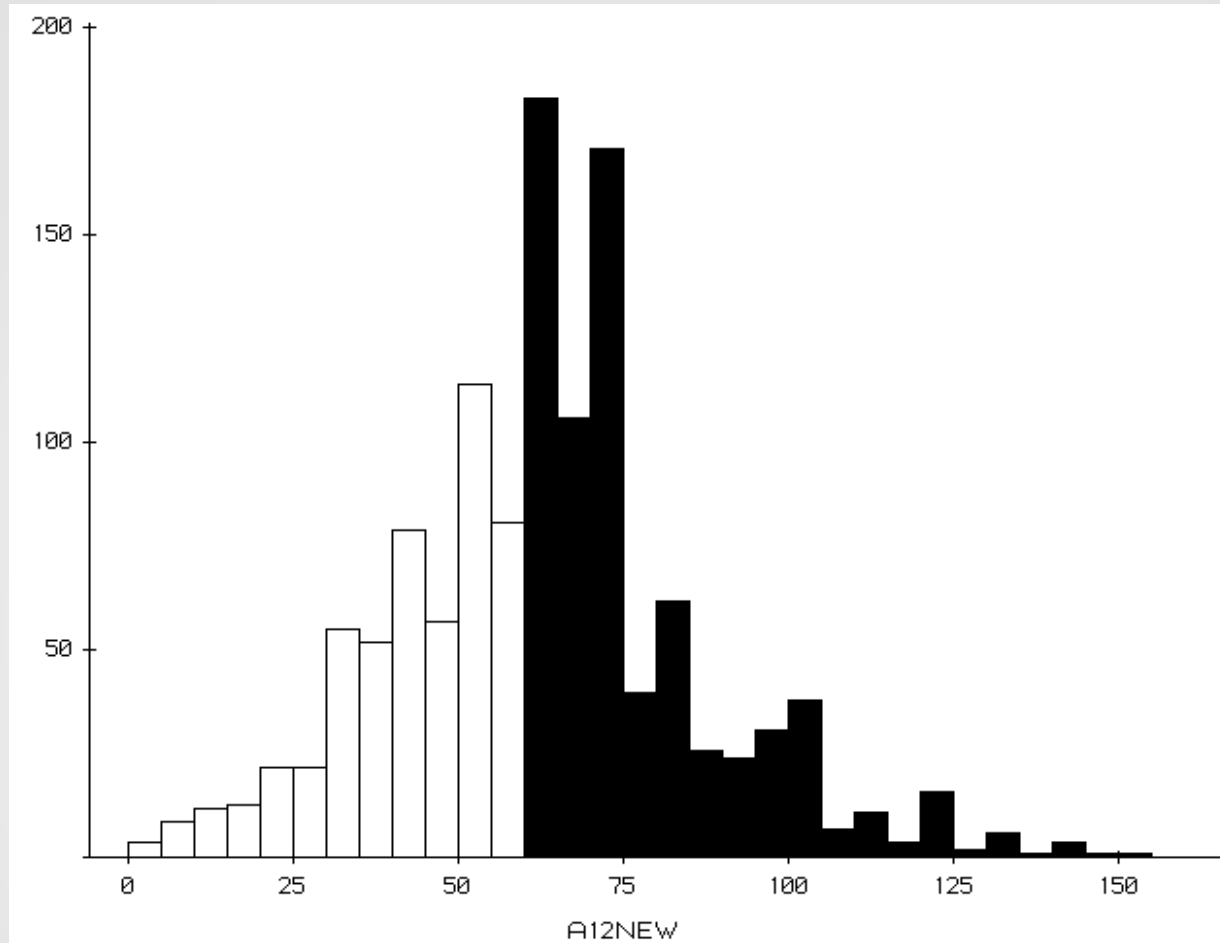


FACT: Truckers Work Long Hours

- University of Michigan Trucking Industry Program 1997 survey (funded by Sloan Foundation) showed median non-union driver worked 65 hours/week
 - 55% not paid for loading/unloading
 - 70% not paid for waiting or other on-the-job work time.
- National Institute for Occupational Safety and Health (NIOSH) 2010 survey, modeled after UMTIP, shows median employee driver (almost all non-union) works 60 hrs/week
 - Employee drivers average 63 hours of work per week
- NIOSH 2010 survey also shows 20% exceed 75 hours/week
 - Truck drivers are not paid for all work time
 - On average, 10.5 hours of work/week (22% of all hours) are unpaid
 - On average, 27% of employee drivers' work week is unpaid labor
- That is why surveys show long-haul drivers regularly work an impossible (illegal) number of hours.



Drivers in Black Work Excessive Hours



Hours worked/week

- Median: 60 hours
- Average: 61.5 hours
- n = 1,254 long haul truck drivers



Why So Many hours?

- If the regulations restrict CMV drivers to 60 hours of work per week, why do half of all long-haul drivers exceed this limit?
- How do carriers and drivers get around the rules?
- How do FMCSA regulations continue to effectively permit excessive hours?
- The answer rests in conflicting definitions of “work”.



DOL-FLSA Definition of Work

- All time during which employees work for an employer, including waiting time, is payable:
 - Unless employer frees the worker from work for specific time and employee knows in advance when work time starts and ends; and
 - Unless worker has practical freedom to leave the place of work to go about his/her personal activity; and
 - Unless worker is not engaged in the work for which he/she was hired, including being available for a call.
 - All time is payable if worker is located away from employer's place of work, and wait time is part of employee's regular work



DOT-FMCSA Definition of Work

- Waiting time is non-work time as long as:
 - “The driver is relieved of all duty and responsibility for the care and custody of the vehicle, its accessories, and any cargo or passengers it may be carrying.”
 - “During the stop, and for the duration of the stop, the driver must be at liberty to pursue activities of his/her own choosing.”
 - Example: looking at his phone or reading (circumstances limit choices)
 - Companies may interrupt driver’s free time and sleep time.
 - Off duty time during a shift may have indeterminate start and end time.
- FMCSA regulations allow carriers to order drivers to log non-driving FLSA-defined work time off duty
 - Drivers have economic incentive to log unpaid work time off duty
 - Since FMCSA has no position on driver pay, grounds for definitions are quite different.
 - Results are inconsistent with policy goal to limit hours of work



Why such long hours? A persistent problem: They do it for the money

This is another component of the ongoing stream of research stemming from the OMC-FHWA FMCSA contract that began in 1997.

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Time is Money

- Economic theory predicts that workers will trade labor for leisure as their earnings increase.
- Rarely can we see this in the data but long hours in trucking allows us to observe it.
- We will test the Target Earnings Hypothesis
 - Drivers work to reach their target earnings
 - Target earnings are sufficient to pay their bills
 - Drivers should reduce work time after reaching their targets
- The microeconomics are more precise as in this case we can use reported wage rates and hours of work, reported in the UMTIP driver survey



University of Michigan Trucking Industry Program Driver Survey 1997-98

- Truck stop survey of 233 employee drivers
- These employee drivers worked an average of 64.5 hours per week with a minimum of 25 and a maximum of 126
- Drivers earned an average of 28.6¢ per mile [53¢/mi in today's dollars; perhaps 15% more than today]
- Averaged 13.7 years of experience
- Average company tenure of 3.5 years



Two-stage least-squares model

- Stage 1: Estimate pay rate based on driver characteristics
- Stage 2: Estimate hours based on rate of pay



Stage 1: Estimate Pay Rates

$$\text{Rate}_i = \beta_1 + \beta_2 X_{i2} + \beta_3 X_{i3} + \dots + \beta_K X_{iK} + \varepsilon_i$$

- Rate_i is the mileage rate for the i^{th} driver
- X 's represent characteristics of the driver and job that are relevant to determining the mileage rate
- β 's are the parameters to estimate
- ε summarizes the random components and unobserved characteristics of the individual driver and job.



Table 1: Mileage Rate Equation

<i>Variable</i>	Estimate	Standard Error	t-value
Constant	0.241***	0.016	14.918
Experience	0.002**	0.001	2.133
Experience ²	-4.1E-05	0.000029	-1.437
Tenure	0.004**	0.0017	2.049
Tenure ²	-0.00011**	0.000054	-1.972
HS Degree	0.000574	0.008	0.076
Union	0.097**	0.057	1.726
White	0.016**	0.008	1.858
Union by White	-0.04	0.058	-0.695
Previous Moving Violation	0.007	0.007	1.051
Medium Firm	0.013**	0.006	2.065
Large Firm	0.026***	0.009	3.164
Private Carriage	-0.020	0.010	-1.900
Dry van	-0.008	0.007	-1.221
Miles per Dispatch	-0.00002***	0.000006	-3.276
Unpaid Time	-0.010	0.008	-1.192
Paid Days Off	0.001**	0.0004	2.071

Sample Size	233	Dependent variable:	Mileage Rate
R-squared:	0.385	Rbar-squared:	0.340
Residual SS:	0.431	Std error of est:	0.045
F(16,216):	8.457	Probability of F:	0.000



Stage 2: Estimate Weekly Hours

$$\text{Hours}_i = \gamma_1 + \gamma_2 * W_i + \gamma_3 W_i^2 + \gamma_4 Z_{i4} + \dots \gamma_K Z_{iK} + \varepsilon_i$$

- Hours_i are the weekly hours of the i^{th} driver
- W_i is the fitted wage of the i^{th} driver from the wage estimation equation
- Z 's represent characteristics of the driver and job that influence the number of hours worked
- ε_i captures the random components of the hours worked not included in the explanatory variables



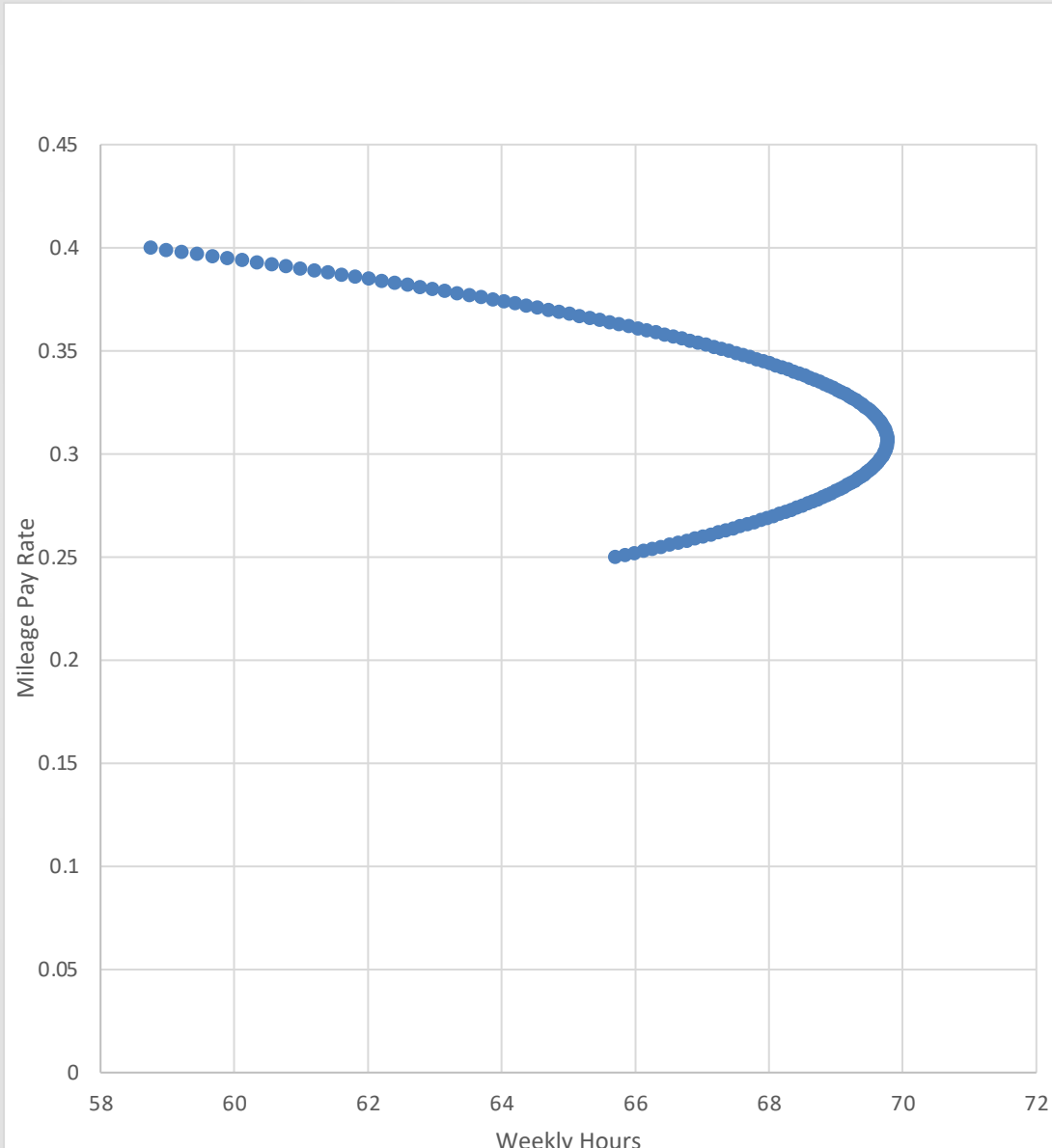
Table 2: Weekly Hours of Work Equation

Variable	Estimate	Standard Error	t-value
<i>Constant</i>	-116.29**	52.88	-2.199
Fitted Rate	776.75**	370.8	2.095
Fitted Rate²	-1266.30**	637.3	-1.987
Age	3.119***	0.849	3.674
Age²	-0.035***	0.001	-3.578
Married	-4.853*	2.548	-1.905
Other Income (\$1,000)	0.021	0.067	0.348
% Night Driving	9.241	5.598	1.651
% Non-Driving Time	-21.820**	9.788	-2.229
Unpaid Time	11.066***	3.441	3.216
Union	10.842	9.372	1.157
Miles per Dispatch	0.0007	0.002	0.313
Private Carriage	-4.082	3.464	-1.178
Tenure	-0.365*	0.201	-1.820
Last Home	-0.006	0.125	-0.045

Sample Size:	233	Dependent variable:	Hours per Week
R-squared:	0.164	Rbar-squared:	0.111
Residual SS:	63611.8	Std error of est:	17.082
F (14,218):	3.061	Probability of F:	0.000



Estimated Labor Supply Curve for Long-Distance Truck Drivers



We estimate that drivers would work 60 hours at just less than 40 cents/mile in 1997 dollars.

That is 74 cents/mile in 2022 dollars.

JB Hunt found there is a “Safe Rate”

Rate Hours

\$0.286 69.2245482

Sample Mean

\$0.307 69.7670643

Max Hours at \$0.3075

\$0.308 69.7650398

Tipping point for reduced work hours

\$0.370 64.693353

Rate set by J.B. Hunt to reduce turnover & crashes

\$0.394 60.1164762

SAFE RATE: 60 hours of work

\$0.395 59.8941155 Rate required to reduce hours of work below legal limit

- “Safe rate” depends on society’s preference for safety.
- I assume 60 hours per week (the legal limit) is the optimal tradeoff between efficiency and safety.
- I define “safe rate” as the rate of pay needed to give drivers incentive to work 60 hours/week.
- **Using the DOL’s CPI calculator, the “safe rate” at the end of 2022 was \$0.74/mile.**



Why Higher-earning Drivers Are Safer

- Efficiency Wage Hypothesis (Yellen)
 - Research using the most comprehensive driver survey estimated safe rate at 60¢/mi, where “safe” is 60 hrs/week
 - Current market-clearing wage is about 44.5¢/mile for new hire with one year of experience (Ryley and Belzer 2023)
 - At this rate, drivers given the chance for more work will take it (see Belzer and Sedo 2018)
 - Average driver at that rate works 68 hours and needs to work more to pay bills.
 - Higher paid truck drivers have incentive to take fewer risks and work safely to retain a higher than market-clearing wage
 - Higher wages attract workers with better skills and safety records
 - This helps explain why higher wages are associated with fewer hours worked and, likewise, greater safety



Summing Up

- The low road costs the economy billions of dollars yearly
 - Wasted time for drivers
 - Wasted time for carriers
 - Major contribution to the truck driver recruiting and retention problem.
- Encourages inefficient use of all resources
 - Labor
 - Capital
- Reduces American Gross Domestic Product (GDP)
- Has profound safety and health cost, which also reduces GDP
- Because commercial transport is a business, economic forces explain safety and health outcomes
- Economic approach to safety and health points the way to policy solutions
- Safe rates will save lives, allocate resources efficiently, and grow the economy



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