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Research PAPER

Review of NHTSA and FMCSA's Preliminary Regulatory Impact Analysis concerning Speed Limiting Devices

9/27/2016

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Introduction

In September 2016, the National Highway Traffic Safety Administration (NHTSA) and the Federal Motor Carrier Safety Administration (FMCSA) released a joint notice of proposed rulemaking (NPRM) in order to mandate speed limiting devices for all heavy vehicles with a gross vehicle weight rating (GVWR) over 26,000 pounds. Utilizing their differing authorities, NHTSA is proposing that all newly manufactured commercial motor vehicles (CMVs) over 26,000 pounds to be equipped with either a 60, 65, or 68-mph speed limiter, while FMCSA is requiring that all motor carriers who operate such vehicles in interstate commerce be required to maintain the speed limiting devices for the service life of the vehicle. Since the NPRM is classified as a significant regulator action, as it is projected to cost in excess of $100 million, the agencies are required to conduct a preliminary regulatory impact analysis (PRIA).

In their commencement of the PRIA, the agencies determined that speed limiting devices are likely to have three main safety effects, which are: (1) a reduction in the severity of crashes by reducing the travel speed of heavy vehicles and thereby reducing the kinetic energy; (2) a prevention of some crashes by slowing heavy vehicles; and (3) a causation of crashes because of speed differential. The analysis focused only on the first effect however as the agencies ***believed*** that it was the primary impact of speed limiters and because they were unable to construct reliable estimates of the other two impacts. It should be noted that this has never limited the agencies in the past as FMCSA has previously attributed crash risk to form and manner violations, and yet the Agency is seemingly unable to estimate the increase in the number of crashes that will occur due to the escalation in interactions between vehicles traveling at different speeds. In regards to the two unquantified impacts nonetheless, the agencies stated, "We ***believe*** that the second, positive effect on safety is likely to be greater than the third, negative effect on safety.[1]"

For the analysis, the agencies only examined cases in which the speed of the heavy vehicle likely affected the severity of the crash (meaning crashes in which the heavy vehicle was the striking vehicle with the principal impact of the heavy vehicle at the front or front side, as well as single vehicle crashes) and crashes in which the heavy vehicle was likely traveling at a high rate of speed (e.g., rural and urban interstates, freeways and expressways, and principal arterials).[2] Rather therefore than only examining cases in which a heavy vehicle was speeding, the agencies focused on collisions which occurred in certain speed limits, namely 55, 60, 65, 70, and 75+ mph. The agencies then pulled data between 2004 and 2013 from the National Automotive Sampling System General Estimates System (NASS GES) and Fatality Analysis Reporting System (FARS) in order to accumulate a sample of 11,056 heavy vehicles (9,918 combination trucks, 904 single-unit trucks, and 234 buses) involved in fatal crashes.

[1] *Preliminary Regulatory Impact Analysis and Initial Regulatory Flexibility Analysis*, NHTSA, pg. 8

[2] For the target population: Collision includes only Front to Rear and Front to Side (Same Direction), Speed Limit includes 55, 60, 65, 70, 75, 80; Traffic Way Flow excludes only Entrance/Exit Ramp; GVWR includes 26,000 lb. and Up; Principal Impact Point are 1, 2, 10, 11, 12, O-clock; Roadway Functional Class includes Interstate (Rural and Urban), Freeways or Expressways, Other Principal Arterial (Rural and Urban).

Table 1: Fatal Crash Baseline by vehicles and speed limit

Speed Limit	Combination Truck	Single-Unit Truck	Bus	Total
55	3,133	471	91	**3,695**
60	768	86	17	**871**
65	3,135	229	79	**3,443**
70	2,212	102	37	**2,351**
75	670	16	10	**696**
Total	**9,918**	**904**	**234**	**11,056**

The agencies adjusted the target population by excluding the impacts of safety rules issued since 2009, namely the final rules adopting seat belt requirements for passenger seats in buses and the electronic stability control requirements for heavy vehicles. For the benefits estimate the agencies focused primarily on the risk of a fatality when a crash occurs, meaning that they assumed that the total *number* of crashes would not change regardless of a speed limiting device mandate.

In its analysis of the PRIA, the Owner-Operator Independent Drivers Association Foundation (OOFI), which is the research and educational arm of OOIDA, the largest non-profit national trade association representing the business interests of over 158,000 owner-operators and professional truck drivers, discovered a number of limitations with the agencies' research. The following paper not only summarizes the agencies' analysis but also enumerates the many flaws found throughout the PRIA.

Benefits

To estimate the safety benefits associated with the proposed rule, the agencies used (1) travel speed data to develop a model to predict how the fatal crash rate[3] would be affected by changing the travel speed; (2) used the probability of a fatal crash to derive the percent reduction of the fatal crash *rate* that would occur by reducing the travel speed; (3) used the FARS data and the observed heavy vehicle travel speed data to estimate the number of fatal crashes at various travel speeds; and (4) applied the percent reduction in the fatal crash rate for each travel speed above the speed setting to the estimated number of fatal crashes at each of those travel speeds to calculate the number of lives saved. The benefits were then subsequently utilized to predict the number of minor and serious injuries. This methodology was repeated to estimate the benefits for each speed limiter setting of 60, 65, and 68-mph.

While considering the estimated safety benefits, it is first crucial to understand the significance of the overall travel speed data. According to the agencies, "The assignment of the travel speed at which a crash occurs is ***critical*** in considering the ultimate goal of this analysis, which is to establish the relationship between travel speed prior to the crash and the probability of the crash resulting in fatalities. The agencies considered three ways of determining the travel speed of the heavy vehicle prior to the crash: (1) the travel speed of the heavy vehicle as reported in the crash databases (both FARS and

[3] Fatal crash rate is the ratio of the number of vehicles involved in fatal crashes to the total number of vehicles involved in police-reported crashes from FARS and GES. (Fatal crash rate = fatal crash ÷ (nonfatal crashes + fatal crashes))

GES); (2) the mean speed based upon observational research; or (3) the speed according to the distribution of the observed speeds for each speed zone (or posted speed).[4]"

The first method however was not utilized because a large number of the crashes (60%) in the FARS and GES databases reported the travel speed prior to the crash as "unknown or missing," and because those which were reported were usually reported as the speed limit of the road. "Considering that this analysis ***heavily*** depends on heavy vehicle travel speed…the agencies chose to assign the travel speed of each heavy vehicle according to the most likely travel speed using actual observed travel speeds on similar roadways. The agencies made this estimate in two ways (emphasis added).[5]"

Although the PRIA stated that "the agency's estimates have ***several*** limitations,[6]" the first and foremost limitation was that "the agency does not have real world data on travel speeds at the time of a crash, which necessitates simulations, of crash travel speeds. The agency attempts this simulation using two separate approaches, both of which have ***significant*** limitations. In both cases, the agency relies on travel speed data from a ***small non-representative*** sample of roads (emphasis added).[7]" Without accurate travel speed data at the time of a crash, how can the agencies effectively predict the number of fatalities and injuries saved? For the safety benefits were formulated by estimating the effect that a speed reduction would have on the severity of crashes. Additionally, the agencies did not have information concerning which heavy vehicles in the crash baseline were equipped with speed limiters.

In order to estimate the heavy vehicle travel speed at the time of the crash, the agencies utilized data from two studies, *Empirical Analysis of Truck and Automobile Speeds on Rural Interstates: Impact of Posted Speed Limits* and *Cost-Benefit Evaluation of Large Truck-Automobile Speed Limits differentials on Rural Interstate Highways*, which collectively observed travel speeds on 20 interstate highways in 13 states. However, in the first study, "only the speeds of "unrestricted" vehicles were measured; vehicles restricted by a leading vehicle were not measured. For this reason, the average speeds presented in this report might be slightly higher than the total mean traffic speeds.[8]" Moreover, the data collected for both 55 and 60 mph speed limited zones from the first study and the 55 and 65 mph zones in the second study, were taken from sites with differential speed limits where compliance for both trucks and cars were poor.[9] These figures unscientifically attribute a mean travel speed of 62, 63, and 66 mph for 55, 60, and 65 mph speed zones respectively, when these speeds have a high chance of being affected by the flow of traffic. Thereby, they might not be representative of all 55, 60, and 65 mph zones where there are uniform speed limits.

The first of the two approaches that the agencies utilized to estimate travel speed, assigned each crash the mean observed travel speed within each speed zone as witnessed in the two studies, meaning that

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[4] Ibid., pg. 47
[5] Ibid., pg. 47-48
[6] Ibid., pg. 35
[7] Ibid.
[8] Johnson and Murray, *Empirical Analysis of Truck and Automobile Speeds on Rural Interstates: Impact of Posted Speed Limits* (July 2009), pg. 5.
[9] Ibid., pg. 6; Johnson and Pawar, *Cost-Benefit Evaluation of Large Truck-Automobile Speed Limits differentials on Rural Interstate Highways*, Mack-Blackwell Transportation Center (2005), pg. 89, 97.

the average speed for a given speed limit was automatically designated as the travel speed of the heavy vehicle involved in a crash. While this approach did assign travel speeds according to the mean and standard deviation profile, it did not take account of the variance in speeds by speed limit. "In reality, fatal crashes occur at varying speeds, even on roads with identical posted speed limits. We cannot determine whether this method underestimates or overestimates benefits…This approach is limited in that while assigning the mean speed to every heavy vehicle represents the most likely travel speed for that particular crash, it is unlikely that every heavy vehicle involved in a crash is actually traveling at one of the five observed mean travel speeds (one mean observed travel speed for each speed limit of 55, 60, 65, 70, and 75+).[10]"

Although the PRIA focused only on crashes which occurred on certain roadways with speed limits of 55 mph or higher, it is important to note that OOFI's analysis of the 2015 FARS database indicated that 80% of fatal crashes in which the travel speed was recorded occurred below 55 mph and that 21% were reported as motor vehicle stopped in transit. A strong possibility therefore exists that observed travel speed data does not accurately reflect the true speeds of heavy vehicles prior to a crash.

Table 2: Fatal Crashes involving heavy vehicles by travel speed, 2015 FARS database

Travel Speed	Combination Truck	Single-Unit Truck	Buses	Total	Percentage
Stopped Mot. Veh. In Tran.	242	40	25	307	**21%**
0-30 MPH	158	55	29	242	**16%**
31-35 MPH	48	13	8	69	**5%**
36-40 MPH	56	14	3	73	**5%**
41-45 MPH	118	25	5	148	**10%**
46-50 MPH	8	2	4	14	**1%**
51-55 MPH	297	54	5	356	**24%**
61-65 MPH	152	10	2	164	**11%**
66-70 MPH	73	2	0	75	**5%**
71-75 MPH	15	1	0	16	**1%**
76-80 MPH	3	0	1	4	**0%**
81-85 MPH	1	0	0	1	**0%**
86-90 MPH	0	0	0	0	**0%**
91 MPH or greater	2	0	0	2	**0%**
Total Reported	1,173	216	82	1,471	**100%**
Not Reported	1,529	224	97	1,855†	**51%**
Unknown	149	58	21	229†	**6%**
Total	2,933	510	201	3,651†	**100%**

"The second approach assumes a normal distribution of crash speeds for each speed limit, though the agency does not have evidence that fatal crash travel speeds are normally distributed. However, crash physics suggest that crashes at higher speeds are more likely to be fatal than crashes at lower speeds. Without actual travel speed data from fatal crashes, however, this assumption cannot be confirmed or

[10] PRIA, pg. 35 and 48

quantified.[11]" In other words, this approach assigned travel speeds based on the distribution of mean travel speeds and standard deviation of all observed travel speeds, since physics would suggest that the mean travel speed in fatal crashes would be higher than the mean travel speed in non-fatal crashes. Nevertheless, the information provided on the target population demonstrates that the there was a higher likelihood of a fatality in ***lower*** speed limited zones for combination and single-unit trucks than in higher speed limited zones.

Table 3: Occupants involved in Fatal Combination and Single-unit Truck Crashes, FARS 2004-2013

Speed Limit	Combination Trucks			Single-Unit Trucks		
	Fatal Injury	Percentage	Total	Fatal Injury	Percentage	Total
55	3,327	37.4%	8,889	491	37.4%	1,314
60	811	34.8%	2,330	89	34.6%	257
65	3,120	33.6%	9,280	249	28.1%	886
70	2,424	34.2%	7,087	114	36.8%	310
75	730	32.1%	2,274	15	28.3%	53
Total	**10,412**	**35%**	**29,860**	**958**	**34%**	**2,820**

The agencies also noted difficulties and limitations of utilizing both FARS and GES databases in the calculations as the fatal crashes or occupant fatalities from FARS are census data and the non-fatal crashes from GES are survey data with sampling weights. Additionally, GES data are collected from sixty primary sampling units (PSU) across the United States, whereas FARS data has no information of PSU or weights. "It is more challenging to describe and interpret similar vehicle crashes consistently using the variables from two different databases, and the similar variables from FARS and GES may also have different missing rates or slightly different interpretations.[12]"

The agencies ultimately utilized multiple model runs that included both approaches. Additionally, the model runs used two types of multivariable regression logistic models, each using two approaches, vehicle-based and person- or occupant-based. The vehicle-based approach examined: (1) crash conditions such as type and speed of a heavy vehicles, (2) number of lanes, and (3) weather condition; while the person-based approach examined: (1) crash conditions such as type and speed of a heavy vehicles, (2) number of lanes, (3) weather condition, (4) belt usage, (5) age and sex, and (6) seating position.

For the vehicle-based model, the agencies only utilized crash data from the highway types coded as rural or urban interstate (FARS) and interstate highway (GES) as they were comparable between the two databases. However, this has an impact on the fatal crash rate, or the risk of a crash resulting in a fatality, as it limits the pool of crashes. Table 4 below is in contrast to the Table 3 above.

[11] Ibid., pg. 35
[12] Ibid., pg. 56

Table 4: Risk of Fatal Combination Truck crashes by speed limit, FARS/GES Vehicle Ratio 2004-2013, Interstate Only

Speed Limit	Vehicles involved in fatal crashes	All vehicles (non-fatal and fatal)	Percentage
55	722	36,168	2%
60	364	19,786	2%
65	1,889	36,204	5%
70	1,854	33,299	6%
75	641	16,738	4%
Total	**5,470**	**142,195**	**4%**

After utilizing the travel speed distribution approach for a set speed limit for the vehicle-based model, and after considering variables such as road condition and lane number, the agencies stated that the risk of a fatal crash would increase by 4.7% for a combination truck (CT) traveling at a higher speed (by 1 mile). "Poor road surface conditions (wet, icy, etc.) would result in approximately 37% higher risk of fatal crash incidents, or 37% more likely to cause some fatal crashes, while lane number is not a significant factor.[13]" When using the mean speed approach, which had a much narrower speed range,[14] the agencies found that a CT traveling at higher speed (1 mph) had approximately 15% higher risk of being involved in a fatal crash than the lower speed vehicle and 44% for poor road surface conditions. Thus, the road surface conditions had a greater role in the risk of a fatal crash than the speed. The agencies failed to mention this however.

While the results of the vehicle-based odds ratios for CTs were statistically significant, the sample size for both single-unit trucks and buses was too small to yield significant results, and yet the agencies continued to use the said ratios to formulate the safety benefits of the rule.

In addition to the vehicle-based model, the agencies also considered a person- or occupant-based model to predict the probability that a person would experience a fatal injury. The occupant-based model utilized the same risk factors as the vehicle model with the inclusion of seat belt use status, occupant gender, age, and seating position. The agencies first utilized the travel speed distribution approach which showed that the risk of a fatality would increase by 3.3% when the speed of a CT is increased by 1 mph, whereas the mean travel speed approached showed a 15% increase in risk. Similar to the vehicle-based model, the occupant or person-based model also yielded non-statistically significant results for SUT and buses.

The effectiveness of the speed limiting device was ultimately represented by the difference between the fatal crash rate at travel speeds that are higher than the speed limiter setting (60, 65, 68 mph) and the fatal crash rate at the proposed speed setting, which is zero.[15] This presents a significant limitation however, as the exact travel speed at the time of the heavy vehicle crash is unknown. For CTs, the agencies selected the lowest odds ratio of 1.047 (4.7%) from the vehicle-based approach with the travel

[13] Ibid., pg. 61
[14] The speed range was based on the observed mean travel speeds of 62 mph for 55 mph zones and 68.8 mph for 70 mph. Ibid., pg. 57
[15] Ibid., pg. 78

speed distribution for the upper bound and 1.033 (3.3%) from the person-based approach as the lower bound for the safety benefit estimate. The same was also true for the non-statistically significant figures for SUT and buses.

Table 5: Number of lives saved by Heavy Vehicle by Odds Ratio

	Combination Truck				Single-unit Truck				Buses			
	Vehicle-based		Person-based		Vehicle-based		Person-based		Vehicle-based		Person-based	
Approach	TSD	MTS	TSD	MTS	TSD	MTS	TSD	MTS	TSD	MTS	TSD	MTS
Odds Ratio	1.047	1.154	1.033	1.150	1.014	1.079	1.035	1.097	0.996	1.081	1.024	1.165
Lives Saved	**84**	**204**	**62**	**201**	**1**	**4**	**2**	**5**	**0**	**3**	**1**	**5**

TSD - travel speed distribution
MTS - mean travel speed

Non-fatal Injuries and PDO prevented

In order to estimate the number of property damage only (PDO) vehicle involvements and injuries prevented, the agencies utilized an analysis for a 2009 NHTSA rulemaking amending FMVSS No. 121, Air Brake Systems using 2004-2006 GES and FARS data. The 2009 analysis subsequently originated from a 2002 regulatory analysis and evaluation report on NHTSA's Tire Pressure Monitoring System FMVSS No. 138.

For the current speed limiter rulemaking, the agencies applied the ratio of prevented injuries based on the estimated benefits of enhanced brakes in CT crashes. For example, enhanced brakes were predicted to prevent about 18 (18.32) times higher number of Maximum Abbreviated Injury Scale (MAIS) 1 injuries when compared to the total number of lives saved. Thus the agencies applied the ratio of enhanced brakes to the number of lives which the speed limiter rule is estimated to save (18.32 X 85[16] = 1,551 MAIS 1 injuries prevented).

However, "The agencies recognize the differences between this rule and the air brake rule that could affect the ratio of injuries to fatalities. First, there are differences in target populations. The air brake rule only includes crashes with brakes applied. The target population for speed limiters includes both braked and unbraked crashes. The air brake rule target population includes all roads, whereas this speed limiters target population only include roads with a posted speed limit of 55 mph and higher. Second, the air brake rule attempts to measure both crash avoidance and crash mitigation benefits. However, this rule only measure crash mitigation benefits. Third, the air brake rule only applies to combination trucks whereas this analysis applies the same ratios to all heavy vehicles, including single unit trucks and buses.[17]"

Fuel Consumption

The PRIA also estimated that the NPRM would reduce fuel consumption by increasing fuel efficiency; however, reducing a vehicle's speed does not necessarily correlate to better efficiency, a fact that the

[16] The agencies continually rounded up throughout the PRIA, thus some numbers do not match. For example, the 85 lives saved mentioned here was previously stated as 84.
[17] Ibid., pg. 96-97

agencies did not even consider. When the travel speed is limited to 65 mph, the agencies believe that 344 million gallons of fuel would be saved annually and that 3.5 million metric tons of greenhouse gas (GHG) emissions would be reduced annually.

As part of their fuel savings analysis, the agencies examined studies conducted by the American Trucking Association and the Mack-Blackwell Transportation Center which concluded that for each increase in one mph above 55 mph, fuel efficiency will decrease by 0.1 or 0.08 miles per gallon. The agencies utilized these figures in order to estimate the fuel savings associated with limiting the speed of heavy vehicles. The Mack-Blackwell study noted however that "in addition to the absolute vehicle speed, speed variance in the traffic flow also has an effect on fuel efficiency when both trucks and automobiles decelerate and accelerate to maneuver around slower traffic. As illustrated by the computer simulation in this study, speed differentials significantly increase the number of interactions among vehicles. The negative impact of traffic speed variation on fuel efficiency has not been addressed in the research literature or as a policy issue.[18]"

While the Mack-Blackwell study concluded that the frequency of interactions with other vehicles by a vehicle traveling 10-mph below the posted speed limit was 227% higher than moving at traffic speed,[19] the agencies did not consider the effect that speed differentials have on overall fuel efficiency. Unless such an analysis is conducted, the agencies' projected fuel savings benefit should not be viewed as conclusive.

Regardless, the agencies first created a baseline from the Federal Highway Administration's (FHWA) 2013 travel data to examine the possible fuel savings associated with the speed limiters. From the data, it was estimated that CTs traveled 87,484 million miles on rural and urban interstates in 2013 while averaging 5.8 mpg. Single-unit trucks (SUTs) and buses were estimated at 4,629 million and 3,658 million miles while receiving 7.3 mpg and 7.2 mpg respectively. The agencies further adjusted the baseline by accounting for both phases of the recent Environmental Protection Agency and NHTSA Greenhouse Gas Emission and Fuel Economy Standards rulemakings. Thus two baselines were subsequently generated, a phase 1 baseline, which increased the fuel economy (mpg) by 20% for CTs, 15% for SUTs, and 10% for buses, and a phase 2 baseline that increased the fuel economy by 24% for CTs and 15% for SUTs and buses.

Table 6: Fuel Consumption Baseline, FHWA 2013

Vehicle	Million VMTs	Fuel Economy	Phase 1 Baseline	Phase 2 Baseline
Combination Trucks	87,484	5.8 mpg	20%	24%
Single-unit Trucks	4,629	7.3 mpg	15%	15%
Buses	3,658	7.2 mpg	10%	15%

The agencies calculated the effect of speed limiters on fuel savings by also estimating the current vehicle miles traveled (VMT) by heavy vehicles, the vehicles' travel speeds, and the vehicles' fuel economy for five categories of roads: 55 mph, 60 mph, 65 mph, 70 mph, and 75 mph. Next, the agencies utilized a

[18] Johnson and Pawar, pg. 129
[19] Ibid., pg. 98

two-step approach in order to overcome the lack of real-world data concerning the fuel efficiency performance of heavy vehicles on the road. The first step was to include the results of a *survey* of commercial fleet managers from the Mack-Blackwell study which found that for every 1 mph increase above 55 mph, there was a 0.08 mpg decrease in fuel economy. The agencies therefore divided the lower end of the Mack-Blackwell estimate by FHWA's estimated average fuel economy to assume that by decreasing the operating speed by 1 mph, fuel economy will increase 1.37% (0.08 mpg ÷ 5.85 mpg = 1.37%).

The second step was to consider whether the aerodynamic improvements associated with the Phase 2 GHG Rule would reduce the magnitude of the supposed increase in fuel economy associated with speed limiters. The agencies contracted the Southwest Research Institute (SWRI) to conduct simulations of the effect of speed limiters on fuel economy. The simulations were completed using a Kenworth T700 tractor in combination with a 53-foot box van trailer. SWRI ran a number of simulations over a speed range from 60 mph to 80 mph on level ground and rolling terrain, as well as five different payloads: empty, 50%, 100%, 38,000 pounds, and 42,000 pounds. The agencies ultimately concluded that the Phase 2 Rule would not reduce the effectiveness of a speed limiter.

It is important to note that the agencies did not have actual travel data at each posted speed limit, so in order to calculate the fuel economy savings, the agencies assumed that the number of crashes on roads within a certain posted speed limit was an appropriate proxy for travel volume to estimate VMT (see Table 7 below). Therefore, similar to estimating the safety benefits without the true travel speed of the heavy vehicles, the agencies did not have the real-world data needed to calculate an appropriate estimate, as they did not know the VMT for each posted speed limit.

Table 7: Combination truck crash rate by posted speed limit, Interstate, 2004-2013 GES, 10 years

Crashes	Speed Limit					
	55	60	65	70	75	Total
Vehicles involved in PAR	35,643	19,613	34,957	32,433	17,166	139,812
Estimated % VMT	25%	14%	25%	23%	12%	100%

The agencies combined the travel data from FHWA with the observed speeds from Johnson and Murray (2009, ATA) and Johnson and Pawar (2005, Mack-Blackwell) that were used to estimate the mean travel speeds of heavy vehicles. The agencies noted that the average observed speed on roads with a posted speed limit of 75 mph is slightly lower than the observed speed for 70 mph, thus they believe that 68-69 mph represents the fastest average speed trucks will travel regardless of speed limit. In other words, a speed limiting device of 68 mph will do little to nothing, while a 65 mph speed limiter will only decrease the average speed by 3 mph, or 4.6%. Utilizing the mean speed and standard deviation the agencies generated normal distributions of travel speed, ranging from 45 to 85 mph, for each posted speed limit and then allocated the VMT for each respective speed limit. From here, it was estimated that the average truck travel speed on all roads with a posted speed of 55 mph or greater was 65.4 mph.

For the fuel savings analysis, the agency utilized FHWA's 5.85 mpg estimate at an average speed of 65.4 to calculate the base fuel economy for a 65 mph speed limiting device (65.4 – 65 = .4 x 1.37% + 5.85 =

5.88 mpg). The agencies then considered the phase 1 and phase 2 proposed standards to adjust the base 65 mph fuel economy by 20% for CTs, 15% for SUTs, and 10% for buses for phase 1, and 24% for CTs and 15% for SUTs and buses for phase 2. This resulted in a baseline of 7.06 mpg at 65 mpg post-phase 1 and 8.76 mpg post-phase 2. The agencies then used the fuel economy baseline estimates and the total VMT at each travel speed to calculate the amount of fuel consumed at each travel speed. These figures were then subtracted by the estimated fuel consumption derived from an overall travel speed of 65 mph to achieve a fuel savings of 377.34 million gallons. The fuel savings were monetized by using the 2015 Annual Energy Outlook. The agencies estimated that the average diesel fuel price over the life of a combination truck would be $3.663 per gallon, equating to $784 million in savings for phase 1 and $632 for phase 2 (both discounted at 7%).

Table 8: Estimated fuel savings using a 65 mph speed limiting device on combination trucks, in millions of gallons

	Phase 1 baseline	Phase 2 baseline
Baseline fuel consumed at ≥ 65 mph	7,232.13	5,832.36
Estimated fuel consumed at 65 mph using speed limiter	6,854.79	5,528.06
Estimated fuel savings	**377.34**	**304.3**

Table 9: Summary of annual Societal fuel savings with 65 mph speed limiter (in millions of gallons and 2013 dollars)

Vehicle Type	Phase 1 CAFE Baseline				Phase 2 CAFE Baseline			
	Fuel	no-discount	3%	7%	Fuel	no-discount	3%	7%
CT	377	$1,220	$988	$784	304	$984	$796	$632
SUT	36	$113	$91	$73	32	$98	$80	$63
Bus	9	$30	$24	$19	8	$26	$21	$17
Total	**423**	**$1,363**	**$1,103**	**$876**	**344**	**$1,108**	**$897**	**$712**

It is important to note however that the current average diesel fuel price is $2.832 according to the U.S. Energy Information Administration,[20] which would result in a drastic change in the overall fuel savings. The agencies noted that "if fuel prices are lower, a larger portion of the labor force would have wages that produce net losses for fleets.[21]" While examining the cost effectiveness of the NPRM for small businesses, it was stated that the cost of the fuel would ultimately determine if speed limiters were financially beneficial. For example, if a single truck was decreased from 70 mph to 65 mph, moving goods would take 27 hours longer each year, costing $542 in additional labor. This cost would be offset by saving 196 gallons of fuel, but if the price of fuel is less than $2.77 per gallon ($542 ÷ 196 = $2.77), limiting the speed setting from 70 mph to 65 mph would not be financially beneficial.[22] The future cost of fuel was not considered in the analysis.

[20] http://www.eia.gov/petroleum/gasdiesel/
[21] PRIA, pg. 189
[22] Ibid., pg. 190

Costs

The agencies estimated that there would be no costs for heavy vehicle manufacturers associated with speed limiters for either equipment or compliance tests. The agencies still requested comment on this nonetheless. Although the rule did not propose a tamper resistant speed limiter, which would increase the cost for the manufacturers, the agencies still estimated the costs associated with such a device. There are two primary designs to render an electronic control unit (ECU) tamper resistance, Pass Code and Hard Code.

The Pass Code design has two options, the first option would not be tamper resistant while the second would make the speed limiting device factory password protected at the original engine manufactory. Therefore the vehicle owner would need to pay approximately $300 per vehicle to make any changes. The Hard Code design permanently establishes a speed setting and would eliminate the possibility of any speed limiting change unless the entire ECU is replaced, resulting in costs of $2,000 or more. The agencies assumed that the second Pass Code option would be the design selected, which would add $44 million to the total cost of the rule based on 2007 dollars.

The primary cost associated with the NPRM was the delay in delivery time. Since the proposal would limit travel speeds, those commercial motor vehicle (CMV) drivers will not be able to reach their destinations in the same amount of time, thus delaying their delivery. The delay would be further compounded by those CMV drivers operating under the hours-of-service regulations.

Without true travel data for heavy vehicles at each posted speed limit, the agencies examined the GES database between 2004 and 2013 and used the crash rate at certain speed limits as a proxy for travel volume. Thus as 25% of all crashes occurred on 55 mph speed limited roads, the agencies assumed that 25% of the VMT were driven on these roadways (see Table 7 above). The agencies then utilized the same speed distribution model which was used to estimate the safety benefits to generate the number of miles traveled at each speed.

To estimate the delay in deliver time, the agencies used FHWA's 2013 data stating that combination trucks (CTs) traveled 87,484 million miles on rural and urban interstates. It was then estimated that 98% of CTs were vehicles with a GVWR of 26,000 pounds and greater, while 95% of crashes occur at a posted speed between 55 mph and 75 mph. Following these adjustments, it was figured that CTs with GVWR of 26,000 lbs. or more traveled 81,778 million miles on roads with speed limits between 55-75 mph.

Utilizing these assumptions, the CT VMT for each posted speed limit (55, 60, 65, 70, and 75 mph) was distributed to estimate that CTs traveled 1,249.841 million hours, compared to 1,289.796 million hours for a 65-mph speed setting. The agencies thereby estimated that the overall delay in delivery time would increase by 3%, or 40 million hours, when vehicles are limited to 65 mph. Nevertheless, this does not fully take into account the hours-of-service regulations which would further increase the delay in delivery time.

The agencies stated that because truck drivers are primarily compensated by the mile, "the delay in delivery time would not impact how much trucking company drivers can earn as they deliver cargos thru the delivery routes as long as the maximum hours of operation is not exceeded by the delay in delivery time." However, for truckers, and especially owner-operators, this delay in delivery time has a very real impact on what they can earn as it can eliminate the number of loaded miles completed in a given year.

According to OOFI's *Detention Time Study Survey*, 76% of drivers and owner-operators lost at least one load per month due to an average detention time between 11 and 20 hours per week. The majority lost three to four loads per month,[23] which will have a great impact on the cost of the rule and a driver's bottom line. Further, the American Transportation Research Institute documented that traffic congestion resulted in more than 728 million hours of lost productivity, or $50 billion in operational costs, to the trucking industry in 2014. The impact of congestion cost per truck averaged nearly $27,000 for those travelling 150,000 miles annually.[24] Speed limiters will certainly increase the impact of congestion, an issue which the agencies did not even consider in their analysis. In the end, the agencies considered the following three cost elements:

1. The quality of life and/or well-being of drivers because of reduced free time (leisure time/lost opportunity cost)
2. Hiring additional drivers to compensate for longer delivery times (operational cost)
3. Costs due to loss in value from slower deliveries (freight inventory cost)

The proposed rule focused on two principal cost issues, namely transfer payments and real costs. Transfer payments were defined as "monetary payments from one group to another that do not affect the total resources available to society.[25]" Thus as motor carriers hire drivers who are currently employed by other businesses outside of the industry, transfer payments would occur and as such these costs were not included in the costs estimate. Real costs included those associated with longer delivery times due to speed limiting devices. The agencies stated that "this cost will either be borne directly by trucking companies who must hire new drivers (increase in operational cost) or current drivers may drive longer hours without an increase in income (lost opportunity cost).[26]"

The lost opportunity cost was figured by using the Department of Transportation's "Revised Guidance on Valuation of Travel Time in Economic Analysis," which recommended that the value of travel time (VOTT) for personal intercity travel time of 70% of total earnings. The agencies therefore used $17.50 in 2013 dollars to estimate the lost opportunity cost ($17.50 per hour x 40 million hours for CTs = $700 million).

The agencies also examined current drivers' wages plus fringe benefits, similar to the Electronic Logging Device Regulatory Impact Analysis, to value non-work time. The agencies accepted FMCSA's assumption that drivers value their leisure time at the same amount that they accept in exchange for it, meaning their current base wage plus fringe benefits. Utilizing the ELD RIA, the agencies multiplied the 2013

[23] *Detention Time Study Survey*, OOFI (2016)
[24] http://www.trucknews.com/transportation/congestion-on-us-highways-costing-trucking-industry/1003071674/
[25] PRIA, pg. 145
[26] Ibid., pg. 145-146

hourly wage for truck drivers from the Bureau of Labor Statistics ($20.08) by the fringe benefits (55%) to receive an hourly wage of $31.12.

Additionally, the agencies estimated the costs associated with the loss in value resulting from slower deliveries known as freight inventory costs by using FHWA hourly inventory costs for payload values of CTs and SUTs of $0.31 and $0.18 per hour respectively in 2010 dollars. To calculate the inventory costs, FHWA computed an hourly discount rate, which is equal to the average prime bank lending rate plus one percent and divided by the number of hours in a year, and multiplied by the value of a composite average shipment. FHWA figured the discount rate to be 0.000485%, while the payloads for CT and SUTs were 42,000 pounds and 25,000 pounds respectively. The average value of commodities shipped by truck was estimated to be $1.52 per pound on a ton-mile weighted basis and was multiplied by the hourly discount rate to produce an hourly value of freight inventory for 2010 of $7.37E-06/lb./hr. This figure was then multiplied by the average payload and adjusted to 2013 dollars to generate an hourly inventory cost of $0.33 for CT and $0.19 for SUT.

In order to estimate for social costs, the agencies took into account the VOTT of personal intercity travel ($17.50) and the freight inventory costs for combination trucks and single-unit trucks ($0.33 and $0.19 per hour, respectively). Nevertheless, the agencies did not include value of truck travel time. They also did not consider opportunity cost for lost loads, for if it takes longer to complete a load due to the decrease in travel speeds, owner-operators will receive fewer loads per year, thus a decrease in available gross income.

Table 10: Societal Costs associated with 65 mph speed limiter

Vehicle Type	Hours in Millions	Societal cost/hr	Freight inventory cost/hr	Not discounted	3%	7%
Combination truck	40	$17.50	$0.33	$712.00	$577.00	$457.00
Single unit truck	5	$17.50	$0.19	$83.00	$67.00	$53.00
Bus	1	$17.50	$0.00	$20.00	$16.00	$13.00
Total	46	$17.50	$0.52	$815.00	$659.00	$524.00

Fleet Costs

The agencies utilized two potential scenarios for large carriers to estimate the costs associated with a speed limiting device: (1) drivers would drive longer hours but keep the same miles traveled, and (2) the agencies assumed that the drivers will be paid the same amount regardless of the fewer miles driven.

Scenario 1

While reviewing the various business models of large truck carriers under the first scenario, the agencies noticed that company drivers could be separated into three groups based on the hours of service (HOS): "Group 1 consists of drivers currently well below the maximum HOS restrictions; Group 2 consists of drivers who are somewhat below HOS maximum restrictions; and Group 3 consists of drivers currently at or very close to the HOS maximum.[27]"

Since the agencies are only focused on lost leisure time, they assumed that there would only be lost opportunity costs for drivers in Groups 1 and 2, as they would drive longer hours without exceeding the maximum HOS limits. A foremost issue with both scenarios however is that the agencies falsely assumed that drivers will be able to travel approximately the same amount of miles over a year, not realizing that a delay in delivery time, along with subsequent HOS restrictions, will limit the total number of miles that a driver can operate, thereby reducing their overall income. Additionally, hiring new drivers could very well take away loads from current drivers. The fact that drivers will receive less loaded miles overall per year because of the delayed delivery time is not considered in the analysis.

In an attempt to figure for delivery times, the agencies admit that one concern associated with decreasing travel speed is that deliveries which come close to the maximum HOS limits will no longer be completed within a single day. The agencies however have limited data on HOS "to estimate the delay in delivery time with the proposed 65 mph speed limiting device. (Various industry firms are currently collecting information on driver e-logging data, but there are no final or full studies that have been completed yet.)." If there is no research to quantify this issue, why then are the agencies proceeding with a rulemaking?

In order to estimate the time drivers spend on-duty, the agencies reviewed a report by the Virginia Tech Transportation Institute (VTTI) entitled *The Impact of Driving, Non-Driving Work, and Rest Breaks on Driving Performance in Commercial Motor Vehicle Operations*, which studied 96 commercial drivers (75 long-haul drivers and 21 line-haul drivers) from four large carriers. The VTTI report found that drivers spend approximately 65.7% (9.2 hours) of their 14-hour shift on-duty driving, 22.8% (3.2 hours) on-duty not driving, and 11.5% (1.6 hours) resting and other activities.

The agencies "note that the VTTI study was not an attempt to characterize work and rest patterns in the motor carrier industry. Its purpose was to examine "the relationship between safety-critical events and driving hours, work hours, and breaks." There were a relatively ***small number*** of drivers (97) in the study, none of whom drove buses or made local deliveries. Although those 97 drivers were not intended to be a representative sample of driving patterns in the entire motor carrier industry, due to ***limited data*** and relatively high costs associated with HOS studies, the time-in-transit analysis was made based on the driving hours recorded in the study (emphasis added).[28]" Rather than push the rulemaking forward with limited data, the agencies should first study the issue properly.

Using an average driving time of 9.2 hours, the agencies assumed that 50% of drivers would operate either above or below 9.2 hours, thereby creating a range between 7.4 and 11 hours [(11 max hours – 9.2 average hours = 1.8 hours), (9.2 hrs. – 1.8 hrs. = 7.4 minimum driving hours)]. Next the agencies utilized a 3.2% increase of delivery time for CTs to figure that drivers who currently drive more than 10.65 hours per shift would not be able to deliver the same amount of payload within the required 11

[27] Ibid., pg. 150
[28] Ibid. pg. 155-156

hours of driving [11/(1+0.032) = 10.65 hours rounded]. Utilizing a triangular distribution as a proxy for HOS due to the lack of a standard deviation, the agencies estimated that only 2% of CMV drivers would not be able to deliver the same amount of payload within the maximum HOS limits. Nevertheless, there are many more variables attributed to the number of hours available to drive in any given day, including parking, detention time, etc.

Under scenario 1, the agencies estimated that new drivers would be needed to cover 0.5 million hours (40 million hours in delay in deliver time x 70% amount of freight hauled by large carriers = 28 million hours, 28 million hours x 2% of drivers who could not complete a load within one day = 0.5 million hours needed). Thus the lost opportunity cost for CT drivers employed by large carriers was estimated to be $309 million with 65 mph speed limiting devices with a discount of 7% and $481 million with no discount (28 million hours – 0.5 million hours = 27.5 million hours, 27.5 million hours x $17.50 lost opportunity cost = $481M, $309 at 7% and $389 at 3%). Inventory cost was $6 million discounted at 7% (28 million hours of delay in deliver time x $0.33 inventory cost/hr = $9.23M, $6 at 7% and $7 at 3%).

In contrast to large carriers, the agencies correctly recognized that small trucking companies and owner-operators will not be able to hire additional drivers due to limited resources. The agencies falsely assumed however that the only cost to drivers employed by small carriers and owner-operators would be lost opportunity costs associated with less leisure time due to driving more hours. Again, the missed opportunity of loads and loaded miles will reduce the bottom line of owner-operators and small businesses.

For a 65 mph speed limiter, the agencies estimated that the total delay in delivery time for small carriers and owner-operators would be 12 million hours (1,289.796 million hrs. with a 65 mph speed limiter – 1,249.841 million hours with the baseline = 40 million hours (39.95 million hours x 30% VMT by small trucking company = 12 million hours). Utilizing the previous estimates that 2% of drivers would exceed the maximum HOS and a 3.2% delay in delivery time, the agencies concluded that 0.2 million hours would need to be absorbed by large carriers hiring new drivers since small companies lack the necessary resources (40 million hours x 30% = 12 million hours, 12 million hours x 2% = 0.2 million hours, rounded). The total lost opportunity cost for small trucking companies and owner-operators was estimated to be $132 million with 65 mph speed limiters, discounted at 7% for the delay in delivery time (12 million hours – 0.2 million hours = 11.8 million hours, 11.8 million hours x $17.50 = $206M, $132M at 7% and $167M at 3%, rounded). Excluding the costs associated with new drivers (transfer costs), the total lost opportunity cost for large and small businesses was estimated to be $449 million discounted at 7%, while the total cost for scenario 1 was $471 at 7%.

Table 11: Overall cost for combination trucks (millions in 2013 dollars) for *Scenario 1* with 65 mph speed limiters

Scenario 1, CT	Not discounted			discounted at 7%		
	Large	Small	total	Large	Small	total
(Lost opportunity cost, current drivers)	$480.68	$206.00	$686.68	$309	$132	$441
(Lost opportunity cost, new drivers)	$8.78	$3.77	$12.54	$5.64	$2.42	$8
(Cost to hire new drivers)	$22.37	$0	$22.37	$14	$0	$14
(Inventory cost)	$9.22	$3.96	$13.18	$6	$3	$8
Total			**$722.23**			**$471**
Total lost opportunity cost						**$449**
Total Societal Cost						**$457**
Total Fleet cost without inventory cost, at 7%						**$14**
Total Fleet cost with inventory cost, at 7%						**$22**

Scenario 2

For the second scenario, it was assumed that drivers employed by large truck and bus companies will be paid the same amount of income despite the fewer miles driven. The agencies believed that these carriers will hire additional drivers to make up the difference in delivery capacity, thus drivers will receive the same wages. The potential costs associated with this scenario are therefore incurred by the motor carriers. The agencies used their estimate of $31.12 per hour for current driver wages (wages plus fringe benefits) in order to figure the cost of the rule for fleets. The agencies thus assumed that impacts on current drivers would be insignificant, not realizing that the hiring of additional drivers to cover the delay in delivery will likely reduce their number of overall miles.

The total combined transfer and opportunity cost was estimated at $1,021 million at 7% for scenario 2 with 65-mph speed limiters. The total cost included $564 million for new drivers with $31.25 hourly wage plus fringe benefits (transfer cost), $449 million for lost opportunity costs, and $8 million for inventory. Although not directly stated, Scenario 2 would add a significant number of trucks and drivers onto the roads in order to cover the delay in delivery goods. This would add to the congestion on the highways and negatively impact both safety and the environment.

Table 12: Overall cost for combination trucks (millions in 2013 dollars) for *Scenario 2* with 65 mph speed limiters

Scenario 2, CT	Not discounted			discounted at 7%		
	Large	Small	Total	Large	Small	Total
(Lost opportunity cost, current drivers)	$0.00	$206.00	$206.00	$0	$132	$132
(Lost opportunity cost, new drivers)	$0.00	$493.23	$493.23	$0	$317	$317
(Cost to hire new drivers)	$877.18	$0	$877.18	$563.76	$0	$564
(Inventory cost)	$9.22	$3.96	$13.18	$6	$3	$8
Total			**$1,589.59**			**$1,021**
Total lost opportunity cost						**$449**
Total Societal Cost						**$457**
Total Fleet cost without inventory cost, at 7%						**$564**
Total Fleet cost with inventory cost, at 7%						**$572**

For the two scenarios however, the agencies believed that scenario 1 was more likely because in their view it represented the current business model. OOFI questions the reasoning behind the selection of scenario 1 as neither scenario is more representative of the industry than the other. It appears instead that scenario 1 requires less analysis on the safety and environmental impacts of placing more drivers and trucks onto the nation's highways.

Table 13: Societal and Inventory Costs associated with the delay in delivery time with 65 mph speed limiter (millions in 2013)

Cost	CT		SUT		Bus		Total	
	3%	7%	3%	7%	3%	7%	3%	7%
Opportunity cost	$566.00	$449.40	$66.00	$52.40	$15.90	$12.60	$647.80	$514.40
Inventory cost	$10.70	$8.50	$0.90	$0.70	$0	$0	$11.60	$9.20
Total Societal cost	**$576.70**	**$457.90**	**$66.90**	**$53.10**	**$15.90**	**$12.60**	**$659.40**	**$523.60**

Impacts on CMV Driver Employment

In order to estimate the number of new drivers necessary to cover the delay in delivery time, the agencies divided the cost to hire additional drivers by the Bureau of Labor Statistics average annual income for truck drivers, which was $40,940. Although the cost to hire new drivers was estimated at $14 million (discounted at 7%) for Scenario 1 and $564 million for Scenario 2, the agencies stated that the cost for additional drivers ranged from $16.4 million to $151 million. They therefore estimated that CT carriers would need to hire approximately 4,000 new drivers (lower range of 400 ($16.4 million ÷ $40,940 = 400) and upper range of 3,688 ($151 million ÷ $40,940 = 3,688), and that speed limiters would increase employment by 0.3% (3,688 new drivers ÷ 1.5 million CT drivers = 0.3%).

If the agencies were to utilize their figures from their Cost chapter however, the number of additional drivers required would be 13,776 ($564 million ÷ $40,940 = 13,776).[29] FMCSA has estimated in previous

[29] In the agencies calculations that utilized the figure from Scenario 2, thus OOF did likewise

rulemakings that the ratio between drivers and trucks is roughly 1:1, hence this proposal would add at least 13,776 more trucks on the nations roadways.

Small Businesses

The agencies do not expect that small carriers and owner-operators will be able to compensate for the effects of the rule and that they will lose loads as a result. The agencies believe instead that larger trucking companies will absorb the additional cargo with their reserve capacity of trucks.

To estimate the economic impact for a substantial number of small businesses, two factors were considered, (1) delay in delivery time and (2) competitiveness. As small carriers represent 90% of the trucking industry, the agencies believe that small businesses and owner-operators would be unable to compensate for the delay in delivery time if a speed limiting device is required. The agencies assumed through *anecdotal* information that owner-operators traveled 30% of the VMT by truck drivers (81,778 million miles x 30% = 24,533 million miles) and earn $0.42 a mile in profit, meaning after all expenses. For the small business impact analysis, it was assumed that owner-operators drive the same amount of hours as company drivers and that 2% of owner-operators would not be able to deliver the same amount of payload within the required 11 hours of driving similar to the delay in delivery time estimates used earlier in the PRIA. The agencies therefore only estimated costs for the 2% who would not be able to complete their delivery and thereby overlooked the fact that the number of loaded miles would decrease for owner-operators overall because of the delay in delivery times.

The agencies anticipated that some owner-operators would become independent contractors (leased-on owner-operators) who the agencies believe earn $0.32 per mile. It was then estimated that small businesses would lose $44 million in labor income if 100% of owner-operators became independent contractors (24,533 million miles x 2% = 440 million miles, 440 million miles x $0.42/mile = $185M, whereas 440 million miles x $0.32/mile = $141M, $185M - $141M = $44M).

Table 14: Loss of owner-operator labor income with 65 mph speed limiters (in $ millions in 2013)

Vehicle type	Potential loss
Combination truck	$44
Sing unit truck	$6
Buses	$5
Total	**$54**

Interestingly, while attempting to measure competitiveness costs by utilizing a Canadian study, the agencies noted that if the travel speed was reduced from 70 mph to 65 mph truck drivers would experience a 6.5% decrease in labor income. This is in direct contrast with most of the PRIA where it was assumed that despite the increase in hours driven, drivers would receive the same amount of income.

It is also important to note that the agencies expect that some small trucking carriers will *not* be profitable with speed limiting devices and thereby will lose some of their market share to large carriers. While large carriers expand their market share and profit, the agencies believe that owner-operators will simply be able to work for large companies at a reduced income. The agencies also assumed that speed limiters will force owner-operators to drive less miles because of the decrease in speed, thus further reducing their income.

Fuel Savings for Small Business

The savings from a speed limiting device are small for a single truck owner and are very sensitive to actual fuel costs. According to the agencies, a 2013 CT traveled 68,155 miles on average and received an average hourly rate of $20.80. If the speed for a single truck was therefore decreased from 70 to 65 mph, moving goods would take 27 hours longer each year costing the driver $542. The cost however would be theoretically offset by saving 196 gallons of fuel. The price of fuel therefore is essential in determining if the rule would be financially beneficial, anything less than $2.77 per gallon would generate a negative benefit. "Given that the cost savings that can be achieved by the use of a speed limiter are small relative to the total cost of operation, and that these cost savings fluctuate based on the price of fuel, voluntarily utilizing a speed limiter for a small fleet ***may not*** be an advisable choice for fleet managers based on cost alone (emphasis added).[30]" And yet the agencies are mandating the use of speed limiters that could be economically inviable for small motor carriers who represent 90% to 96% of the trucking industry.

Cost-Effectiveness

According to the Office of Management and Budget guidelines, agencies are required to perform both a cost effectiveness and benefit-cost analysis when considering a proposed rule. The Cost effectiveness analysis (CEA) compares the associated costs with the projected outcomes, or effects, of a rule, whereas a benefit-cost analysis assigns a monetary value to the measure of the effect. During the CEA, the agencies attempted to address the question, "If it is in the industry's best interest to adopt speed limiters, why don't they all do so voluntarily,[31]" by examining how fuel and labor costs affect an individual truck operators' decision making process. The agencies approached the question by assuming that fuel savings will result if a heavy vehicle is limited "above or equal to the vehicles' optimal speed for fuel efficiency.[32]" The optimal speed for fuel efficiency however was never examined while estimating the fuel savings associated with the proposed rule.

After determining that the fuel savings would exceed the fuel and labor costs, the agencies presented three reasons why motor carriers do not voluntarily equip their trucks with speed limiters, of which none of them reflect reality. (1) Regional and other variations in fuel and labor prices may make using speed limiters more profitable to some fleets than others; (2) the savings resulting from speed limiters are small for a single vehicle relative to its total operating cost and are sensitive to unpredictable future changes in fuel prices; and (3) operators may not know precisely how much money they can save from driving slower.[33] The agencies interestingly stated that they are seeking comment on each explanation and other plausible explanations which they did not identify for the purpose of discussing the possibility that the agencies' estimated fuel savings were incorrect.

[30] Ibid., pg. 190
[31] Ibid., pg. 185
[32] Ibid
[33] Ibid., pg. 187

While giving further explanation on Reason 1, the agencies note that if the hourly wages were increased to match those of the more experienced drivers, which are in the 90th percentile ($29.81), then the trucking fleets would experience a negative net benefit of $129 million.

Though the agencies did not mention that their calculations concerning fuel savings and additional labor costs were uncertain in their respective chapters, they did speak of this fact during the CEA, stating that "Although most firms have voluntarily adopted speed limiters, data limitations inhibit our ability to precisely determine the overall impact on the industry. Our estimates often rely on data and assumptions that are less specific ***than would be ideal***...Were such data available, we might find that speed limiters were either more or ***less*** cost-beneficial than we currently estimate (emphasis added).[34]"

During the CEA, the agencies stated that "One limitation in the data supporting this analysis is that there is little information about the percentage of trucks that are speed limited, and the speeds existing speed limiters are set to. Thus, we can only theorize on why some trucks are using speed limiters and some trucks are not.[35]" Other limitations included:

- The imprecise valuation of fuel savings
- Uncertainty inherent in predicting future price of fuel
- Estimates of amount of fuel saved from the use of speed limiters may be too high
- Valuation of delay may be too low
- Either or both valuations of drivers' time or freight inventory cost could be incorrect
- The analysis aggregates the benefits and costs of all operators, including those who use speed limiters
- Fuel savings and labor estimates were derived upon estimated national averages instead of regional variations which could result in either or both overestimating the fuel savings or underestimating the labor costs of the rule
- A speed limiter standard that cannot vary with changing fuel and or labor prices could be either less or more cost-effective that the agencies measured.

Alternatives

Pursuant to the Regulatory Flexibility Act, agencies are required to prepare an initial regulatory flexibility analysis (IRFA) which contains six separate requirements, one of which is to describe "any significant alternatives to the proposed rule which accomplish the stated objectives of applicable statutes and which minimize any significant economic impact of the proposed rule on small entities." However, the only alternatives which the agencies considered were the various speed limit settings of 60, 65, or 68 mph and the potential feasibility to limit the speed of a heavy vehicle to the posted speed limit of the road through a global positioning system, vision system, vehicle to infrastructure communication, or other types of autonomous technology.

[34] Ibid., pg. 191
[35] Ibid., pg. 192

The agencies also announced that they are seeking comments on the possibility of allowing GPS-based speed limiters that adjust to the actual speed limits on the roads to be used as an alternative means of compliance if conventional speed limiters are required.

Retrofit

The agencies estimated that there are currently 2 million heavy vehicles that were manufactured in 1992 and later years that are still in use today which can be retrofitted with an ECU, and that 40% of these do not have speed limiting devices. While the agencies give no citation or explanation as to why they believe that 40% do not have speed limiters, they estimated that it would cost $2,000 per unit to retrofit a heavy vehicle with a speed limiting device. It was therefore estimated that retrofitting these vehicles would add over $3 billion in societal costs discounted at 7%.

Effect of Speed Limiting Devices

As part of the PRIA, the agencies conducted a literature review of several studies concerning the effects of differential speed limits on safety. Although the studies generally concluded that the lowest probability of a crash occurring is when all vehicles are traveling near the median speed, the agencies choice to utilize the findings of the West and Dunn study, titled *Speed and Accident Volume II*, because they "***believe*** that it provides a reasonable basis ***for the conclusion*** that limiting the speed of heavy vehicles to 65 mph or higher would not increase the probability of being involved with a crash (emphasis added).[36]" In other words, the study gave the agencies the answer that they were searching for, namely that speed differentials do not increase the risk for a crash.

The West and Dunn study collected data on a state highway in Indiana with speed limits between 40 and 50 mph. While the research did find a U-shaped relationship between speed deviation and crashes, similar to studies conducted by Solomon, Garber and Gadiraju, Cirillo, and NHTSA,[37] found that the crash risk was greatest for vehicles traveling more than 15 miles above or below the average speed.[38] After excluding slow turning maneuvers (e.g., turning into or out of traffic) from the analysis,[39] the crash involvement rate was found to be approximately the same for high and low speed deviations.[40] Therefore, after a maneuver that occurs in everyday highway type situations was removed, the speed deviations did not have as much of an effect. The agencies fail to mention this fact in the PRIA.

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[36] PRIA, pg. 25

[37] David Solomon, *Accidents on main rural highways related to speed, driver, and vehicle*, U.S. Department of Commerce/Bureau of Public Roads (1964); Garber and Gadiraju, *Speed Variance and its Influence on Accidents*, AAA Foundation for Traffic Safety (1988); N.J. Garber and R. Gadiraju, *Impact of Differential Speed Limits on Highway Speeds and Accidents*, Department of Civil Engineering, University of Virginia (1991); Cirillo, *Interstate System Accident Research Study II, Interim Report II*, US DOT (1968); *Commercial Motor Vehicle Speed Safety*, NHTSA (1991).

[38] Relation of Speed and Speed Limits to Crashes, pg. 8

[39] Gates et al., *Differential Speed Limits on Two-Lane Rural Highways in Montana,* Montana Department of Transportation (2016), pg. 16

[40] https://trid.trb.org/view.aspx?id=117002

The agencies also utilized the Johnson and Pawar study to demonstrate that a 65 mph speed limiting device will create speed differentials between cars and trucks less than 10-mph. This conclusion however was based on travel speed data on the Cherokee turnpike in Oklahoma, where there is a uniform speed limit (USL) of 75 mph. The authors of the study wrote that "it should be noted that the sample size for this site was lower than the sites in the other states due to a much lower traffic volume. In addition, the proportion of trucks was lower.[41]" The agencies also failed to mention that "a computer simulation used in this study indicated that, for the interstate with posted differential speed limits of 65/55 mph, the number of interactions for a truck traveling at the speed limit (55 mph) would be more than four times the number of interactions for a truck traveling at mean traffic speed.[42]"

The agencies also quoted from the Idaho Department of Transportation study on differential speed limits (DSL) which found that a change from USL to DSL did not increase crashes. Nevertheless, this study stated that other factors and safety improvements, such as the installation of rumble strips, might have contributed to the overall declining crash rate. Although the study claimed that DSL policy favorably affected highway safety, it also stated that the speed differential had the potential to increase crash rates. The research team indicated that there were some important factors to consider while evaluating the conclusions of this study. First, it is important to note that the study only compared two months' worth of speed data in each year from 1992 to 2011. Second, the speed and volume data was gathered from sixteen sites and only three sites were available to collect data before the DSL policy implementation in 1998. Third, the study focused on only rural interstate highways only, which does not reflect or represent all of Idaho's DSL affected highways. Fourth, the report categorized passenger cars and large trucks by length, but did not differentiate between the two in the data analysis.

The agencies also examined research conducted by the Virginia Transportation Research Council entitled *The Safety Effects of Differential Speed Limits on Rural Interstate Highways* which studied a small number of states with varying speed limit policies, meaning DSL and USL. The study concluded that no safety effects of DSL as compared with USL were observed. The report however included a number of limitations, including:[43]

1. The sample size varied by state which questioned the representativeness of certain results (Missouri had three sites compared to 556 sites for Arizona).
2. The investigator could not control site selection as it was based on how individual states set up their individual speed monitoring programs.
3. Some of the durations in the study were relatively short.
4. The rural interstates were analyzed at an annual level of detail without stratification by time period or season.
5. The authors were not able to obtain speeds by vehicle type (passenger cars and trucks).
6. Comparison groups were imperfect as they were composed of different roadways and different states.

[41] Johnson and Pawar, pg. 84.
[42] Ibid., pg. 125.
[43] Garber et al., *Safety Effects of Differential Speed Limits on Rural Interstate Highways*, FHWA (2005) pg. 46-47.

7. Specific speeds often not available on every section of interstate that was a segment in the crash analysis.
8. Possibility of regression to mean bias.
9. The crash estimation model used only two variables, average annual daily traffic and section length.
10. The sample size used in the statistical tests associated with the speed analysis were defined as the number of speed monitoring sites rather than the number of vehicles at all of the sites combined.

While no effects were observed in the Virginia Transportation Research Council report, other studies have yielded different results. For example, Council, Duncan and Khattack in 1998 found that for rear-end collisions between cars and trucks a high speed differential actually increased the severity of the crash.[44] Another study which compared collision rates between Virginia, a DSL state, and West Virginia, a USL state, showed relatively more rear-end crashes in Virginia, suggesting that the DSL might have a negative impact on safety.[45] Hall and Dickinson demonstrated in 1974 that speed differences contributed to crashes, primarily rear-end and lane change collisions.[46] According to a study by Aarts and Van Schagen, "Larger differences in speed between vehicles are related to a higher crash rate. Without exception, a vehicle that moved (much) faster than other traffic around it, had a higher crash rate.[47]"

Ultimately, the agencies chose not to include an estimate of crashes avoided and to only estimate the safety benefits associated with reducing crash severity due to the difficulty in projecting the effect of speed limiters on crash risk.

Conclusion

It is evident throughout the PRIA that the agencies' calculations and estimates are ripe with limitations as even the analysis states that "the agency's estimates have several limitations,[48]" the primary of which being that "the agency does not have real world data on travel speeds at the time of a crash, which necessitates simulations, of crash travel speeds." The agencies further confessed that the two approaches utilized in their simulations "have ***significant*** limitations. In both cases, the agency relies on travel speed data from a ***small non-representative*** sample of roads (emphasis added).[49]" With such a plethora of flaws and limitations OOFI questions how the agencies can accurately predict the effects of a speed limiter mandate. The following list is a summary of both the stated and unstated limitations found in the agencies' preliminary regulatory impact analysis:

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[44] Council et al., "Applying the Ordered Probit Model to Injury Severity in Truck-Passenger Car Rear-end Collisions," Transportation Research Board (1998).
[45] N.J. Garber and R. Gadiraju, *Impact of Differential Speed Limits on Highway Speeds and Accidents*, Department of Civil Engineering, University of Virginia (1991)
[46] J.W. Hall and L.V. Dickinson, *An Operational Evaluation of Truck Speeds on Interstate Highways*, Department of Civil Engineering, University of Maryland (1974).
[47] http://www.sciencedirect.com/science/article/pii/S0001457505001247
[48] PRIA Ibid., pg. 35
[49] Ibid.

Benefits

- Lack of real world data on the travel speeds of heavy vehicles prior to a crash.
- Small non-representative samples of observed travel speeds.
- Utilizing both FARS and GES databases together in calculations despite the differences in variables and interpretations.
- Utilizing the ratio of prevented injuries based on the estimated benefits of enhanced brakes in CT crashes to determine the number of property damage only vehicle involvements and injuries prevented.
- The agencies did not know which crashes in their baseline involved heavy vehicles which were already speed limited.
- For the safety benefit analysis, the agencies assumed that all vehicles traveling above the speed setting would be limited to that said speed setting, but this does not take into account heavy vehicles traveling downhill.
- While estimating the safety benefits for single-unit trucks and buses, the agencies utilized non-statistically significant findings. For buses in particular, the agencies "do not have a high degree of confidence the estimated number of lives saved (about one life) can be realized with a 65 mph speed limiter.[50]"
- In order to generate the safety benefit estimate for buses, the agencies utilized the travel speed of trucks as a proxy for large buses as they did not have the same type of observational travel speed data to supplement the missing travel speeds.
- The agencies did not have actual travel data at each posted speed limit, so in order to calculate the fuel economy savings, the agencies assumed that the number of crashes on roads with a certain speed limit was an appropriate proxy for travel volume to estimate VMT. Therefore, similar to estimating the safety benefits without the true travel speed of the heavy vehicles, the agencies did not have the real-world data needed to calculate an appropriate estimate, as they did not know the VMT for each posted speed limit.
- The agencies estimated as part of the fuel economy savings, that 95% of crashes occur at a posted speed limit of 55 mph to 75 mph. FARS data however refutes this statement by indicating that in 2015, 80% of fatal crashes in which the travel speed was recorded occurred below 55 mph.

Costs

- While attempting to figure for costs associated with a particular speed limit setting, the agencies noted that they did not have real world travel distance distribution data, and therefore they had to assume that the travel distance was the same with respect to travel speeds.
- The agencies did not include the possibility of lost loads due to a delay in delivery time and thereby an overall annual loss of loaded miles. Instead, the agencies only seemed to focus on lost leisure time.
- The agencies note that drivers are losing wages because of the speed limiter proposal, and yet they do not figure this in the costs of the rule.

[50] PRIA., pg. 91

- A foremost issue with both scenarios in the Cost chapter is that the agencies falsely assumed that drivers will be able to travel the same amount of miles over a year, not realizing that a delay in delivery time, along with subsequent HOS restrictions, will limit the total number of miles that a driver can operate, thereby reducing their overall income. The fact that drivers will receive less loaded miles overall per year because of the delayed delivery time is not considered in the analysis.

Cost-Effectiveness

- The agencies stated that "One limitation in the data supporting this analysis is that there is little information about the percentage of trucks that are speed limited, and the speeds existing speed limiters are set to. Thus, we can only theorize on why some trucks are using speed limiters and some trucks are not.[51]"
- The agencies attempted to address the question, "If it is in the industry's best interest to adopt speed limiters, why don't they all do so voluntarily,[52]" by examining how fuel and labor costs affect an individual truck operators' decision making process. The agencies approached the question by assuming that fuel savings will result if a heavy vehicle is limited "above or equal to the vehicles' optimal speed for fuel efficiency.[53]" The optimal speed for fuel efficiency however was never examined while estimating the fuel savings associated with the proposed rule.
- The imprecise valuation of fuel savings.
- Uncertainty inherent in predicting future price of fuel.
- Estimates of amount of fuel saved from the use of speed limiters may be too high.
- Valuation of delay may be too low.
- Either or both valuations of drivers' time or freight inventory cost could be incorrect.
- The analysis aggregates the benefits and costs of all operators, including those who use speed limiters.
- Fuel savings and labor estimates were derived upon estimated national averages instead of regional variations which could result in either or both overestimating the fuel savings or underestimating the labor costs of the rule.
- A speed limiter standard that cannot vary with changing fuel and or labor prices could be either less or more cost-effective that the agencies measured.

After responding to petitions by the American Trucking Association and Road Safe America to require the mandatory installation of speed limiting devices on all trucks greater than 26,000 pounds, NHTSA published a notice on January 3, 2011 that the agency would initiate a rulemaking process. OOFI is appalled by the significant number of data gaps and limitations that are rampant throughout the current PRIA despite having a lead time of five years. It is evident that the agencies have struggled greatly in attempting to justify a rule which prevailing research has demonstrated will have a negative impact on safety. Rather than push a speed limiter rulemaking forward with such negligent and questionable

[51] PRIA, pg. 192
[52] Ibid., pg. 185
[53] Ibid

research, OOFI requests that the agencies concede to the truth that there is no real-world scientific data which supports a rule that will create speed differentials on our nation's highways.

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