



# **Truck drivers are overtired, overworked and underpaid**

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Economics Department

January 25, 2019

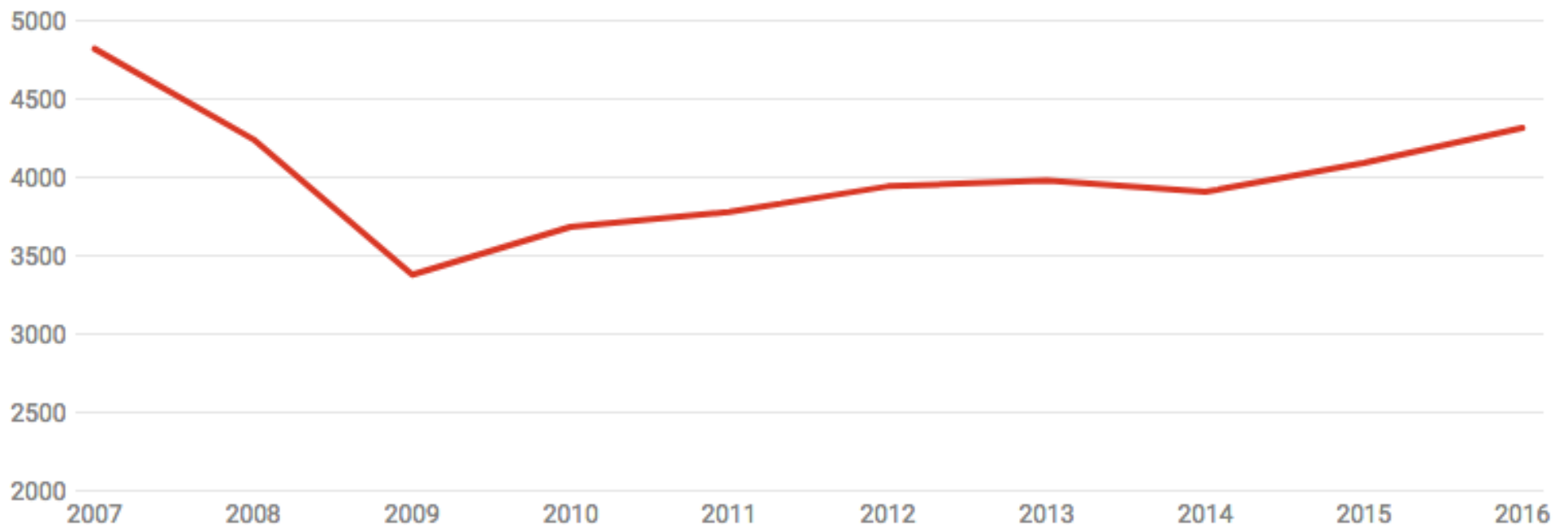
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# Truck Fatalities Rising

## Deaths from truck crashes in the US

In 2015, there were 4,317 total fatalities from large truck crashes in the U.S.



*A large truck is defined as a truck with a gross vehicle weight rating greater than 10,000 pounds. The "All vehicle types" category includes crashes involving passenger cars, light trucks, buses, motorcycles, or any other type of motorized vehicle.*

Chart: The Conversation, CC-BY-ND • Source: U.S. Federal Motor Carrier Safety Administration • [Get the data](#)



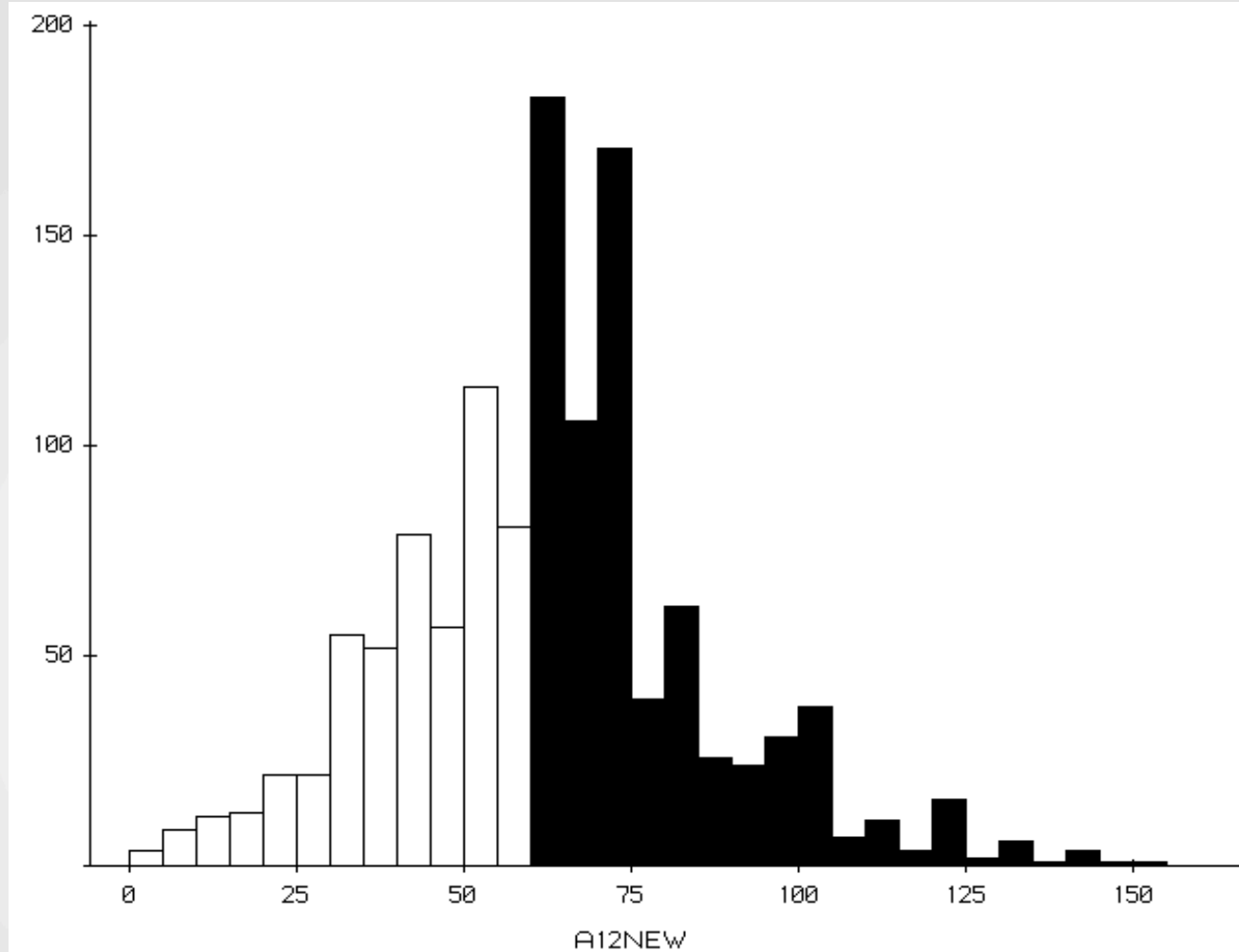
# Long Hours and Crashes

- Long work hours leads to fatigue.
- Fatigue is associated with safety and health risk.
  - Panel on Research Methodologies and Statistical Approaches to Understanding Driver Fatigue Factors in Motor Carrier Safety and Driver Health. 2016. *Commercial Motor Vehicle Driver Fatigue, Long-Term Health, and Highway Safety: Research Needs*. Washington: National Academies of Science.
  - <http://www.nap.edu/24818>



# Long Working Hours in Trucking

NIOSH  
2010  
Survey of  
Long-Haul  
Truck  
Drivers



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



# Long Working Hours in Trucking

All labor time currently not paid

1. NIOSH 2010 survey shows average driver works 60 hrs/week, of which about 10.5 are unpaid
  - Owner operators work fewer hours
  - Employee drivers work 63 hours average
2. NIOSH 2010 survey shows 20% exceed 75 hours/week
3. Drivers log unpaid work time off duty

That is why surveys show drivers work an impossible (illegal) number of hours regularly.



# Pay Rates Predict Working Hours

- Economists want to know “why”.
- Belzer, Michael H., & Sedo, Stanley A. (2018). Why Do Long Distance Truck Drivers Work Extremely Long Hours? *The Economic and Labour Relations Review*, 29(1), 59–79. doi:10.1177/1035304617728440 (March 2018).
- <https://goo.gl/M5Xx47>



# Theory: Why is this happening?

- Efficiency wage hypothesis
  - 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 safety records
  - This helps explain why higher wages are associated with fewer hours
  - Union drivers are paid more & are safer
- Target earnings hypothesis
  - Drivers work to reach their earnings targets
  - Drivers reduce work time after reaching their targets
  - If drivers have target earnings, paying for all labor time would reduce incentive to log work time off duty
  - Higher pay rates and pay for all work time reduces drivers' incentives to work illegal hours, thus improving safety



# Data: University of Michigan Trucking Industry Program Driver Survey 1997-98

- Truck stop survey of 233 employee drivers
- These drivers worked an average of 64.49 hours per week with a minimum of 25 and a maximum of 126
- Drivers earned an average of \$0.286 [\$0.45 today] per mile
- Averaged 13.66 years of experience
- Average company tenure of 3.46 years





# Two-stage least-squares model

## Stage 1: Labor Supply Curve Estimation

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

- $\text{Rate}_i$  is the mileage rate for the  $i^{\text{th}}$  driver
- $X$ 's represent characteristics of the driver and job that are relevant to determining the mileage rate
- $\beta$ 's are the parameters to estimate
- $\varepsilon$  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
<i>Constant</i>	0.241***	0.016	14.918
Experience	0.002**	0.001	2.133
Experience <sup>2</sup>	-4.1E-05	0.000029	-1.437
Tenure	0.004**	0.0017	2.049
Tenure <sup>2</sup>	-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



# Two-stage least-squares model

## Stage 2: OLS Weekly Hours Estimation

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

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



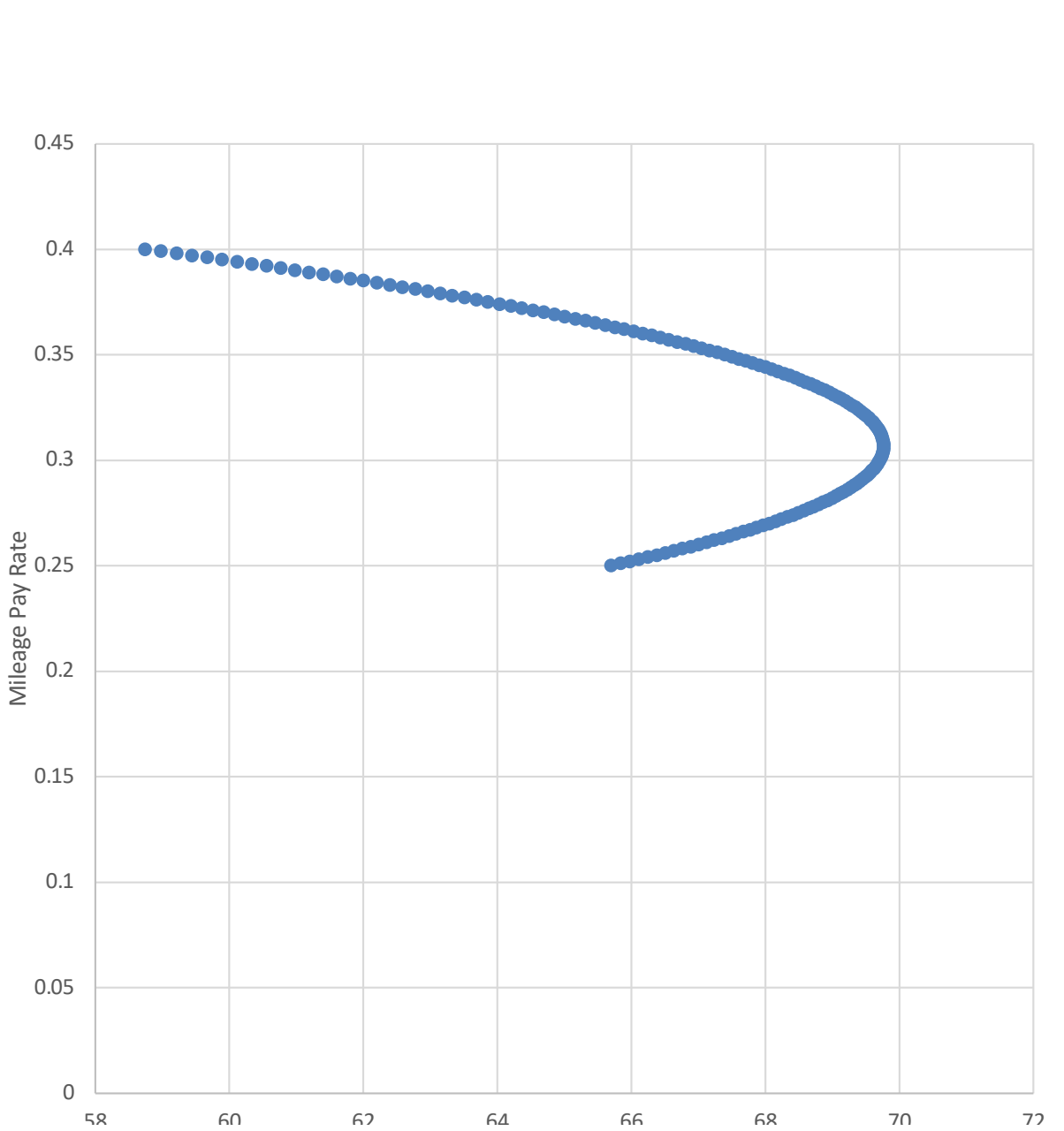
# Stage 2: Weekly Hours of Work Equation

Variable	Estimate	Standard Error	t-value
<i>Constant</i>	-116.29**	52.88	-2.199
Fitted Rate	776.75**	370.8	2.095
Fitted Rate <sup>2</sup>	-1266.30**	637.3	-1.987
Age	3.119***	0.849	3.674
Age <sup>2</sup>	-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



# Result: Labor Supply Curve for Long-Distance Truck Drivers



# Interpretation: “Safe Rates” Exist

Rate	Hours	
\$0.286	69.2245482	Sample Mean
\$0.307	69.7670643	Max Hours at .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	60 hours of work
\$0.395	59.8941155	Rate required to reduce hours of work below legal limit

- Depends on society’s preference for safety.
- As legal limit, I assume 60 hours per week is the optimal tradeoff between efficiency and safety.
- The “safe rate” is the rate of pay needed to give drivers incentive to work 60 hours/week.
- **Using the DOL’s CPI calculator, the 2017 “safe rate” is \$0.60/mile.**



# Detention Time Adds More Risk

- Office of the Inspector General (OIG) of the US DOT did “detention time” study.
- Office of the Inspector General. (2018). *Estimates Show Commercial Driver Detention Increases Crash Risks and Costs, but Current Data Limit Further Analysis* (ST2018019). Retrieved from Washington:  
<https://www.oig.dot.gov/sites/default/files/FMCSA%20Driver%20Detention%20Final%20Report.pdf>
- They limited analysis by defining “detention” as more than two hours loading or unloading



# Detention Time Adds More Risk

- This “industry standard” was created during the regulated era (before 1980), when tariffs allowed two hours of loading or unloading before cargo owner incurred “demurrage” charge but drivers paid for all time.
- The expectation of two-hours free time remained after deregulation
- When carriers could not collect from cargo owners, they stopped paying drivers.
- Declining union bargaining power meant drivers could not collect.





# Detention Time and ELDs/ELBs

- Electronic logbooks cannot determine driver activity.
- They record only that the truck is stopped.
  - FMCSA allows carriers to tell drivers to log off duty when they get to shipper or receiver.
  - FMCSA does not require that drivers report their activity at each change of duty; just location.
  - FMCSA allows drivers and carriers to consider up to 17 mph as off duty.
  - New rules may allow drivers to use trucks as a “personal conveyance” when out of hours.
  - Drivers log off duty because they are not paid.



# Detention Time and Logging

- ATA currently estimates the average length of haul at 550 miles.
  - This means average driver may load and unload once/day.
  - Drivers may give away up to four hours/day at little or no pay.
- Unpaid labor values carrier delay time and driver delay time at zero.
  - Detention kicks in at two hours
  - Carriers may find it hard to collect
  - No enforcement mechanism
- Economic principles
  - People will consume an infinite amount of a free good
  - Shippers and receivers have little incentive to conserve free labor time.



# OIG Detention Time Study Results

- 15-minute increase in average dwell time increases the average expected crash rate by 6.2%.
  - Drivers probably not paid for this work time; log off duty
  - One additional crash per 1,000 power units
  - 6,509 additional crashes per year
  - Every 5% increase in proportion of stops resulting in detention is associated with 4.7 increase in crashes
- 2014 FMCSA study found that
  - 10% of all stops experienced 2+ hour detention time
  - For those stops, delay time averaged 1.4 hours
    - This means total stop time 3.4 hours
  - Smaller carriers had more delay



# OIG Detention Time Study Results

- Detention is associated with between \$1.1 billion to \$1.3 billion lower annual earnings for for-hire CMV drivers in the truckload sector.
  - That's between \$1,281 and \$1,534 per driver per year
  - Helps to explain labor shortage
- Detention reduces motor carrier net income by \$250.6 to \$302.9 million per year
- Unpaid delay time contributes to excessive driver labor time
- Excessive labor times drives up crash risk



# Truck Driver OSH Resource Reading

- **Saltzman, Gregory M. and Michael H. Belzer.** 2007. "Truck Driver Occupational Safety and Health: 2003 Conference Report and Selective Literature Review," Washington, DC: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health (NIOSH), 117, CD with supporting documents.
- <http://www.cdc.gov/niosh/docs/2007-120/>





Links to underlying research:  
**“Truck Drivers are Overtired,  
Overworked, and Underpaid”**

*The Conversation*

July 25, 2018

<https://theconversation.com/truck-drivers-are-overtired-overworked-and-underpaid-100218>

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