Variability in Jury Awards for Noneconomic Damages in Motor Vehicle Negligence Cases

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Abstract

I analyze the efficiency of jury awards for noneconomic compensatory damages awarded to automobile accident victims suffering nonfatal injuries bringing motor vehicle negligence tort claims. Data from 1002 Jury Verdict Research (JVR) case abstracts was narrowed down to 218 observations of plaintiffs receiving noneconomic damages awards at trials involving motor vehicle negligence from 1988-2019 across the United States. Using age-specific value of life estimations, functional capacity losses associated with plaintiffs' injuries, and productivity losses, I estimate an 'expected' noneconomic damages award that serves as a benchmark against which I compare observed awards. I regress the natural log of the ratio of observed to 'expected' awards on injury-severity-level indicator variables and other controls, thus attempting to find whether juries award disproportionately high or low noneconomic damages awards in accordance with plaintiff, defendant, or case-specific factors. I conclude that juries award disproportionate noneconomic damages at the opposite ends of the injury severity spectrum, with plaintiffs suffering severe injuries receiving disproportionately high awards. I also find that juries punish business and government entity plaintiffs. These results serve as evidence that jury decision-making is indeed significantly impacted by hindsight bias in large-value cases and attempts to punish supposedly wealthier defendants, creating inconsistency (variability) in compensatory damages award determinations.

JEL Codes: K1, K13, Q51

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I. Introduction

In 1985, economist Stanley Smith's testimony in the case of *Sherrod v. Berry* put him at the forefront of a legal revolution. Smith testified that the father of the decedent, who was shot and killed by a police officer, was entitled to damages "separate from [the] economic productive value of an individual," what he called the "hedonic value of life" (Price, 1993, p. 1061). The jury ultimately awarded $850,000 in 'hedonic damages' to the plaintiff, an amount greater than the 'loss of parental association,' 'financial loss to the estate,' and 'funeral expenses' awards combined (McClurg, 1999). The U.S. Court of Appeals for the 7th Circuit affirmed this decision, marking the first time that expert witness testimony on life's value in excess of traditional financial damages was allowed (Smith, 1988). Noneconomic damages are now permitted in nonfatal injury cases in all states. Unlike economic damages, noneconomic damages compensate for losses that cannot be itemized on a receipt, including the 'loss of enjoyment of life' (hedonic damages), 'pain and suffering,' 'mental anguish,' 'emotional distress,' etc.

Juries often have little to no formal guidance in setting accurate awards for noneconomic damages, providing the context for my research. I intend to research the factors associated with the difference between observed noneconomic damages awards in civil court trials from across the United States and 'expected' noneconomic damages awards. These 'expected' awards will be constructed by monetizing motor vehicle accident victims' functional capacity losses following an injury. The natural log of the ratio of observed-to-'expected' noneconomic awards will be my dependent variable, while my main explanatory variables will be indicator variables corresponding to levels of plaintiff injury severity. In effect this will gauge whether trends in biased jury awards (disproportionately high or low awards; jury variability) are associated with changing injury severities and other controls. This will shed a new light onto theories of jury bias and factors of particular note amidst the cloudy "stew" of noneconomic award determinations.

Unlike previous research inferring Value of a Statistical Life (VSL) estimations from jury awards, as opposed to the labor market, my research will leave observed jury awards alone and independently construct 'expected' awards. Stage 1 of my research involves constructing 'expected' awards for noneconomic losses. Post-injury functional losses are monetized with appropriate age-specific Value of a Statistical Life Year (VSLY; annualized VSL) estimations; hence Stage 1 requires knowledge of plaintiff ages and Stage 1 'expected awards' are sensitive to changes in the VSL with age.

Stage 2 involves a different construction of 'expected' awards. Updated functional capacity loss estimations, provided as a present-value lump-sum loss across all future life years, are monetized with a single measurement of value-of-life per year. Stage 2 expected awards are independent of plaintiff ages; hence the accuracy of Stage 2 results depends upon a relatively symmetrical distribution of ages in my data.[1]

Section II examines the body of literature motivating my research and where my research fits amongst existing works. I transition to detailing my proposed theoretical methodology in Section III, including the construction of the Stage 1 'expected' award for each case observation. In Section IV I expand upon the data from which I will collect relevant noneconomic award observations from case abstracts, as well as the data and methodology involved in determining an

[1] Younger and older plaintiffs lose greater and fewer future life years due to injury, respectively. Thus, 'expected' awards should be age-dependent regardless of whether age-specific VSLY estimations are used. The under- and over-estimation of 'expected' awards should even out across a relatively symmetrical distribution of ages.

injury severity ranking for each plaintiff. I clarify my complete empirical model and identify control variables in Section V. Section VI includes results and descriptions of my findings.

II. Literature Review

Jury awards for noneconomic damages compensate for the attributes of life related to the "pleasure of being alive," rather than monetary attributes such as wages (Smith, 1988, p. 72). Deriving "expected" rewards thus requires a method for valuing life. My research will focus on the "willingness-to-accept" (WTA), or conversely "willingness-to-pay" (WTP), method of calculating an individual's hedonic value of life (Viscusi, 1990). This involves determining the minimum amount an individual is willing to be paid (or pay) to assume an incremental increase (or decrease) in the risk of death (Smith, 2000). The "value of a statistical life" (VSL) metric, widely used throughout the hedonic damages literature, is a single 'value of life' calculated using the WTA theory. VSL calculations often refer to labor market data and scale workers' values of incremental changes in fatality risk up to an 100% probability of death.[2] Hypothetically, if 10,000 workers in a room are each willing to face a 1/10,000 increase in the risk of death for an additional $900 in payment, the workers have determined a VSL of $9 million. A VSL estimation can be turned into a Value of a Statistical Life Year (VSLY), which is the annuitized value of an-age specific VSL based on age-specific years of life expectancy (L) and a discount rate (r) (Aldy and Viscusi, 2008).

$$VSLY_{age} = rVSL_{age}/(1- (1+r)^{-L}) \tag{1}$$

The WTA and WTP methods are *ex-ante* – they "estimate the value of life prior to the life-threatening event" (Smith, 2000, p. 171). However, these risk trade-offs are not calculable in a

[2] VSL estimations assume that the amount a worker will be willing to receive for an incremental increase in the risk of death remains consistent across all marginal fatality risk increases, up to an 100% probability of death.

legal context. Rather, juries make *ex-post* valuations of noneconomic damages based upon the unique facts of each case. Jury discretion in noneconomic awards can lead to a host of issues. For example, expert testimony suggesting high noneconomic damages may provide a psychological "anchor" for jury deliberation (Viscusi, 2000). Likewise, product liability suits, for instance, often involve "large loss, low probability events" which may cause juries, regardless of corporate safety investment or the natural high stakes of a given industry, to focus on "the magnitude of the stakes involved rather than the expected damages" (Viscusi, 2001, p. 111-2). Viscusi (2001) similarly finds that jury-eligible citizens fault companies for conducting sound cost-benefit analyses resulting in the decision to sell a risky product, suggesting the potential role of hindsight bias in jury-decision making. It thus seems reasonable to suppose that juries could award disproportionately high noneconomic damages for severe injuries, as severe injuries involve a "shock factor" and significant inherent risks that juries may assign inappropriate blame on defendants for incurring. Cases of severe injury would, in general, likely be subject to maximum scrutiny by jurors with a zero-risk mentality.

Cohen and Miller's (2003) empirical work seems to provide evidence of an opposite effect from that of disproportionately increasing awards for greater injury severity as just described. They divide observed *ex-post* jury awards for "pain and suffering" by percentage losses in lifetime utility to estimate the VSL numbers implied in juries' awards. These VSL estimates, inherently adjusted for injuries of different severities, display a slight downward trend for increasing levels of impairment. It is suggested that jurors may approach even the least severe injuries with a relatively significant 'minimum' pain and suffering award greater than any marginal award increases for injury severity. This seems to conflict with notions of juries' extremely low risk tolerance and susceptibility to the "shock factor" of severe injuries. Nonetheless, the authors do attribute some variance in implied VSL estimates to "deep pocket" effects, which account for jurors' tendencies to punish large corporate defendants with large award payments.

My analysis addresses the relationship between different levels of injury severity and the ratio of actual jury awards to WTA-derived 'expected' awards for individual plaintiffs in negligence cases involving motor vehicle collisions. Unlike previous studies, I aim to consider plaintiffs' ages and apply age-specific estimates of VSLY weighted by utility loss over time in estimating 'expected' awards. My findings will fill a gap in existing research by analyzing jury effectiveness through evidence of actual jury awards, objective age-based VSLY valuations, and estimations of utility loss by injury type and severity to analyze jury behavior.

In theory, if 'expected awards' are accurately calculated, the difference between an actual jury award and an objective 'expected' award should represent a rough measurement of jury discretion. In this context, "discretion" is the stew of factors motivating juries to award disproportionately high or low noneconomic damages. If juries are indeed risk-averse, for example, I might find that this measurement of jury "discretion" is abnormally high and positive for awards to plaintiffs suffering the worst injuries. The wealth and nature (individual, business, or government entity) of a defendant may also account for juries' decisions to punish the defendant with a disproportionately high award.

Previous studies calculating VSL implied in jury awards, such as Smith (2000) and Aiken and Zamula (2009) have found comparable VSL estimates to those determined in labor market studies. Smith (2000) further remarks that his results provide evidence that juries tend to "make rational decisions in determining awards" (171). This suggests two things: first, jury awards may tend to reflect what we might 'expect' them to be when objective expectations are derived from the labor market. Thus, major changes in the ratio of observed jury awards to 'expected' awards would be meaningful. Secondly, significant differences in the ratio between jury awards and 'expected awards' attributable to a given variable might signal the weight jurors assign the variable in their 'rational' decisions. For example, if I find that certain levels of injury severity are associated with an abnormally high ratio of realized to 'expected' noneconomic awards, I may be able to conclude that, from a mathematical perspective of optimizing jury awards, these levels of injury severity (and potentially the shock factor they introduce) are given too much weight in the 'stew' of award determinants. While awards for future medical expenses, for example, are theoretically guided by calculations to which an expert witness can provide substantial guidelines in testimony, jury decisions with regard to noneconomic damage awards are much more variable, and expert testimony is often only able to provide a basic benchmark number for the jury to go by. It seems that a method such as the one I intend to use in my research is a way to begin to better understand the factors juries value when tasked with such indefinite award decisions.

III. Theoretical Framework

The general empirical methodology motivating my research resembles that found in Cohen and Miller's (2003) approximation of the implied VSL in jury awards, assuming juries are guided by risk trade-off calculations as in the WTA and WTP methods for determining VSL. At its core, Cohen and Miller's process of determining implied VSL involves dividing observed jury awards for "pain and suffering" by the victim's losses in functional capacity (measured in years). The basis for my research is a kind of rearrangement of these variables. Instead of manipulating the observed jury award, I will create two 'expected' jury award metrics – one age-dependent (Stage 1) and one age-independent (Stage 2). This section discusses the complex construction of Stage 1 'expected' awards.

Stage 1 'expected' awards equal the sum of the cumulative present values of the losses in functional capacity in each period (years 1, 2-5, and 6-to-death) following an injury, multiplied by the age-specific average VSLY values for those three periods, minus overall productivity losses that would otherwise be included in labor market-derived VSL estimations but which are irrelevant to valuing functional noneconomic losses. The division of functional capacity losses into three periods is necessitated by the estimations of quality-of-life losses in Miller et al. (1995). 'Expected' awards for each plaintiff will be compared to their observed noneconomic damages awards, leading to my results.

Perhaps the most complex measurement involved in arriving at an 'expected' jury award involves determining just how much functional capacity a victim has lost in successive time periods following an injury. Miller (2000) discusses a useful metric that can serve as a guideline for lost utility, Quality Adjusted Life Years (QALYs). QALYs are measurements of health outcomes whereby a year of perfect health is assigned a 1 and death is assigned a 0. The value of the QALY a person lives in year X can thus be understood as the percentage of the functional capacity or utility they attain compared to the quality of life of an individual with perfect health. My focus will be on QALY (functional capacity) losses at the time of a jury's award, computed by summing the present value of the estimated QALY loss during each year a victim is recovering from an injury or living with a residual disability. In practice, as I will discuss, I refer to estimations of injury-based functional capacity losses that only provide cumulative functional capacity losses for post-injury years 1, 2-5, and 6-to-death. Thus, functional capacity losses for years 2-5 and 6-to-death after an injury will correspond to an average QALY loss in those years. So, QALY loss due to an injury can be calculated

$$\text{QALY}_{\text{TOTAL LOSS}i} = a\text{QALY}_{1i} + b\text{QALY}_{2\text{-}5i} + c\text{QALY}_{6+i} \quad (2)$$

where $QALY_1$, $QALY_{2\text{-}5}$, and $QALY_{6+}$ are measures of functional capacity *loss* (average QALY loss) over years 1, 2-5, and 6-to-death, respectively, after an injury, and *a*, *b*, and *c* are the present values of a victim's expected pre-injury health-adjusted life years for years 1, 2-5, and 6-to-death after the injury, respectively.[3,4] QALY losses due to injury range from 0, absolutely no impairment, to 1 in cases of fatality.

In general, QALY losses due to injury are the basis for the necessity of jury awards for noneconomic damages. An injury, with its attendant economic costs and quality of life losses, will make a person's previous optimal combination of wealth and quality-adjusted lifespan (QALYs) unattainable. Figure 1 from Aiken and Zamula (2009) displays the maximum utility attainable for an individual pre-injury (U') and post-injury (U'') if utility is a function of wealth and lifespan (QALYs lived). The aim of compensatory jury awards is to restore an injury victim to U' from U''. Prior to injury, an individual starts out at point A on U' with quality-adjusted years Q' remaining and wealth of W'. Resulting functional capacity and monetary losses (medical expenses, vehicle repair expenses, lost wages, etc.) due to an accident cause the victim to move to point B (Q'' and W''). As QALYs cannot be regained (the individual is stuck at Q''), juries can only shift the individual vertically. A jury's award of economic damages in the amount of W'–W'' returns the victim to their original level of wealth, but leaves them below their original utility U'. Monetary compensation beyond the victim's economic losses, in the form of noneconomic damages for

[3] The present value coefficients measure the cumulative present value of pre-injury life years over the time periods of years 1, 2-5, and 6-to-death. Thus, *b* equals the summed present values of life years 2, 3, 4, and 5 after the injury. Likewise, *c* equals the summed present values of all life years from 6 years post-injury until the plaintiff's expected death.

[4] Example: For a 47-year-old plaintiff suffering from a concussion in 1995, $QALY_1 = 0.715$, $QALY_{2\text{-}5} = 0.167$, and $QALY_{6+} = 0.006$ (QALY losses from Miller, et al. 1995). Additionally, using the present-value discounting factors discussed below, $a = 0.9853$, $b = 3.6626$, and $c = (20.692 - 4.6479) = 16.044$. Total QALY loss is therefore 1.412 life years (about 17.5 months).

effects of injury such as "pain and suffering" and "emotional distress," of W'''–W' are required to return the victim to U'. This causes injury victims to reach U' at a combination of greater wealth and shorter lifespan than their pre-injury optimum. Thus, jury compensation from W'' to W' is insufficient. My research addresses whether juries effectively and consistently compensate W'''-W' (noneconomic damages) for different kinds of victims with varying characteristics, or whether significant jury "discretion" is involved for certain types of plaintiffs, defendants, cases, etc. The 'expected award' I construct is an attempt to construct a consistent and relatively accurate estimation of what W'''-W' should be in dollars.

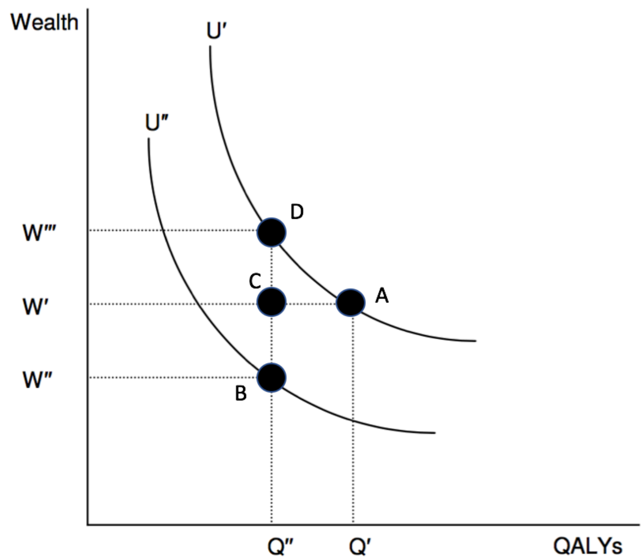

FIG. 1. – Pre- and Post-Accident Utility and Wealth/QALY Levels (Aiken and Zamula, 2009)

Building 'expected awards' for plaintiffs in motor vehicle negligence cases requires an estimation of the functional capacity losses (QALY losses) resulting from injury. I refer to Miller et al. (1995), who use functional capacity loss ratings derived from the Injury Impairment Index (III) to present injury costs for 44,000 people injured in motor vehicle crashes from 1982-1985 according to body region and levels of injury severity. The III, widely used in functional capacity loss literature such as Cohen and Miller (2003) and Aiken and Zamula (2009), covers the level impairment over the course of an injury across six different dimensions: mobility, cognition, daily living (i.e. bending and grasping), sensory aspects, pain, and disfigurement/cosmetic. For every victim, physicians with expertise in orthopedics, neurology, surgery, and plastic surgery rated the functional loss and severity of impairment within each of the six dimensions over three time periods: the first year, years two through five after injury, and years six and onwards (Lawrence et al., 2018). A seventh dimension of functioning was added to measure long-term disability, and then all dimensions were weighed and functional losses across dimensions converted into single measures of QALYs lost in the three post-injury time periods (Miller et al. 1995, Aiken and Zamula 2009, Lawrence et al. 2018).

The present value of total QALY losses due to injury across all three time periods (years 1, 2-5, and 6-to-death after injury) at a 3% real discount rate with mid-year discounting is

$$\mathrm{QALY}_{\mathrm{tot}i} = [0.9853 \times \mathrm{QALY}_{1i}] + [3.6626 \times \mathrm{QALY}_{2\text{-}5i}] + [(PV_{yrsi} - 4.6479) \times \mathrm{QALY}_{6+i}] \qquad (3)$$

where PV_{yrs} is the present value of the victim's expected lifespan (L) and the QALY inputs are average QALY losses in the respective time periods following an injury (Lawrence et al. 2018).[5] The present values of future life years, which are the weights of the QALY loss values, are the sums of simple present-value calculations of a single year with mid-year discounting.[6]

As previously mentioned, Miller et al. (1995) present average QALY losses in the three post-injury time periods by body region and injury severity. Body regions and injury severities correspond with injury descriptions in the 1985 revised version of the Abbreviated Injury Scale

[5] For L, I use data on age-specific expected life years remaining from United States Life Tables published annually by the National Center for Health Statistics (NCHS). Observations remaining life years combined between both sexes are used. Each plaintiff's assigned PV_{yrs} equals their expected life years remaining, as identified in the life table corresponding to the year of their accident, discounted at 3% with mid-year discounting.

[6] From Lawrence et al. (2018):

$0.9853 = (1/1.03)^{1/2}$

$3.6626 = (1/1.03)^{3/2} + (1/1.03)^{5/2} + (1/1.03)^{7/2} + (1/1.03)^{9/2}$

$4.6479 = 0.9853 + 3.6626$

(AIS85), an injury severity rating scale published by the American Association for Automotive Medicine. The AIS assigns a code for every injury, including digits corresponding to body region and injury severity. Bodily regions are coded as follows: (1) external area (i.e. skin), (2) head, (3) face, (4) neck, (5) thorax, (6) abdomen and pelvic contents, (7) spine (including cervical spine), (8) upper extremity, (9) lower extremity, (10) brain. Meanwhile, injury severities are ranked and coded on a scale of 1-6: (1) minor, (2) moderate, (3) serious, (4) severe, (5) critical, (6) maximum (virtually un-survivable), (9) unknown (Kramer et al., 1990). The QALY losses presented in Miller et al. (1995) are averages of the QALY losses suffered by each motor vehicle accident victim due to their primary injury, defined as the one with the maximum AIS severity score (MAIS). Rating overall injury severity in multiply injured patients according to the highest AIS severity score (MAIS) is recommended in the AIS85. If multiple injuries have the same MAIS score, the injuries accounted for in Miller et al. (1995) are determined by a hierarchy of body regions. So long as I can identify affected bodily regions and injury severity levels from correspondence between injury descriptions in case briefs and injuries listed in the AIS, Miller et al. (1995) provide corresponding QALY loss averages.

Finding a dollar value per QALY is the last major component of deriving Stage 1 'expected awards.' This can be done with a VSLY method. Aldy and Viscusi (2008) provide evidence that, in fact, VSL (and VSLY) changes over the course of the lifespan. Thus, applied VSLY estimations in 'expected' awards must account for ordinary changes in VSLY as the victim's age changes over the course of time periods following an injury. While one might expect VSL estimations to decrease with age, since individuals have less future life to enjoy as they age, Aldy and Viscusi provide evidence that, in a world with imperfect capital markets, VSL estimations derived from the labor market follow an inverted U-shape over the course of the lifespan. This results from younger workers' inability to "borrow against higher future expected earnings or efficiently insure against idiosyncratic labor income shocks" (Aldy and Viscusi, 2008, p. 574). Younger workers will have to assume greater risks for a given amount of present wealth than older workers will be willing to assume. Their VSLs, changes in their wage with respect to mortality risk, will therefore be lower. Aldy and Viscusi also adjust for the confounding factor of cohort effects, life-cycle variations in VSL estimations unique to certain birth-year cohorts. Both cohort-adjusted VSL and VSLY estimations display a similar inverted-U shape between ages 18-62, with cohort-adjusted VSL peaking at $7.76 million at age 46 and cohort-adjusted VSLY peaking at $401,000 at age 54.

Aldy and Viscusi (2003) employ job-related fatality data from the U.S. Bureau of Labor Statistics Census of Fatal Occupational Injuries (CFOI) to estimate a hedonic wage function with an age-risk interaction term. This leads to a VSL that peaks at $5.93 million at age 29 and remains positive until age 61. Aldy and Viscusi also use minimum distance estimation to fit a third-degree polynomial in age to nine age-group (6-year age groups from 18 to 62) VSL estimations based on age-group-specific average wages derived from within-age-group job mortality risk as opposed to an overall risk-age interaction.

$$\mathrm{VSL}(AGE) = 1880000AGE - 45400AGE^2 + 335.24AGE^3 - 19200000 \tag{4}$$

According to Equation 4, VSL values become positive at about age 15 and exhibit an inverted-U shape, with a peak of $5,455,888.60 at about age 32, until at about age 45, where the function inflects and becomes U-shaped. A local VSL minimum exists at about age 58, after which the function rapidly increases (as driven by the cubic functional form).

I derive my VSLY estimations from the minimum distance estimation in Equation 4 with some modifications. To account for the imperfection in estimating the inverted-U VSL function with a third-degree polynomial in age, I use the line tangent to Equation 4 at its inflection point to estimate VSL values from about age 45 until the line intersects the *x*-axis between ages 68 and 69. Furthermore, to estimate VSLYs for plaintiffs 15-years-old or younger, I find the line tangent to Equation 4 at the age of 25-year-old and use this line for VSL estimation, thus slightly flattening VSL estimation function from the steep rise in VSL present in Equation 4. Finally, to avoid negative VSL estimations, I set VSLs for ages below 5.45 years or above 68.69 years (the x-intercepts of the modified VSL function in Figure 2) to 0. My VSL estimation thus becomes

$$\begin{cases} VSL(AGE) = 0 \text{ if } AGE < 5.4542597 \\ VSL(AGE) = (238575)(AGE - 25) + 4663125 \text{ if } 5.4542597 \leq AGE \leq 25 \\ VSL(AGE) = 1880000AGE - 45400AGE^2 + 335.24AGE^3 - 19200000 \text{ if } 25 < AGE < 45.141781 \\ VSL(AGE) = (-169437.2)(AGE - 45.141781) + 3989723 \text{ if } 45.141781 \leq AGE \leq 68.688694 \\ VSL(AGE) = 0 \text{ if } AGE > 68.688694 \end{cases} \quad (5)$$

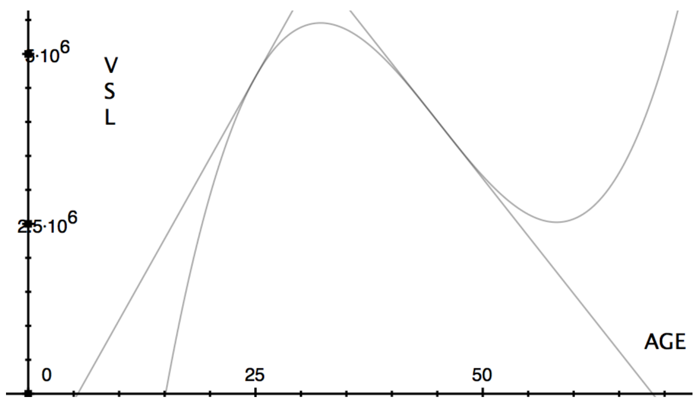

FIG. 2. – VSL function modified from Aldy and Viscusi (2003)

Age-specific VSLs can be transformed into VSLY estimations using Equation 1, which requires the input of age-specific life expectancy, which will vary year-to-year. For the VSLY estimations to be used to monetize the QALY loss observations, as the 'expected award' methodology requires, VSLYs will have to be calculated for each plaintiff in years 1, 2-5, and 6 and onwards after an injury. Every plaintiff is assigned VSL_1, $VSL_{2\text{-}5}$, and VSL_{6+}, corresponding to plaintiff's current age, current age plus 2.5 years, and the median between the plaintiff's age five years in the future and their total expected life years, as measured from the year of injury, respectively. In other words, the *AGE* inputs in Equation 5 and the VSLY estimations correspond to each plaintiff's median age within each of the three post-injury time periods ($VSLY_1$, $VSLY_{2-5}$, and $VSLY_{6+}$, respectively). The inputs for expected future life years in Equation 1, as measured based upon the plaintiff's expected future life years at the time of injury (L), are L, $L - 2.5$, and $(L - 5)/2$, respectively.

However, as noted by Blincoe et al. (2015), Miller et al. (1989), and Miller (2000), valuations of life based upon willingness-to-pay (as in VSL and VSLY) include productivity losses that would be compensated through economic damages. The willingness-to-pay method encompasses individuals' entire life experience, including the wages, fringe benefits, and household productivity that contribute to potential material consumption (Blincoe et al., 2015). The present value of productivity losses, including lost wages and fringe benefits plus the cost of hiring someone to do housework that would have been feasible pre-injury, must be subtracted from the total present value of monetized QALYs since these are inherent in VSLYs but key components of economic, not noneconomic, damages (Miller et al., 1989).

Productivity losses can be estimated from the short-term work (wage work and household work) and long-term work loss components of the Revised Injury Cost Model in Miller et al. (2000). These two categories compensate for a victim's inability to work while recovering from an injury and permanent disability remaining after recovery, respectively. Miller et al. (2000) separates work-losses into equations for hospital-admitted and non-admitted victims. Without knowledge of whether the plaintiffs in case abstracts were hospitalized, I estimate a generic total productivity loss as the sum of short-term and long-term work losses (WS and WL, respectively):

$$WS = [(T^{*} \times w^{*}) + (T' \times w')] \quad (6)$$

$$WL = K \times [d_t + (p \times d_p)] \quad (7)$$

$$TOTALPRODUCTIVITY = WS + WL \quad (8)$$

where,

T* = days of *wage* work loss for hospital-admitted victims
T' = days of *household* work loss for hospital-admitted victims
w* = valuation of lost *wage* work (per day)[7]
w' = valuation of lost *household* work (per day)[8]

K = present value of lifetime work (by age group and gender)[9]
d_t = probability of long-term *total* disability[10]
d_p = probability of long-term *partial* disability[10]
p = percent lifetime earnings loss by victims with long-term partial disability[11]

Miller et al. (2000) use data collected in the 1993 Bureau of Labor Statistics (BLS) Annual Survey of Occupational Illness and Injury to estimate short-term work losses (T*).[12] Mean and median short-term work losses are presented for 13 BLS medical diagnosis groups. I match injury descriptions in case briefs to BLS diagnosis groups and plug-in the median short-term work losses

[7] Estimated with 2003 median annual income data by gender and age group in the Person Income Data from the United States Census Current Population Survey (CPS), which includes observations on people 15 years-old and older across both sexes and all races. I assume a 2080-hour work year and 8-hour work-day. I add fringe benefits, valued at an estimated 21.9% of daily wages, to daily wage estimations. Adjusted to 1996 dollars (as used in Aldy and Viscusi 2003) using the BLS Consumer Price Index for all urban consumers (CPI-U) for all items.
[8] Taken from Grosse et al. (2009), who used data from the American Time Use Survey. Adjusted to 1996 dollars using the CPI for all items.
[9] Present value of lifetime earnings (including fringe benefits) and household production at a 3% discount rate by age group and gender from Lawrence et al. (2018).
[10] Probabilities of total and partial permanent work-related disability presented in Miller (2000) and Miller et al. (1995) by body region and AIS injury severity. Values derived from the sample of 44,000 motor vehicle accident victims from 1982-5.
[11] Valued at 13.45% as in Miller et al. (2000)
[12] BLS data includes annual observations from approximately 200,000 employers across the public and private sectors on nonfatal occupational injuries and illnesses. There is no apparent reason to suppose that the scope of employees injured on-the-job across the United States would look vastly different from the population involved in motor vehicle accidents.

for T*. Both Miller et al. (2000) and Zaloshnja, et al. (2004) suggest that injured individuals lose housework on 90% of the days they lose wage work due to injury. Since Miller et al. (2000) estimates that people do wage work on an estimated 243 days per year, in contrast to household work which is done 365 days per year,

$$T' = (365/243) \text{ x } 0.9 \text{ x } T^* \tag{9}$$

In summary, I suggest that existing literature and previous research lay a possible groundwork for building an age-dependent Stage 1 'expected' noneconomic damages award value for individual plaintiffs equal to the monetization of functional capacity losses due to injury minus lost productivity. This 'expected' award can be compared to observed awards for noneconomic damages, and analyzing differences in this ratio will provide insights into the factors associated with "jury discretion." This assumes that functional capacity losses are linearly proportional with the combination of factors that compose cumulative noneconomic awards, as will be discussed. 'Expected' awards are constructed

$$\text{EXPAWARD}_i = \text{VSLY}_{1i}[0.9853 \times \text{QALY}_{1i}] + \text{VSLY}_{2\text{-}5i}[3.6626 \times \text{QALY}_{2\text{-}5i}] + \text{VSLY}_{6+i}[(PV_{yrsi} - 4.6479) \times \text{QALY}_{6+i}] - \text{TOTALPRODUCTIVITY}_i \tag{10}$$

where the QALY loss inputs are taken from Miller et al. (1995) and VSLY estimations are derived from Equation 5, a modified version of the VSL minimum distance estimator in Aldy and Viscusi (2003). The weights on the QALY inputs are the present values of a victim's expected pre-injury health-adjusted life years for years 1, 2-5, and 6-to-death after the injury calculated at a 3% real discount rate with mid-year discounting. PV_{yrs} is the total present value of a plaintiff's expected future lifespan given the plaintiff's current age.

The 'expected award' is simply the monetization of the present value of total QALY losses from Miller et al. (1995) minus productivity losses. However, this poses a slight problem.

Monetizing functional capacity (QALY) losses according to age-specific VSLY estimations would be more accurate for estimating only "hedonic damages," compensation for the "loss of a normal life." Noneconomic damages, however, constitute many categories of losses. Many plaintiffs only receive awards for "pain and suffering," intended to compensate for physical discomfort and negative emotions.

My 'expected award' methodology in both Stages 1 and 2 inherently assumes that monetized QALY losses and total noneconomic damages of W'''-W' in Figure 1 – including "pain and suffering," "hedonic damages," "disability," "emotional distress," etc. – are relatively linearly proportional for victims of nonfatal injuries. This means that the physical discomfort, negative emotions, emotional distress, etc. associated with an injury are proportional to the amount of physical life years lost due to an injury (as determined by the six-component III), which will be greater for more severe injuries. Nonetheless, the 'expected award' is more than just a benchmark. Juries are also limited in the information from which they must determine noneconomic awards, and utilizing QALY losses for this purpose may likely be their best option.[13] Juries are not privy to any 'magic' formula for quantifying or monetizing components of noneconomic damages such as "pain and suffering" or "emotional distress."

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[13] Since calculating 'expected awards' involves monetizing QALY losses based upon VSL estimations, it is possible that the value-per-QALY would increase over time as real wages increase, thus increasing individuals' willingness-to-pay for safety, and ultimately increasing VSL estimates in real terms. This is similar to the observation of higher VSLs in rich countries than in poor countries when calculated with the WTP or WTA method. My data covers 1988-2019 and I control for four groups of years (1988-2000, 2001-2005, 2006-2010, and 2011-2019) to account for potential growth in real VSLs (and therefore real growth in 'expected awards'). Nonetheless, small real wage growth over this period, jury deviation from the 'expected award' methodology, and significant jury variability in award determinations renders real VSL growth over time insignificant for comparing the overall relationship between observed and 'expected' awards.

IV. Data

The table of functional capacity losses in Miller et al. (1995) provides a guide for data collection within the database of Jury Verdict Research (JVR) reports. JVR collects data on damage awards from civil cases in all states and for approximately 40% of all verdicts. Aiken and Zamula (2009) explain that a key motivator in choosing JVR as a data source is its provision of information regarding the nature of a plaintiff's injury, plaintiff characteristics (age, sex, employment status, etc.) and demographic information, and jury award amounts. The vast number of case abstracts in the JVR database allows me to sort through the cases for specific injury descriptions for which the severity levels are clearly listed in the AIS85. For example, a search for an injury description of "closed fibula fracture" may provide many results in the JVR database. All plaintiffs who suffer this specific injury have incurred a lower extremity injury of AIS severity 2 and an estimated 20 days of short-term wage work loss. I can then assign plaintiffs estimated average QALY loss values over years 1, 2-5, and 6-to-death following the injury and permanent disability probabilities, as I know the injury severity and bodily region of the injury. With information on the plaintiff's age, I have the necessary data to build an 'expected' noneconomic damages award for comparison to the actual award observed in the JVR case abstract.

Nonetheless, there are some well-documented concerns in existent literature with JVR data. JVR data has been criticized for possibly being biased upwards "through the over-representation of large awards" (Cohen and Miller, 2003, p. 169). However, Cohen and Miller (2003) assert that changes in the collection of JVR data since the mid-1980s effectively addressed these concerns and provide empirical support for this claim. Moreover, even if JVR data does not fully represent all cases, the data are still "appropriate for drawing inferences about the relationship between the seriousness of injuries and jury awards" (Cohen and Miller, 2003, p. 169). This is precisely my intended use for JVR data.

Another concern with the practical use of JVR data involves the number of missing pieces of information in most case abstracts. Most case abstracts do not provide basic information about the plaintiff such as their age (which is critical for calculating 'expected' awards), race, employment status, etc. Jury awards are also often not broken down into components of noneconomic or economic (future medical expenses, wage losses, punitive damages, property losses, losses of services, etc.) damages. Many cases involving noneconomic awards report no compensation for any other losses. This raises the possibility that reported noneconomic awards are agglomerate award values including economic (wage, medical expense, productivity loss, etc.) and punitive damage components. Noneconomic damages may also be used by juries as a mechanism to compensate for low (or nonexistent) economic or punitive damages. Both aforementioned possibilities present issues with assuming that observed noneconomic damages equal the noneconomic losses juries ascribe to each plaintiff. Furthermore, injury descriptions often lack specific detail, making MAIS injury severity levels more difficult to assign. Collecting data points from JVR case abstracts often requires inferences from case details provided in narrative form.

All the issues with JVR data aside, the vast number of case briefs available makes JVR data the best available data source for finding instances of specific injuries suffered by plaintiffs. Enough case abstracts exist with the sufficient data points for inclusion as an observation in my research: a jury award for noneconomic damages, a description of the plaintiff's injury corresponding to an injury listing in the revised AIS85, and the age of the plaintiff. These data points, combined with observations for control variables taken from the case abstracts and supplemented from external data sources, comprise the data necessary for my empirical methodology.

I have conducted two separate searches through the database of JVR case abstracts, looking for specific injury types that correspond to listings of injury types in the revised AIS85. Furthermore, both searches require that search results are limited to cases including the words “vehicle” and “crash” or “collision” in close succession. This specification is intended to limit the scope of my research and maintain a relatively consistent context for all instances of noneconomic awards. To achieve relevant empirical results, I will limit the scope of my research on variability of noneconomic awards to negligence claims involving motor vehicle collisions.

The majority of cases appearing in my searches are not usable. All cases not settled by jury trial are immediately thrown out, including the numerous cases which settled before trial and resolved via arbitration. Furthermore, cases resulting in a verdict for the defendant, in which the plaintiff would not receive an award, are eliminated. Even if a case involved a jury verdict for the plaintiff, it is thrown out if no component of the plaintiff’s total award for “pain and suffering” or “noneconomic damages” is specified. Cases are eliminated if the plaintiffs are too old for accurate VSLY estimations or the type of case does not fall within the scope mentioned above.

My first search through the JVR database included keywords for vehicle crashes/collisions as well as for injuries to the spinal cord (severances, lesions, and lacerations), concussions (mild or moderate concussions), burns (of a specified degree), and amputations. This search resulted in 178 cases (“Batch 1”), which I narrowed down to 25 plaintiff observations.

The second search through the JVR database included keywords for eleven kinds of injuries: (1) cranial nerve injuries, (2) brain stem injuries, (3) optic nerve injuries, (4) maxilla fractures, (5) flail chest, (6) incomplete cord syndrome, (7) complete cord syndrome, (8) spinal cord contusions, (9) elbow injuries, (10) shoulder injuries, and (11) sternoclavicular joint injuries. This search produced 841 case abstract results ("Batch 2"). I narrowed down 824 of these cases to 193 plaintiff observations. Collectively, the total 218 observations between Batches 1 and 2 are on verdicts from 1988-2019.

Plaintiff ages, a critical data point for constructing 'expected awards' through the appropriate VSLYs for monetizing QALY losses and present-value coefficients on QALY losses, were only present in JVR case abstracts for 88 plaintiff observations. To fill in missing ages, I searched through media reports and the InfoUSA U.S. residential historical files for 2006, 2010, 2014. This database includes a single observation for most US households, lists the members of the household and the location of their residence, and provides a data point for the age of the head of the household. In searching for plaintiffs mentioned in JVR case abstracts, I assumed that a plaintiff's spouse's age, if mentioned in the InfoUSA data, was a usable proxy for the plaintiff's age. If a plaintiff's name appeared multiple times in the InfoUSA data, I would only use InfoUSA observations if one or multiple of the same-named individuals lived within or in close vicinity of the county in which the plaintiff's motor vehicle accident occurred. If multiple same-named individuals assigned different household-head ages were located within the same county, I used the individual living closest to the scene of the accident, if this information was given in the JVR case abstract. In total, I supplemented the JVR data with 35 additional age observations, leaving me with 123 plaintiff observations for which ages are specified.

Like Cohen and Miller's (2003) concern that JVR data contains an excessive percentage of large-loss cases, I find that the JVR case abstracts for which plaintiff ages are provided or can be found (using InfoUSA to find plaintiffs based upon sufficient information such as full name and place of residence) skew towards larger losses. As displayed in Table 2, the observed noneconomic and economic awards for cases included in Stage 1 regressions (for which age data is necessary) are higher than for the overall sample of 218 cases. It is logical that more severe accidents would be considered more ‘important,’ and thus more likely to have more descriptive data points available case abstracts. Nonetheless, I observe relationships between injury severity and jury awards within the Stage 1 subgroup, so even if the cases in this subgroup are skewed overall, important inferences can still be drawn from jury variability within this subgroup.

Injury severity levels from the revised AIS85 have been assigned to all 218 plaintiff observations collected from Batches 1 and 2, as determining injury severity level is necessary for identifying a plaintiff’s functional capacity losses, a component of the ‘expected’ award. The revised AIS85 includes listings of injuries, each of which is assigned a code. The first digit in each code corresponds to the bodily region affected while the last digit in each code (after the decimal point) corresponds to the injury severity level from one to six.

Some common injuries amongst the 218 plaintiff observations, how these injuries would appear in JVR injury descriptions, and their associated revised AIS85 codes are listed in Table 1. The injury severity variables in my data are simply indicators corresponding to the severity code of the plaintiff’s most severe injury. Note that only physical injuries could be coded according to the AIS85; thus mental/emotional impacts of injury (i.e. traumatic stress) would not qualify as independent injuries suffered by plaintiffs for the purposes of determine the injury of greatest severity. Mental/emotional losses will be incorporated into overall QALY losses to the extent they are attendant with a plaintiff’s maximum-severity physical injury and decrease functioning in one of the six dimensions accounted for in the III.

Assigning functional capacity losses based upon MAIS and body region is a noisy operation. Miller et al. (1995) do not provide observed functional capacity losses for spinal cord injuries of MAIS 1 or 2, for example, so these injuries must be coded according to average functional capacity losses for all body regions combined. Most plaintiffs suffer multiple injuries, in which case the injury used for MAIS level and QALY losses is that corresponding with the highest level of injury severity. If two injuries have equal severity according to the AIS85, the injury with the greatest total functional capacity loss (cumulative across the three time periods) was used.

Noneconomic awards were measured in 1996 dollars, matching the VSL estimates from Aldy and Viscusi (2003), using the CPI-U for all items. In my current dataset of 218 observations, noneconomic awards range from $76.78 for a shoulder and spinal strains suffered by a 51 year-old male to $11,729,172 for an above-the-knee leg amputation, spinal fracture, and head injury suffered by a 48 year-old male. Table 2 includes Stage 1 summary statistics for plaintiff ages, $VSLY_1$, $VSLY_{2\text{-}5}$, $VSLY_{6+}$, total productivity losses, ‘expected’ awards, observed noneconomic awards, and observed economic awards. For 74 of the 218 observations, the plaintiff’s total award consisted of only a noneconomic damages award, which most often consists only of compensation for “pain and suffering.” In other words, these plaintiffs did not receive awards for economic damages, punitive damages, or loss of consortium.

As for monetizing QALY losses, the $VSLY_1$ and $VSLY_{2\text{-}5}$ observations exhibit an inverted-U relationship with age.[14] This is expected, since these estimations are derived from VSL estimates following an inverted-U relationship with age themselves. However, the $VSLY_{6+}$ observations, which correspond to the median age between six years following the injury and the total expected life years, exhibit a downward-sloping trend. This is also expected, since the age input for the

[14] Since VSLYs are age-dependent components of Stage 1 ‘expected’ awards, VSLY observations only exist for the plaintiffs with specified ages (117 observations).

$VSLY_{6+}$ observation, the plaintiff's median age between 6 years post-injury and total expected life, for the youngest plaintiff would correspond to the age closest to that for which VSLY is maximized. $VSLY_{6+}$ observations will decrease as age increases.

V. Empirical Specification

My aim is to analyze the ratio of observed jury awards for noneconomic damages to 'expected awards.' Specifically, my goal is to determine whether injuries of high severity (MAIS 4 and 5) are associated with disproportionately large noneconomic awards, as would be expected from Viscusi (2000) and Viscusi (2001).

i. *Stage 1*

Stage 1 'expected' awards are calculated as described in Section III. The present value of QALY loss values over time from Miller et al. (1995) for victims of injuries of certain severities to specific bodily regions are multiplied by the appropriate age-specific VSLY values, and productivity losses are subtracted. If a certain variable, such as a single level of injury severity, is associated with a significant positive or negative impact upon the ratio between observed and 'expected' awards, we can say that the variable represents a component of jury "discretion" in determining awards. It will be most important to compare variables to each other; I am looking for variables whose impact upon the ratio of observed to 'expected' awards differ significantly from other variables. In the context of overvaluing increased injury severity levels, in which observed awards become disproportionately high for the injuries of greatest severity, for example, such a finding would be a sign of jury aversion to certain severe outcomes.

ii. *Stage 2*

It is reasonable to be concerned that, in light of medical advances, QALY loss estimates from 1995 may be outdated for determining the functional capacity losses of my 218 plaintiff observations, which have a median trial year of 2007. Spicer et al. (2011) update the III scoring algorithm from Miller et al. (1995) and find QALY loss estimates ranging from 4.6% to 11.5% lower depending on MAIS level. They present median total (cumulative across all post-injury years) QALY losses, discounted at a rate of 3%, per nonfatal road crash injury victim by MAIS level, body region and whether or not a fracture or dislocation was involved. I created an indicator variable corresponding to whether JVR case abstracts specifically mentioned a fracture or dislocation as a feature of each plaintiff's maximum severity injury and then assigned each plaintiff total QALY losses based on the MAIS injury severity and body region observations used for matching injuries to QALY losses from Miller et al. (1995).[15]

Monetizing the lumped-sum QALY losses from Spicer et al. (2011) requires a single, constant cost per QALY. I use the estimation from Lawrence et al. (2018) of $210,423.70 per QALY in 1996 dollars.[16] Thus, I am able to create a new 'expected' award that is not age-specific and a new version of JURYEFFICIENCY equal to the natural log of the ratio of the new Stage 2 'expected' award to the observed noneconomic award. My use of lumped-sum QALY losses and a constant QALY cost rests on the assumption that the under- and over-estimation of the new 'expected' awards for younger and older plaintiffs, respectively, balance out over the 218 plaintiff observations (see Footnote 1). Summary statistics for the new 'expected' awards and the new version of JURYEFFICIENCY are found in Tables 2 and 3, respectively.

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[15] Spicer et al. (2011) do not provide median QALY loss estimates for spinal cord injuries of MAIS severity level 1 or 2. These injuries are assigned the QALY loss estimates for "Burns/Other" of MAIS 1 or 2.

[16] $292,422 in 2010 dollars. Based upon a VSL of $8.7 million in 2014 dollars (equal to $8.01 million in 2010 dollars and $5.77 million in 1996 dollars using the CPI-U for all items). Adjusted to 1996 dollars using the CPI-U for all items. Does not include productivity costs.

It is clear from the lower values of JURYEFFICIENCY that the lumped-sum QALY loss and constant QALY cost methodology of deriving ‘expected’ awards results in higher ‘expected’ award values, on average, than ‘expected’ awards derived from the original time-separated QALY loss and age-based VSLY estimations. This is likely due to the relatively high cost per QALY from Lawrence et al. (2018) compared to the age-based VSLY estimations from Aldy and Viscusi (2003), from which productivity losses are further subtracted. The sensitivity of Stage 2 ‘expected’ awards to a high cost-per-QALY seems to override the effect of the bias towards large noneconomic awards in the Stage 1 data sample. All else being equal, it would seem that Stage 2 ‘expected’ awards would be lower than Stage 1 ‘expected’ awards, just like the relationship between the observed noneconomic awards for both Stages.

iii. *Complete Model*

My complete empirical model is

$$\text{JURYEFFICIENCY} = (\text{LN}(\text{NONECONOMIC}_i) - \text{LN}(\text{EXPAWARD}_i)) =$$
$$\beta_0 + \beta_1\text{MAIS}_{3i} + \beta_2\text{MAIS}_{45i} + \text{PLAINTIFF CONTROLS} + \text{DEFENDANT CONTROLS} + \text{CASE DETAIL CONTROLS} + u_i \quad (11)$$

where the dependent variable (JURYEFFICIENCY) is the natural log of the ratio of observed noneconomic award to ‘expected’ award.[17] Table 3 presents summary statistics for JURYEFFICIENCY by the five levels of injury severity.

The central explanatory variables on which I will regress JURYEFFICIENCY are indicator variables corresponding to injuries of AIS severity levels 4 or 5 and severity level 3. Combining injuries of AIS severity 4 and 5 helps limit the impact of having limited observations of these kinds

[17] Contributory negligence impacts the amount plaintiffs ultimately receive, but subtracting contributory negligence from expected and ‘observed’ awards distorts the values juries assign to plaintiffs’ noneconomic losses.

of injuries. The coefficients on the injury severity indicator variables (β_1 and β_2) are interpreted in relation to the constant β_0, which represents the average JURYEFFICIENCY ratio for plaintiff observations for MAIS severity levels 1 and 2, as well as other observations from groups excluded from the controls because of multicollinearity concerns.[18] β_1 and β_2, multiplied by 100, are the percent differences in the population mean values of JURYEFFICIENCY between observations accounted for in β_0 and plaintiffs suffering moderate (MAIS 3) and severe (MAIS 4 or 5) injuries, respectively. Positive coefficients suggest that the observed-to-'expected' (JURYEFFICIENCY) ratio is, on average, higher than that for the low-injury-severity baseline observations. In other words, positive coefficients suggest an average increase in the observed award relative to the 'expected' award associated with a given variable. Higher coefficients correspond to greater differences in the observed-to-'expected' ratio. Rejecting the null hypothesis that β_1 or β_2 equals 0 in favor of the alternate hypothesis that β_1 or β_2 is greater than 0 suggests that the average JURYEFFICIENCY ratio increases for injuries of increased severity. In this case, which is what I expect to find, significant variability in jury award determinations exists, such that plaintiffs suffering severe injuries are awarded disproportionately high noneconomic damages. Therefore, I expect both β_1 and β_2 to be positive and β_2 (and possibly β_1) to be statistically significant. Since I expect that injuries of MAIS severity 4 and 5 will be associated with very disproportionate noneconomic awards, I further expect to be able to reject the null hypothesis $\beta_1 = \beta_2$.

iv. *Test for Reliability*

[18] For example, if JURYEFFICIENCY is regressed on the $MAIS_3$ and $MAIS_4$ indicators, as well as an indicator equal to 1 if a plaintiff is female and two other indicators equal to 1 if a plaintiff is relatively old or relatively young, respectively, then β_0 represents the average JURYEFFICIENCY ratio (the ratio of observed to 'expected awards') for male middle-aged plaintiffs suffering injuries of MAIS severity 1 or 2.

However, as mentioned previously, a major concern is that juries' awards for economic and noneconomic damages are not independent. In other words, a jury's economic award amount influences its decision regarding the appropriate level of noneconomic damages, or vice versa. If this were a major systemic problem, the results from the regressions described in this section could not effectively isolate the impact of high and low injury severities on the ratio of observed to 'expected' awards. To test for this concern, I create an economic damages analog of JURYEFFICIENCY:[19]

$$\text{ECONEFFICIENCY} = (\text{LN}\ (\text{ECONOMIC}_i)) - \text{LN}\ (\text{EXPAWARD}_i)) \qquad (12)$$

The 'expected' award consists of monetized functional capacity losses, and larger functional capacity losses are associated with more severe injuries, which have greater attendant medical costs, lost wages, etc. It can be reasonably expected that 'expected' awards will be positively linearly proportional to observed economic awards, which is true in my data sample of 218 plaintiff observations. Seemingly unrelated regressions can be constructed to isolate the impact of explanatory and control variables upon both the ratio of observed economic awards to 'expected' awards (ECONEFFICIENCY) and the ratio of observed noneconomic awards to 'expected' awards (JURYEFFICIENCY).[20] This eliminates any interplay between the economic and noneconomic awards.[21] Stage 1 and 2 results can be found in Table 6.

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[19] Economic damages awards are adjusted to 1996 dollars using the CPI-U for medical care.

[20] Note that plaintiff observations will only be included in the seemingly unrelated regressions if there is non-zero economic damages compensation. The average JURYEFFICIENCY ratio does not seem to differ significantly between observations with and without zero economic damages compensation. Mean JURYEFFICIENCY with non-zero economic damages is 0.424 with a standard deviation of 2.157. Mean JURYEFFICIENCY with zero economic damages is 0.523 with a standard deviation of 2.339.

[21] I conduct the seemingly unrelated regressions separately for Stages 1 and 2 on the MAIS indicators and the significant controls in Regressions (4) and (9) (as displayed in Tables 4 and 5), respectively. The control variables will be described in subsection (v).

$$\begin{cases} \text{ECONEFFICIENCY}_i = \beta_0 + \beta_1\text{MAIS}_{3i} + \beta_2\text{MAIS}_{45i} + \text{CONTROL VARIABLES} \\ \text{JURYEFFICIENCY}_i = \beta_0 + \beta_1\text{MAIS}_{3i} + \beta_2\text{MAIS}_{45i} + \text{CONTROL VARIABLES} \end{cases} \quad (13)$$

The correlations of the residuals from the seemingly unrelated regressions in both Stages 1 and 2 are positive and very high. This means that when the ratio of observed economic awards to 'expected' awards is high or low, so too is the ratio of observed noneconomic awards to 'expected' awards. In other words, juries do not seem to treat noneconomic and economic awards as substitutes. I can proceed with improved confidence that the awarding of high or low economic damages does not skew the awarding of noneconomic damages – juries, in general, do not treat noneconomic damages as a secondary category of compensation for 'evening out' the impact of economic damages.[22] If noneconomic damages reflect what juries actually consider to be appropriate compensation for noneconomic losses, comparing observed noneconomic awards to 'expected' awards as derived in this paper makes sense.

v. *Control Variables*

With the general credibility of reported noneconomic damages awards supported, Equation 11 can provide meaningful results. This shifts the focus to the control variables, which control for omitted variable bias in the estimation of the impact of levels of injury severity upon

[22] Shortcomings in the data assigning MAIS severity levels to each plaintiff could provide an alternate explanation for the high and positive correlations of the residuals in the seemingly unrelated regressions. Errors in assigning injury severity could result in seemingly disproportionately high or low noneconomic and economic damages, skewing the results of the seemingly unrelated regressions to the observed correlations. In cases of misattributed AIS levels, economic and noneconomic damages may not be independent but may be reported as both disproportionately high or low because of comparison to an inadequate 'expected award.' I must assume that errors in MAIS severity attribution, if existent, exhibit symmetry over the range of plaintiff observations (a relatively equal number of over-estimated and under-estimated injury severity levels).

JURYEFFICIENCY. The control variables used in my empirical methodology can be separated into three categories: plaintiff controls, defendant controls, and case detail controls. In both Stages 1 and 2, each group of controls is included in a separate regression, each of which contains the $MAIS_3$ and $MAIS_{45}$ explanatory variables. The relatively small number of overall observations in my study, the loss of some observations due to some missing data points for certain control variables, and concerns about the relatedness of all variables (multicollinearity issues) provide ample reason to conduct separate regressions instead of attempting to include all controls in a single regression.

My main inspiration for many of the control variables I intend to use in my empirical methodology comes from two existing datasets used in the literature mentioned in this paper. Smith's (2000) dataset includes information taken from 340 usable cases out of an original 666 case abstracts from 1980-1990. Cohen and Miller's (2003) dataset takes information from 514 physical assault cases from 1980-1991 and 728 consumer product-related injury cases from 1980-1995 coded from JVR reports. All the control variables I use, short descriptions for each variable, observations per variable in Stages 1 and 2, and population means in Stages 1 and 2 are listed in Table 7.

The first set of controls will relate to information about the plaintiff (victim), as used in Regressions (1) and (6) (Stages 1 and 2, respectively; see Tables 4 and 5). Both influential datasets include information on the sex of the plaintiff, which I include in the indicator variable FEMALE (equal to 1 for female plaintiffs) when the JVR case abstract provides this information. Cohen and Miller (2003) have indicator variables for older and younger age groups, which could possibly account for jury reactions to either younger or older victims that would cause these victims to receive disproportionately high or low awards even after age is taken into consideration for noneconomic award calculations. My model includes the age-group indicator variables OLDERVICTIM and YOUNGERVICTIM, equal to 1 for plaintiffs 46-years-old or older or 24-years-old or younger, respectively. It is important to note that these are also VSL_1 age cut-off points in my manipulation of the VSL minimum distance estimation from Aldy and Viscusi (2003) (see Equation 5). I control for the age-group indicators in Stage 1 (Regression 1), but not in Stage 2 (Regression 6), where all plaintiffs regardless of the availability of age data are included. Finally, Regressions (1) and (6) additionally include fixed effects corresponding to the plaintiff's affected body region for their maximum-severity injury. It is possible that injuries to certain body regions are associated with disproportionately high or low noneconomic damages awards.

The equation for Regressions (1) and (6) is displayed in Equation 14 below. The constant term (β_0), multiplied by 100, can be interpreted as the average percentage by which observed awards exceed 'expected' awards (or lag behind 'expected' awards if β_0 is negative) for the sample of middle-aged males suffering injuries of MAIS 1 or 2. Meanwhile, β_1 and β_2, multiplied by 100, can be interpreted as the percent difference in the observed-to-'expected' ratio between the sample average for plaintiffs suffering moderate and severe maximum-severity injuries, respectively, compared to the β_0 baseline.[23] Thus, if β_1 and β_2 are positive, injuries of severity higher than MAIS 1 or 2 are associated with higher observed-to-'expected' award ratios, and vice versa.

$$\text{JURYEFFICIENCY}_i = \beta_0 + \beta_1\text{MAIS}_{3i} + \beta_2\,\text{MAIS}_{45i} + \beta_3\text{OLDERVICTIM}_i + \beta_4\text{YOUNGERVICTIM}_i + \beta_5\text{FEMALE}_i + \text{BODY REGION FIXED EFFECTS}_i + u_i \tag{14}$$

[23] Referencing the Stage 1 regression results in Table 4, β_1 in Regression (1) is interpreted as follows: The observed-to-'expected' award ratio (JURYEFFICIENCY) is, on average, 67.0% higher for plaintiffs suffering injuries of MAIS 3 than for middle-aged males suffering injuries of MAIS 1 or 2, holding all other variables constant. β_2 is interpreted: The observed-to-'expected' award ratio is, on average, 186.3% higher for plaintiffs suffering injuries of MAIS 4 or 5 than for middle-aged males suffering injuries of MAIS 1 or 2, holding all other variables constant.

The next set of control variables relates to the defendant and is included in Regressions (2) and (7) (Stages 1 and 2, respectively). Cohen and Miller (2003) provide indicator variables for when the government and a business are the only defendants in a case. I similarly include indicator variables corresponding to whether a government body, business, or individual are included amongst the defendants found liable by the jury. Multiple defendants and different kinds of defendants may all be found liable in the same case. These variables are important because jurors may act differently when cases involve different kinds of defendants. As previously discussed, the "deep pockets" effect suggests that jurors might also tend to specifically punish rich corporate defendants. One additional way I attempt to control for this effect is by including a variable equal to 1 when a 'large business' is a defendant (see Appendix B). 'Large businesses' include major insurance companies, trucking companies, and other well-known corporations. I further control for whether the JVR case abstract specifically mentions that the defendant accepted liability or not, as it is possible that jurors favor defendants who admit their own guilt.

A third group of control variables relates to the specifics of the case itself (case detail controls) and is included in Regressions (3) and (8) (Stages 1 and 2, respectively). As lists of attorneys and expert witnesses are some of the most reliably present pieces of information in JVR case abstracts, I will control for total number of attorneys and experts used by the plaintiff and defendant combined, as well as the ratio of plaintiff attorneys to defense attorneys. Since it is reasonable to expect that more attorneys (and possibly more expert witnesses) are involved in larger-loss and higher-value cases, which would probably also be cases where the plaintiff has suffered a severe injury worthy of hefty compensation, I expect that the coefficients on the total attorneys and total experts controls to be positive and economically significant. This is for the same reason as my expectation of the β_2 coefficient – I expect to find jury bias towards over-compensation in large-loss cases. Additionally, the plaintiff-to-defense attorney ratio control will provide some indication of whether plaintiff attorneys are successful in convincing juries to award disproportionately high noneconomic damages.

Regressions (3) and (8) also include an indicator variable corresponding to whether the state in which the case is held has a statutory cap on noneconomic damages in motor vehicle negligence cases. While caps on noneconomic damages are enforced in judgment, a process following a jury's verdict, a jury's awareness of impending caps on its noneconomic awards may lead it to take the initiative to reduce its awards. States with caps on noneconomic damages may also have a citizenry more opposed to high noneconomic awards than other states (after all, damages caps are passed by the representatives of the state's citizens). This means that the jury pools in these states might be more likely to be opposed to the practice of awarding high noneconomic damages.

Not all variables in the three aforementioned categories of controls have a significant impact upon the ratio of observed to 'expected' awards. Stage 1 Regressions (4) and (5) and Stage 2 Regressions (9) and (10) include only the controls between all three categories for which their coefficients in previous regressions were statistically significant at the 10% level. For further robustness, Regressions (4) and (9) add time-based fixed effects to the model. This is meant to account for general changes in jury practices over time and potential real growth in VSLY (see Footnote 13). Each plaintiff observation is categorized is categorized into one of four trial year groups: 1988-2000, 2001-2005, 2006-2010, and 2011-2019.[24] Regressions (5) and (10) are

[24] Some JVR case abstracts do not mention the year of trial or year of incident. When one of these years is provided, I assume a three-year lag between incident and trial.

identical to Regressions (4) and (9) except they include the body-region fixed effects used in Regressions (1) and (6) instead of time-based fixed effects.

VI. Results

Results from Regressions (1) through (10) (as found in Tables 4 and 5) suggest that noneconomic damages are disproportionately awarded at the opposite ends of the injury severity spectrum, when awards are compared to 'expected awards' constructed from the QALY loss and VSLY methodology for plaintiffs' most severe injuries. While the low-injury-severity baseline β_0 is negative in all regressions except Regression (2) and β_2 is positive in all regressions, it would be inaccurate to conclude that observed awards for injuries of low or high severity are outright insufficient or excessive, respectively. These estimations are highly sensitive to controversial VSLY estimations and QALY loss estimates that, as I explain in this section, may not account for the full range of noneconomic losses, as well as other potential inaccuracies in 'expected' award calculations. Relationships between JURYEFFICIENCY and both explanatory and control variables are more relevant for gleaning insights from the regressions.

The relationship between JURYEFFICIENCY for both Stage 1 and Stage 2 estimations and the MAIS levels of injury severity is displayed in Figure 3. It is clear that the ratio of observed to 'expected' noneconomic awards increases exponentially for plaintiffs suffering injuries of high severity, suggesting jury bias in large-loss cases. Nonetheless, it is important to note that the QALY loss inputs into 'expected awards,' based upon the III's six categories of functioning, may not accurately account for plaintiffs' mental/emotional losses attendant with their physical injuries. It is theoretically possible that the mental/emotional component of injury increases exponentially as physical injury severity increases – for example, a fractured limb may be associated with disproportionately low mental/emotional losses when compared with an amputated limb or paraplegia. It is even possible that mental/emotional losses could dwarf the physical components of QALY loss (life years lost due to injury) for very high-severity injuries. Hence, the condition of linear proportionality between monetized QALY losses and total noneconomic damages (which includes categories such as "mental anguish" and "emotional distress"), described on page 20, may be violated. In this case, the 'expected award' would cease to be an accurate benchmark.

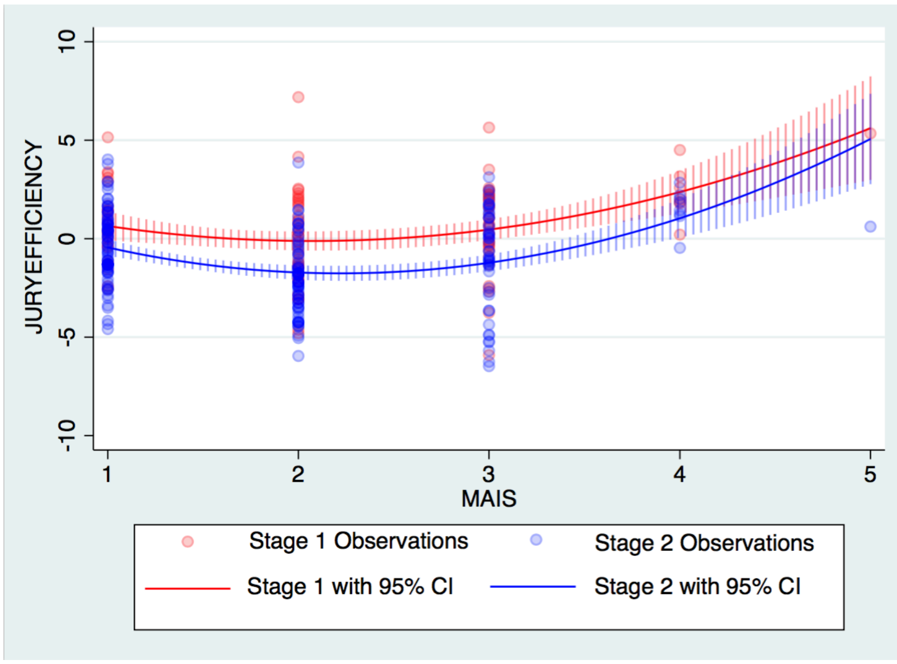

FIG.3. – JURYEFFICIENCY Relationship with Injury Severity

Likewise, it is also possible that the number of injuries suffered by plaintiffs would increase exponentially with the severity of a plaintiff's most-severe injury, to the extent that the MAIS value serves as a proxy for the overall impact of an automobile accident. This would mean that, as injury severity increases, QALYs lost due to a plaintiff's most severe injury would represent a decreasing fraction of overall QALY losses due to an accident – and 'expected' awards would fail to represent a consistent percentage of overall losses for all plaintiffs. If this were true, or if mental/emotional losses attendant with physical injury increase disproportionately compared to losses accounted for in the III, ostensible jury "bias" in cases of high-severity injury could be explained as proper compensation for the entire range of noneconomic damages, including mental/emotional components. Disproportionately high observed-to-'expected' award ratios for plaintiffs suffering very severe injuries would reflect desirable jury behavior. Whether observed jury variability indeed reflects accurate compensation for disproportionately high mental/emotional losses, or whether overall large-loss incidents result in a disproportionately high number of injuries (compared to less severe incidents), remain areas for further research.

Nonetheless, it seems unlikely that mental/emotional losses and the number of overall injuries associated with incidents that result in a high maximum-severity injury account for all of the expansive growth of the JURYEFFICIENCY ratio as injury severity increases. Juries do appear to be biased towards disproportionately high noneconomic damages awards in large-loss cases, using MAIS to represent severity of the incident. Moreover, disproportionately high or low observed awards (as measured against 'expected' awards as constructed in this paper) associated with control variables can still suggest jury bias/variability in award determinations. For instance, it is unreasonable that plaintiffs in states with caps on noneconomic damages in motor vehicle negligence cases would suffer disproportionately low intangible (mental, emotional, etc.) losses or a disproportionately low number of overall injuries resulting from accidents as a group. Hence, the multiple results of significance for the negative value of the coefficient on the noneconomic damages cap indicator variable in Regressions (3)-(5) and (8)-(10) (see Tables 4, 5) suggest that juries do tend to be biased towards low awards in these states.

i. *Stage 1 Results Overview*

I can reject the null hypothesis that the coefficient on $MAIS_{45}$ (β_2) equals zero at the 1% level of statistical significance in Regressions (2) and (3), the 5% level in Regression (1), and the 10% level in Regressions (4) and (5). I use *F*-tests to determine whether the ratio of observed-to-

'expected' noneconomic awards varies significantly between plaintiffs suffering injuries of moderate severity (MAIS 3) and high severity (MAIS 4 and 5). As the relationship between JURYEFFICIENCY and MAIS in Figure 3 would suggest, I find a statistically significant increase in award ratio in Regressions (2), (3), and (4), with the other *F*-statistics relatively high but not statistically significant given the small data sample of 117 and 110 observations in Regressions (1) and (5), respectively. Comparing the difference between the magnitudes of the $MAIS_3$ coefficients (β_1) and the constant term (β_0) to the difference between β_2 and β_1, I similarly find an economically significant "jump" in the observed-to-'expected' ratio (JURYEFFICIENCY) between plaintiffs suffering moderately (MAIS 3) and highly severe (MAIS 4 or 5) injuries. In Regressions (1) - (5), the marginal shift from moderate to high severity corresponds an average 157% increase in the JURYEFFICIENCY ratio, compared to just a 35.3% increase for the marginal shift from the low-severity baseline to moderate severity.[25]

ii. Stage 2 Results Overview

The Stage 2 results are qualitatively consistent with those for Stage 1, despite the skew towards large-loss cases in the Stage 1 sample of 117 observations. This is an important fact validating the observed variability in awards, given the differences in age-dependency, costs per QALY, and QALY loss estimations underlying the 'expected' awards in each Stage. I can reject the null hypothesis that the coefficient on $MAIS_{45}$ (β_2) equals zero at the 1% level of statistical significance in Regressions (7) and (8), the 5% level in Regression (9), and the 10% level in Regression (6). The *F*-tests on the null hypothesis $\beta_1 = \beta_2$ result in *F*-statistics that are statistically

[25] $\beta_1 - \beta_0$ equals 0.745, -0.175, 0.016, 0.284, and 0.897 in Regressions (1) through (5), respectively. $\beta_2 - \beta_1$ equals 1.236, 1.924, 2.111, 1.561, and 1.018 in Regressions (1) through (5), respectively.

significant in Regressions (6), (7), (8), and (9).[26] While the F-statistics for Regressions (5) and (10) are statistically insignificant, the F-statistic for Regression (10) is closer to statistical significance at the 10% level.[27] This seems to suggest that, with an increased number of observations in Stage 2, the data tend toward displaying a clearer disparity in the observed-to-'expected' award ratio between plaintiffs suffering moderate and severe maximum-severity injuries.[28] This would mean that exponential growth in the JURYEFFICIENCY ratio for injuries of high severity exists and can be found with statistical significance if the sample size of observations is large enough.

Nonetheless, the Stage 2 results display comparable "jumps" in the JURYEFFICIENCY ratio corresponding to increases in injury severity from low to moderate and moderate to high. The marginal shift from moderate to high severity corresponds to an average 167.9% increase in JURYEFFICIENCY, compared to an 138.8% increase for the shift from the low-severity baseline to moderate severity.[29] The clearer distinction in JURYEFFICIENCY between the low and moderate severity levels may be due to the greater sample size of low-loss cases in the Stage 2

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[26] Note that the F-statistic for Regression (6), but not Regression (1), is statistically significant. Both regressions include the FEMALE indicator, but only Regression (1) includes the OLDERVICTIM and YOUNGERVICTIM indicators.

[27] The F-statistic for Regression (5) has a p-value of 0.107, while the F-statistic for Regression (10) has a p-value of 0.105. With a few more observations, the F-statistic for Regression (10) would likely be significant at the 10% level.

[28] This assumes a relatively symmetrical age distribution among the 218 plaintiff observations and similar age distributions within each MAIS level. If, for example, the data skews towards older victims, and if older victims suffer a disproportionately large number of MAIS severity level 4 or 5 injuries, the β_2 coefficient and F-test results would reflect effects of disproportionately high JURYEFFICIENCY ratios for older victims as a group.

[29] $\beta_1 - \beta_0$ equals 1.524, 1.359, 0.895, 1.708, and 1.453 in Regressions (6) through (10), respectively. $\beta_2 - \beta_1$ equals 1.296, 2.174, 1.98, 2.024, and 0.921 in Regressions (6) through (10), respectively.

data, in which strong evidence can be found for jury under-compensation of plaintiffs suffering injuries of severity level MAIS 2.[30]

iii. Further Results Analysis

The Regression (1), (4) and (5) results indicate that juries tend to overcompensate older victims and undercompensate younger victims.[31] This pattern is apparent in the signs of the coefficients in Regression (4), although only statistically significant in Regressions (1) and (5). It is possible that older or younger victims suffering severe injuries would incur disproportionate significant mental/emotional losses attendant with physical injury or a disproportionate number of overall injuries (and therefore observed "bias" towards these groups would reflect accurate jury compensation for older victims suffering severe injuries), but this is unlikely and not supported by the data.[32] Rather, it seems that the coefficients on the older and younger victim indicators can be interpreted similarly to the coefficients on the injury severity indicators – evidence of jury

[30] See Table 3. The Stage 2 data include 56 and 32 more observations of plaintiffs with maximum-severity injuries of levels MAIS 1 and 2, respectively, than the Stage 1 data. The Stage 2 data include only 12 more MAIS 3 observations, 1 more MAIS 4 observations, and no more MAIS 5 observations. Juries may award a "premium" just for coming to trial, as evidenced by higher JURYEFFICIENCY ratios corresponding to MAIS 1 observations (whose 'expected' awards would be minimal) than MAIS 2 observations in both Stages. However, median JURYEFFICIENCY decreases 195.9% between observations of MAIS 1 and 2 in Stage 2, compared to just a 62.1% decrease in Stage 1. Jury under-compensation for MAIS 2 injuries thus becomes more evident in Stage 2.

[31] From the Regressions (4) and (5) results, compared to the middle-age baseline, juries overcompensate older victims by between 104.2% and 104.6%, and undercompensate younger victims by between 18.9% and 49.6%.

[32] When including the Regression (5) controls in a regression on an indicator corresponding to MAIS levels 3, 4, and 5 ($MAIS_{345}$) and including an interaction term between $MAIS_{345}$ and OLDERVICTIM, I find that the interaction is insignificant and the coefficient on OLDERVICTIM is statistically significant at the 1% level. The coefficient on an interaction between $MAIS_{345}$ and YOUNGERVICTIM is also statistically insignificant. It thus seems that the over-compensation of older victims and under-compensation of younger victims cannot be attributed to either group's outcomes in large loss cases. I interact $MAIS_{345}$, not $MAIS_{45}$, with OLDERVICTIM and YOUNGERVICTIM because of the small size of the overall $MAIS_{45}$ observation pool.

bias/variability so long as the factors insufficiently addressed in the ‘expected’ award do not disproportionately apply to younger or older victims as an entire group and account for the whole scope of the disproportionate regression outcomes. It is also worth noting that observed jury “bias” towards older victims and against younger victims may also be intentional. These two groups of victims receive different awards not only because of the differences in expected life years remaining but also because of age-based discrepancies in VSLY. Due to moral concerns, juries may want to assign a single value to all years of life regardless of the victim’s age, hence resulting in observed “bias” when observed awards are compared to ‘expected’ awards constructed from age-based VSLYs.

The coefficients on the government-defendant and business-defendant indicators in Regressions (2), (4), (5), (7), (9), and (10) indicate that, as expected, juries tend to “punish” these supposedly wealthy and powerful entities with disproportionately large noneconomic damages awards. This is evidence of the “deep pockets” effect. However, the coefficients on the ‘big company’ indicator are insignificant, and the economic significance of these negative coefficients suggest that ‘big companies’ are punished with smaller noneconomic damages, on average, than business-entity defendants that are not ‘big companies.’[33]

The statistical significance of the negative coefficient on the noneconomic damages cap indicator variable in Regressions (3), (5), and (8) (and the economic significance of this negative coefficient in Regressions 4, 9, and 10) is somewhat surprising. The results indicate that juries in

[33] Since all ‘big companies’ are also business defendants, the coefficient on the ‘big company’ indicator is interpreted as the difference in the population mean JURYEFFICIENCY ratios between plaintiff observations where ‘big companies’ are defendants and observations where business defendants that do not qualify as ‘big companies’ are defendants. Despite the negative coefficients on the ‘big company’ indicators, ‘big companies’ are still punished with disproportionately higher awards on average than non-business-entity defendants in both Regressions (2) and (7).

states with noneconomic damages caps award disproportionately low noneconomic damages, on average, compared to juries in all other states. As previously described, juries in states with caps may tend to account for the eventual reduction of their awards in judgment. Jurors in states with caps may also tend to be opposed to the practice of awarding noneconomic damages in general, or tend to award smaller noneconomic damages for another reason.[34]

Neither regressions (3) nor (8) indicate that the total number of experts in a case or the plaintiff-to-defense attorney ratio correspond with disproportionate noneconomic damages awards. This is evidence that a larger number of plaintiff attorneys working on a single case does not, on average, result in convincing the jury to award damages higher than would be awarded with fewer plaintiff attorneys. The *total* number of attorneys is, however, significant, as would be expected. The total number of attorneys would logically seem to serve as a proxy for the importance (severity of losses, potential monetary compensation, etc.) of the case of the whole. The more severe a plaintiff's injury, it would seem, the greater the likelihood of a large number of attorneys working on the case. Such a relationship is borne out by the data. The pairwise correlation of $MAIS_{345}$ and the total number of attorneys is relatively large at 0.347.[35] The mean total attorneys per case for observations of plaintiffs suffering injuries of MAIS severity 4 or 5 is 4.2, compared to 3.875 for MAIS 3 and 2.567 for MAIS 1 or 2. Hence, just like the positive coefficients on $MAIS_{45}$, the positive coefficients on the total attorneys indicator in Regressions (3), (4), (5), (8),

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[34] Noneconomic damages caps are an example of tort reform, a politically-fraught issue. It is possible that jurors in states with enacted caps would be, on average, more opposed to the practice of awarding noneconomic damages than jurors in states without caps. In theory, jurors are a random draw from the population at large.

[35] $MAIS_{345}$ is an indicator variable equal to 1 when a plaintiff's injury is of MAIS severity level 3, 4, or 5.

(9), and (10) indicate that juries award disproportionately large noneconomic damages (when compared to the 'expected' award) in large-loss cases.

The finding of jury bias/variability in large-loss cases may point towards systemic hindsight bias in juries' noneconomic damages awards.[36] In the midst of the "shock" of a severe injury outcome, juries may use excessive noneconomic damages as a tool to punish the negligent party for precaution they believe, in hindsight, they should have taken.[37] Hindsight may also distort juries' view of the toll a severe injury has taken upon a plaintiff in the time between the incident and trial. However, it also logically follows that if the number of attorneys working on a case corresponds with the severity of the plaintiff's injury, the number of attorneys would likewise correspond with the components of noneconomic damages that are not sufficiently addressed in the 'expected' award (mental/emotional losses, total injuries per accident, etc.). Just as with the $MAIS_{45}$ indicator, observed jury "bias" in large-loss cases with higher numbers of attorneys may (partially or even fully) reflect accurate and desired noneconomic compensation if these factors increase disproportionately with injury severity.

VII. Conclusion

It is likely that jury bias in noneconomic damages compensation exists at the opposite ends of the injury-severity spectrum. Juries seem to react to large-loss cases and supposedly wealthy defendants differently than the baseline, raising issues of potential "deep pockets" effects and hindsight bias. The results in this paper suggest notable variability in awards, adding evidence for

[36] Hindsight bias in jury behavior is well-documented; juries award once the outcome of an incident is already known and therefore are likely to overreact in punishing the at-fault party.
[37] Punitive damages may be more appropriate for punishing the at-fault party, but very few (4) cases in my sample include formal punitive damages. The vague nature of the components of noneconomic damages makes this category of compensation a likely informal alternative to punitive damages for punishing the at-fault party.

the justifiability of tort reforms targeting supposedly "excessive" noneconomic damages awards. A more mathematical approach to determining noneconomic damages, similar to the 'expected' awards developed in this paper, may be optimal for standardizing awards across the injury severity spectrum, as opposed to damages caps that can result in under-compensation in large-loss cases. Further research should address updated QALY loss estimates that better reflect the full range of plaintiffs' noneconomic losses. This would be necessary for proper implementation of standardized noneconomic damages calculations.

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TABLE 1
Injuries in JVR Case Abstracts

Injury	**JVR Injury Description Example**	**Occurrences in 218 Plaintiff Observations[1]**	**Revised AIS85 Injury Code**
Leg Amputation, Below Knee	"A male suffered a right leg below the knee amputation…"	6	90101.3
Leg Amputation, Above Knee[1]	"…injuries to his right leg that required amputation above the knee"	6	90102.4
Cerebral Concussion (Not further specified)	"A female alleged that she suffered a concussion…"	8	20637.2
Spinal Cord Laceration; Paralysis/Paraplegia	"severe spinal cord injuries that resulted in paralysis from his waist down…"	1	Cervical: 70301.5 Lumbar: 76401.5 Thoracic: 73301.5
Spinal Cord Strain	"A female alleged that she suffered…cervical, lumbar, and shoulder strains…"	31	Cervical: 70101.1 Lumbar: 76101.1 Thoracic: 73101.1
Disc Herniation with Nerve Root Damage (Radiculopathy)	"…claimed he suffered … herniated discs at L4-L5 with nerve root compression…"	10	Cervical: 70401.3 Lumbar: 76501.3 Thoracic: 73401.3

[1] Injury occurrences are only counted if they are the plaintiff's maximum-severity injury, as used for determining 'expected' noneconomic damages. All 218 plaintiff observations have a single maximum-severity injury.
[2] "Leg Amputations" without further specification were assumed to be above-the-knee amputations.

TABLE 2
Summary Statistics of Case Observations Relevant for Calculating JURYEFFICIENCY

VARIABLE	Observations	Mean	25th Percentile	Median	75th Percentile	Standard Deviation
	Stage 1: Time-Separated QALY Losses (Miller et al. 1995) and Age-Based VSLY Estimations (derived from Aldy and Viscusi 2003)					
Plaintiff Age	117	39.274	31	40	49	12.539
$VSLY_1$ (1996 dollars)	117	171,959.40	152,282.10	188,975.00	209,634.20	48,376.12
$VSLY_{25}$ (1996 dollars)	117	168,407.30	144,213.20	180,724.50	210,067.00	48,982.23
$VSLY_6$ (1996 dollars)	117	78,800.92	22,882.39	77,728.97	129,363.60	57,203.25
Lost Productivity Due to Injury (1996 dollars)	117	31,333.73	5,033.854	19,259.29	49,625.47	37,536.77
'Expected Award' (1996 dollars)	117	145,508.30	5,639.71	92,075.02	226,001.50	168,563.00
Observed Noneconomic Award (1996 dollars)	117	836,849.70	6,025.35	63,186.49	664,866.40	1,828,173.00
Observed Economic Award (1996 dollars)	117	345,593.40	0	12,940.00	101,028.10	1,000,885.00
	Stage 2: Lumped QALY Losses (Spicer et al. 2011) and Constant QALY Valuation (Lawrence et al. 2018)					
'Expected Award' (1996 dollars)	218	290,174.30	13,046.27	98,688.72	421,689.10	399,411.80
Observed Noneconomic Award (1996 dollars)	218	496,185.40	5,231.42	21,216.62	180,309.50	1,431,526.00
Observed Economic Award (1996 dollars)	218	198,791.20	0	4,124.90	29,160.09	753,663.10

TABLE 3
JURYEFFICIENCY Summary Statistics

Injury Severity (MAIS Level)	Time-Separated QALY Loss, Age-Based VSLY Estimates (Stage 1)			Lumped QALY Losses, Constant QALY Valuation (Stage 2)		
	Observations	Median	Standard Deviation	Observations	Median	Standard Deviation
1	29	0.431	1.743	85	-0.221	1.803
2	43	-0.190	2.346	75	-2.180	1.816
3	37	0.770	2.157	49	-0.627	2.523
4	7	1.996	1.331	8	1.643	0.983
5	1	5.343		1	0.613	
Total	117	0.431	2.202	218	-1.107	2.148

TABLE 4 – Stage 1 Regressions
Natural Log of the Ratio of Observed To "Expected" Awards Calculated with Time-Separated QALY Losses (Miller et al. 1995) and Age-Based VSLY Estimations (derived from Aldy and Viscusi 2003)

VARIABLE	Plaintiff Controls with Body Region Fixed Effects (1)	Defendant Controls (2)	Case Detail Controls (3)	Significant Controls with Year Range Fixed Effects (4)	Significant Controls with Body Region Fixed Effects (5)
$MAIS_3$	0.706 (0.393)	0.158 (0.472)	-0.467 (0.613)	-0.214 (0.398)	0.357 (0.261)
$MAIS_{45}$	1.942 (0.756)**	2.082 (0.719)*	1.644 (0.572)*	1.347 (0.438)***	1.375 (0.607)***
Older Victim	0.985 (0.341)**			1.046 (0.720)	1.042 (0.185)*
Younger Victim	-0.735 (0.375)***			-0.189 (1.488)	-0.496 (0.236)***
Female	-0.272 (0.319)				
Government Defendant		0.321 (0.602)			
Business Defendant		1.034 (0.518)**		0.481 (0.574)	0.570 (0.128)*
Individual Defendant		-0.355 (0.743)			
Big Company		-0.817 (0.664)			
Liability		-0.060 (0.492)			
Noneconomic Damages Cap			-1.114 (0.490)**	-1.332 (0.955)	-1.185 (0.199)*
Total Experts			0.053 (0.074)		
Total Attorneys			0.258 (0.081)*	0.190 (0.015)*	0.140 (0.104)
Attorney Ratio			0.102 (0.333)		
Constant	-0.039 (0.371)	0.333 (0.781)	-0.483 (0.601)	-0.498 (0.171)***	-0.540 (0.253)*
R-squared	0.120	0.115	0.176	0.202	0.191
N	117	116	104	110	110
F-test[1] (*F* statistics displayed)	2.55	6.88*	13.54*	12.45**	3.42

In parentheses: Robust standard errors for regressions (2), (3), and (4); clustered standard errors for regressions (1) and (5)
* Indicates statistical significance at 1 percent level
** Indicates statistical significance at 5 percent level
*** Indicates statistical significance at 10 percent level
[1] *F*-test on H_0: $MAIS_3 = MAIS_{45}$

TABLE 5 – Stage 2 Regressions
Natural Log of the Ratio of Observed To "Expected" Noneconomic Damages Awards Calculated with Lumped QALY Losses (Spicer et al. 2011) and Constant QALY Valuation (Lawrence et al. 2018)

VARIABLE	Plaintiff Controls with Body Region Fixed Effects (6)	Defendant Controls (7)	Case Detail Controls (8)	Significant Controls with Year Range Fixed Effects (9)	Significant Controls with Body Region Fixed Effects (10)
$MAIS_3$	0.334 (0.651)	-0.026 (0.426)	-0.315 (0.474)	0.022 (0.561)	-0.020 (0.460)
$MAIS_{45}$	1.630 (0.759)***	2.148 (0.416)*	1.665 (0.493)*	2.046 (0.421)**	0.901 (0.678)
Female	0.140 (0.315)				
Government Defendant		1.104 (0.596)***		0.696 (0.708)	0.757 (0.258)**
Business Defendant		0.957 (0.489)***		0.243 (0.428)	0.603 (0.192)**
Individual Defendant		0.162 (0.543)			
Big Company		-0.715 (0.530)			
Liability		-0.241 (0.329)			
Noneconomic Damages Cap			-0.853 (0.365)**	-0.935 (0.574)	-0.738 (0.544)
Total Experts			0.073 (0.063)		
Total Attorneys			0.193 (0.079)**	0.231 (0.042)**	0.126 (0.105)
Attorney Ratio			-0.307 (0.237)		
Constant	-1.190 (0.270)*	-1.385 (0.561)**	-1.210 (0.341)*	-1.686 (0.161)*	-1.473 (0.308)*
R-squared	0.056	0.089	0.121	0.111	0.103
N	218	217	197	207	207
F-test[1] (*F* statistics displayed)	4.74***	18.95*	15.61*	11.34**	3.34

In parentheses: Robust standard errors for regressions (7), (8), and (9); clustered standard errors for regressions (6) and (10)
* Indicates statistical significance at 1 percent level
** Indicates statistical significance at 5 percent level
*** Indicates statistical significance at 10 percent level
[1] *F*-test on H_0: $MAIS_3 = MAIS_{45}$

TABLE 6 – Seemingly Unrelated Regressions (SUR)
Dependent Variable in Regressions (A) and (C): JURYEFFICIENCY
Depdent Variable in Regressions (B) and (D): ECONEFFICIENCY

	Stage 1 SUR		*Stage 2 SUR*	
VARIABLE	A	B	C	D
$MAIS_3$	-0.063 (0.473)	-0.444 (0.451)	0.218 (0.415)	-0.082 (0.363)
$MAIS_{45}$	1.535 (0.739)**	1.567 (0.704)**	1.970 (0.745)*	1.823 (0.651)*
Older Victim	0.542 (0.471)	0.611 (0.449)**		
Younger Victim	0.443 (0.809)	-0.742 (0.771)		
Government Defendant			0.686 (0.880)	0.657 (0.769)
Business Defendant	0.366 (0.452)	0.392 (0.430)	0.305 (0.339)	0.092 (0.339)
Noneconomic Damages Cap	-1.661 (0.669)**	-1.413 (0.637)**	-1.345 (0.444)*	-0.839 (0.388)**
Total Attorneys	0.068 (0.095)	0.039 (0.091)	0.072 (0.089)**	0.130 (0.077)***
Constant	-0.026 (0.474)	-0.001 (0.452)	-1.349 (0.341)*	-1.425 (0.298)*
R-squared	0.194	0.234	0.159	0.154
N	83	83	134	134
Correlation of Residuals	0.752		0.688	

* Indicates statistical significance at 1 percent level
** Indicates statistical significance at 5 percent level
*** Indicates statistical significance at 10 percent level

TABLE 7
Independent Variables for Regressions on JURYEFFICIENCY

			Stage 1		*Stage 2*	
VARIABLE	Variable Type	Description	Observations	Mean	Observations	Mean
$MAIS_3$	Indicator	Equal to 1 if platiniff's injury is of MAIS level 3	117	0.316	218	0.225
$MAIS_{45}$	Indicator	Equal to 1 if platiniff's injury is of MAIS level 4 or 5	117	0.068	218	0.041
Older Victim	Indicator	Equal to 1 if plaintiff is over 45 years old	117	0.359	N/A	N/A
Younger Victim	Indicator	Equal to 1 if plaintiff is under 25 years old	117	0.120	N/A	N/A
Female	Indicator	Equal to 1 if plaintiff is female	117	0.479	218	0.482
Government Defendant	Indicator	Equal to 1 if a government entity is listed as a defendant	117	0.077	218	0.055
Business Defendant	Indicator	Equal to 1 if a business entity is listed as a defendant	117	0.368	218	0.326
Individual Defendant	Indicator	Equal to 1 if an individual entity is listed as a defendant	117	0.889	218	0.913
Big Company	Indicator	Equal to 1 if a 'large business entity' is listed as a defendant	117	0.188	218	0.183
Liability	Indicator	Equal to 1 if the defendant accepts liability	116	0.25	217	0.263
Noneconomic Damages Cap	Indicator	Equal to 1 if the state caps noneconomic damages in motor vehicle negligence cases	117	0.128	218	0.170
Total Experts	Continuous	Total number of plaintiff and defense experts combined	108	2.620	203	1.754
Total Attorneys	Continuous	Total numer of plaintiff and defense attorneys combined	110	3.291	207	2.947
Attorney Ratio	Continuous	Ratio of the number of plaintiff attorneys to the number of defense attorneys	105	1.118	200	1.119
Year Range	Categorical	Four categories of trial year ranges: 1988-2000, 2001-2005, 2006-2010, 2011-2019	117		218	
Body Region	Categorical	Plaintiff's injury assigned to one of ten distinct bodily regions	117		218	

Appendices

A. Step-by-Step Construction of Stage 1 'Expected' Awards

Monetized QALYS

1. Determine the body region (1-10) of the plaintiff's maximum-severity injury
2. Using the AIS85, determine the AIS injury severity score (1-5) for the plaintiff's maximum-severity injury
3. Assign the plaintiff's injury average QALY losses in post-injury years 1, 2-5, and 6+ ($QALY_1$, $QALY_{25}$, $QALY_{6+}$) according to MAIS and body region using the table in Miller et al. (1995)
4. Using the United States Life Table (published by the NCHS) for both sexes combined corresponding to the year of the plaintiff's injury accident, find the plaintiff's current expected future life years (PV_{yrs}) based upon their age at the time of injury.
5. Calculate the plaintiff's age-based VSL for each of the three post-injury periods (VSL_1, VSL_{25}, VSL_6) by using AGE_1, AGE_{25}, and AGE_{6+}, respectively, for AGE in Equation 5:
   AGE_1 = plaintiff's current age (AGE)
   AGE_2 = ((AGE + 1) + (AGE + 4))/2
   AGE_3 = ((AGE + 5) + (AGE + PV_{yrs}))/2
6. Find $VSLY_1$, $VSLY_{25}$, and $VSLY_6$ by plugging in VSL_1, VSL_{25}, and VSL_6 to Equation 1. Note that $r = 0.03$ and $L = PV_{\text{yrs}}$

Productivity Losses

7. Match the injury description in the JVR case abstract to one of the 13 BLS medical diagnosis groups for which short-term work losses are provided Miller et al. (2000). The provided median short-term work losses are the value for T^*.
8. Using Equation 9, compute T'.
9. Find median annual income data for the plaintiff's age group and gender in the Person Income Data from the 2003 United States Census Current Population Survey (CPS). Divide this by 260 to get a daily wage. Multiply by (156.9/184) to obtain an hourly wage in 1996 dollars. This is the w* value.
10. Find the daily value of household service corresponding to the plaintiff's age group and gender in Grosse et al. (2009). Multiply this dollar value by (156.9/214.537) to convert to 1996 dollars. This is the w' value.
11. Find the present value of combined lifetime earnings (including fringe benefits) and household production at a 3% discount rate corresponding to the plaintiff's age group and gender from Lawrence et al. (2018). Multiply this value by (156.9/251.107) to convert to 1996 dollars. This is the K value.
12. Find the probabilities of total (d_t) and partial (d_p) permanent work-related disability corresponding to the plaintiff's MAIS and body region in Miller et al. (1995).
13. Calculate WS and WL (Equations 6 and 7) using the values calculated in steps (7) – (12). Note that p = 0.1345.
14. Using Equation 8, calculate the plaintiff's total productivity loss.

Final 'Expected' Award Calculation

15. Plug the QALY loss values from step (3), the VSLY values from step (6), total productivity loss from step (14), and PV_{yrs} into Equation 10. The result is the 'expected' noneconomic damages award.

B. The 'Big Company'/'Large Business' Control Variable

The following business entities are considered 'large business' defendants for the purposes of this control variable:

Insurance Companies

- State Farm
- Allstate Corp.
- American Family Insurance Co.
- Farmers Insurance Group
- GEICO
- Grange Insurance
- Bankers Insurance
- Progressive Corp.
- Lexington Insurance Co. (AIG)
- American Guarantee and Liability Insurance Co. (Zurich American Insurance Co.)
- Sentry Insurance Co.
- UnitedHealth Group
- CNA Financial

Trucking/Delivery

- UPS
- Ward Transport and Logistics
- Schneider National Carriers
- Prime Inc.
- Riverside Transport Inc. (RTI)
- Ryder System, Inc.

Car Rental

- Avis Budget Group
- Enterprise Leasing Co. of Denver
- Alamo Rent-a-Car

Other

- Rand McNally Co.
- Hussmann Corp.
- Crown Equipment Co.
- Kinder Morgan, Inc.
- Pizza Hut of America Inc.
- Amtrak