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# No-Fault Insurance and Automobile Accidents

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Abstract: Removing accident liability through a no-fault system may only have minor effects on driver care, yet existing studies assessing whether no-fault auto insurance requirements increase accidents use fatal accidents as the primary outcome. In this paper we estimate the effect of no-fault on overall accident rates using detailed data from police accident reports in New Jersey, North Carolina, and Utah. We focus on accidents involving out-of-state drivers and account for differences in driving prevalence using accidents beyond the control of the driver. Controlling for a wide variety of accident, driver, and vehicle characteristics, we find little evidence that drivers under no-fault cause more accidents. Results on accident severity are mixed.

JEL Classification: K13, G28

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## 1. Introduction

Proponents of no-fault auto insurance argue that it reduces the administrative costs associated with accident compensation by removing claims from the relatively inefficient tort system. However, basic models of the incentive effects of liability rules (e.g. Shavell 1987) point to the possibility that no-fault insurance laws may increase accidents by lowering the costs of reckless driving for insured drivers. The numerous empirical investigations of the effect of no-fault on accidents draw conflicting conclusions. Several studies find a substantial positive effect of no-fault (Landes 1982, Devlin 1992, Cummins et al. 2001, Cohen and Dehejia 2004), and others estimate a zero or negative effect (Kochanowski and Young 1985, Loughran 2001, Derrig et. al. 2002). One limitation shared by all of these papers is their reliance on fatal accident data—a typical paper regresses state-level counts of fatal accidents on an indicator for a no-fault requirement in a particular state and year. If fatal accidents represent a random subset of all accidents, then patterns in fatal accidents are informative about the effects of no-fault on accident rates more generally. However, prior research suggests fatal accidents systematically differ from other accidents in important ways (Levitt and Porter 2001a). Additionally, no-fault may affect driver care, but through channels that do not detectably influence fatal accident statistics, particularly given that fatal accidents comprise less than 1% of all accidents.

One reason for the prior focus on fatal accidents is that events involving loss of life impose particularly high costs on society. However, the costs of non-fatal accidents are even more substantial. Recent estimates place the annual economic cost of non-fatal motor vehicle accidents in the U.S. at $195 billion, roughly four times the cost associated with fatal accidents (National Safety Council, 2007). In addition, given that most U.S. no-fault laws are targeted towards relatively minor traffic accidents, understanding the extent to which such laws affect the total volume of accidents has important implications for the efficiency of such policies.

In this paper we utilize rich accident data from New Jersey, North Carolina, and Utah to estimate the effects of no-fault coverage on accidents, both fatal and non-fatal. These three states are geographically diverse and represent the three major types of liability systems in the United States—tort, no-fault, and choice. Additionally, the presence of important interstate transportation corridors in each of the states allows us to observe accidents involving over 350,000 out-of-state drivers from all U.S. states. Our empirical approach examines whether drivers from no-fault states are more likely to cause accidents controlling for a wide range of accident, vehicle, and driver characteristics. By examining collisions in which drivers are hit when they themselves are driving safely, we are able to account for differences in prevalence between drivers from no-fault and liability states. Although the focus of this paper is on no-fault insurance, the identification procedure we outline has wide applicability in estimating relative prevalence and risk for different types of drivers.

Our analysis indicates accident rates are similar for vehicles across liability regimes. Across all three states our preferred estimates fail to reject the null hypothesis of equal accident rates for drivers under no-fault, and in all states our estimates are sufficiently precise to exclude increases in accidents due to no-fault of more than 3 percentage points at the 95% level. These findings are robust to changes in sample that exclude various logical sets of states, accidents, or vehicles from the analysis. Using additional information available for New Jersey and North Carolina drivers, we perform further tests of the incentive effects of no-fault by comparing drivers with and without insurance coverage and vehicle owners and non-owners. Consonant with our findings using out-of-state drivers, we find that no-fault vehicle owners and insured drivers are less likely to cause accidents than counterparts who are not subject to no-fault. Turning to accident severity, we find some evidence that no-fault vehicles are slightly more likely to sustain damage and contain injured occupants, although these effects are fairly modest.

Section 2 of the paper describes previous theoretical and empirical work on no-fault. Section 3 describes our empirical approach for measuring the effects of no-fault, which departs from the state-level panel regressions typical in this literature. Section 4 describes our data. Our primary results and a series of robustness checks are reported in Section 5. Section 6 concludes.

## 2. Prior Work on No-Fault and Accidents

There is a substantial body of theoretical work on the effects of strict liability, of which pure no-fault auto insurance can be considered a special case. Landes and Posner (1987) and Shavell (1987) describe basic economic models of liability suggesting that individuals will adopt appropriate caution only when they bear the full costs of their actions. In these models, no-fault insurance, which removes liability for damages caused in certain classes of accidents, may induce drivers to engage in suboptimal levels of care. Such models point to the possibility that any administrative cost savings arising from adoption of no-fault provisions may be offset by increased accident costs arising from driver negligence. However, more complex models that account for liability thresholds, experience rating, and other peculiar features of no-fault as implemented in U.S. states (e.g. Liao and White, 2002; Cummins et al. 2001) generate ambiguous predictions regarding the relationship between no-fault and accident rates.

Beginning with Landes (1982), there has been considerable interest in empirically estimating the extent to which adoption of no-fault statutes is associated with increased accidents. Most existing studies, summarized in Table 1, identify the effects of no-fault on accidents using changes in no-fault requirements across states. A notable feature of all eight studies is their focus on fatal accidents as the relevant measure of interest in understanding the deterrent effects of liability rules.[1] Most studies employ panel approaches, differing primarily in sample window, methods for measuring the characteristics of the no-fault system, and approaches for dealing with the endogeneity of no-fault adoption.[2] The unsettled nature of empirical work in this area is apparent in the final column, which reports that four of the studies find no effect of no-fault while the remaining half find statistically significant and practically important effects. This dissonance across studies may partly reflect the difficulty of detecting potentially subtle behavioral changes in aggregate data--given the myriad of factors that can contribute to a fatal accident, statistically isolating the contribution of no-fault rules represents a formidable challenge. If factors such as new road construction, vehicle safety features, or other contributory factors for accidents are correlated with changes in no-fault status, state-level panel analyses will be particularly sensitive to the particular set of control variables selected.

In addition to only describing a small subset of road accidents, aggregate analyses such as those in Table 1 contain an additional limitation. Theoretical discussions of liability rules such as Landes and Posner (1987) and Shavell (1987) differentiate between types of behaviors that may avoid accidents, including reducing participation in risky activities, increasing care in ways that affect the probability of an accident, and increasing care so as to minimize the damage that

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[1] Loughran (2001) does examine the relationship between no-fault and the ratio of property damage claims to property damage exposure, which he takes as a measure of overall accidents. The relationship between actual accidents and this ratio remains unclear, however.

[2] Two departures from this basic approach are provided by Devlin (1999), which examines the relationship between no-fault and injury severity using closed-claims data, and Sloan et al. (1995), which relates no-fault to alcohol-involved driving.

may occur in the event of an accident.[3] Different liability rules affect not only the amount of care but the types of care exhibited by potential injurers. Because they do not directly examine driver behavior behind the wheel, existing studies cannot disentangle whether changes in fatal accidents result from increased driving in more hazardous conditions or changes in other types of driver care.

With data on the fatal and non-fatal accidents from all states, a difference-in-difference approach similar to that of Loughran (2001) or Cohen and Dehejia (2004) might provide estimates of the effect of no-fault on overall accidents. Unfortunately, such comprehensive data are not available.[4] We instead turn to accident microdata and examine the behavior of drivers who are covered by differing liability rules by virtue of their state of residence.

## 3. Estimation Strategy

Our accident data include incidents involving drivers from both no-fault and tort jurisdictions and thus yield counts of accidents conditional on insurance regime. Raw comparisons between accident counts may be misleading, however, both because the prevalence of drivers on the road may differ according to no-fault status and because no-fault drivers may operate their vehicles under different conditions (locations, weather, time of day, etc.) which may themselves contribute to accidents. Our empirical approach is designed to account for both of these potentially confounding factors.

[3] In the driving context, examples of these different types of care would include driving less during bad weather, speeding less (which would likely affect both the probability of an accident and the cost of the accident), and wearing a seatbelt (which would affect the cost of an accident but not directly affect the probability of an accident).
[4] The National Highway Traffic Safety Administration's General Estimates System (GES) could theoretically be used in a similar manner as FARS to examine how no-fault status affects non-fatal accidents. However, because these data begin in 1988 and only Connecticut, Georgia, and Colorado have changed no-fault status since 1988, it would be difficult to identify the effects of no-fault using standard panel approaches.

A simple test for whether drivers covered by no-fault insurance are more likely to cause accidents would examine whether the number of accidents due to negligence for drivers with-no fault is greater than the number of accidents for drivers under standard tort liability rules on a per-mile basis[5], i.e.

$$\frac{Negligent\ Accidents_{nf}}{Miles\ Driven_{nf}} = \frac{Negligent\ Accidents_{l}}{Miles\ Driven_{l}} \tag{1}$$

In practice, accurately observing the miles driven by different types of drivers is impossible, making a direct implementation of (1) infeasible. We instead exploit the fact that our data includes information on both at-fault and not-at-fault accidents.[6] Under the assumption that being involved in a not-at-fault accident is not dependent on the insurance type of a driver, the relative risk of different types of drivers is identified. To see this, note that the assumption translates to:

$$\frac{Non-Negligent\ Accidents_{nf}}{Miles\ Driven_{nf}} = \frac{Non-Negligent\ Accidents_{l}}{Miles\ Driven_{l}} \tag{2}$$

Dividing (1) by (2) yields a direct test of the relative risk of different types of drivers using observable data, i.e.

[5] One possibility is that no-fault affects behavior by inducing people to drive less. We do not focus on this channel, instead denominating our measure by miles driven to concentrate attention on other behavioral aspects of no-fault.
[6] The vast majority of not-at-fault accidents in the data are cases in which one driver was hit by another acting negligently. Accidents arising due to vehicular malfunction, improper signs, road damage, or other environmental conditions beyond the control of the driver are also classified as not-at-fault accidents.

$$\frac{Negligent\ Accidents_{nf}}{Non-Negligent\ Accidents_{nf}} = \frac{Negligent\ Accidents_{l}}{Non-Negligent\ Accidents_{l}} \quad (3)$$

Essentially, assumption (2) permits identification of the relative prevalence of different types of drivers on the road by taking the ratio of their counts of not-at-fault accidents. Given that the relative prevalence of these drivers is known, it is possible to assess whether drivers under no-fault cause more accidents.[7,8]

Assumption (2) captures the intuitive idea that for safe drivers, being hit by an unsafe driver is essentially a random event and is unlikely to be correlated with one's insurance status. This assumption may fail, however, if otherwise safe drivers covered by no-fault tend to drive under circumstances which are more likely to generate accidents. To account for this possibility, we implement (3) in a regression framework and include numerous flexible controls for the location, weather, and other driving conditions present at each accident. In particular, we estimate regressions of the form:

$$AtFault_{ij} = \alpha \cdot NoFault_i + \beta_1 \cdot X_i^d + \beta_2 \cdot X_i^v + \beta_3 \cdot X_i^a + \varepsilon_{ij} \quad (4)$$

[7] Alternatively, driver care may be defensive in nature, in which case increases in care are manifest through the avoidance of accidents. Under this scenario, if no-fault changes driver care equation (2) may not hold with equality because no-fault drivers will have differential rates of accident avoidance. However, the defensive nature of driver care would also imply that equation (1) does hold with equality, in which case the same statistical test is available. More problematic for this identification approach would be if drivers could engage in behaviors that simultaneously increase their risks of hitting other drivers while decreasing their risk of being hit by other drivers. Purchasing an SUV might provide an example of such a behavior, although in our case we can control directly for vehicle type.

[8] Levitt and Porter (2001b) provide an alternative method for identifying the relative prevalence and risk of different types of drivers based upon the distribution of driver types in two-car accidents. Given that their focus is on drunk driving, for which drunk drivers are presumptively at fault, they are unable to exploit the at-fault/not-at-fault distinction as we do.

where $AtFault_{ij}$ represents an indicator for whether the driver in vehicle $i$ and accident $j$ was at fault in the accident, $NoFault_i$ is an indicator for a vehicle registered in a state requiring no-fault insurance, and $X^d$, $X^v$, and $X^a$ represent driver-, vehicle-, and accident-level controls. Combining estimates of $\alpha$ from this regression with the average probability that a driver is at fault in an accident allows us to recover the relative risk.[9] We also examine outcomes such as the severity of vehicle damage or injuries to assess whether accidents involving no-fault drivers are more serious.

Although the particular focus of this research is on no-fault, the identification logic of equations (1)-(3) applies equally well to other classes of drivers. For example, comparing rates at which younger drivers are involved in accidents while driving safely versus recklessly can yield estimates of their risk and prevalence relative to older drivers.

## 4. Data Description

Our primary data are taken from crash records for North Carolina, Utah and New Jersey. In the case of New Jersey the data include all accident reports filed by police between 2001 and 2006, a total of almost 1.9 million accidents.[10] Both the North Carolina and Utah data cover a subset of all accidents occurring on major roads. The Utah data include roughly 85,000 vehicle-level observations each year for 1996-2000 and the North Carolina data include roughly 200,000 yearly observations for 2000-2004.

[9] This need not be equal to .5 since both drivers can engage in reckless behavior that contributes to an accident and some accidents may not involve fault, such as those due to road damage.
[10] The New Jersey data comes from the New Jersey Department of Transportation. The North Carolina and Utah data were obtained from the Federal Highway Administration's Highway Safety Information System (HSIS). More detailed descriptions of the North Carolina and Utah data, including codebooks, are available at http://www.hsisinfo.org/

We focus on New Jersey, North Carolina, and Utah because these states cover the three predominant U.S. insurance systems, are geographically diverse, and incorporate differing rules regarding the treatment of out-of-state drivers. In North Carolina, a tort state, and Utah, a no-fault state, an out-of-state driver's no-fault status follows them into the state. Thus, a driver from Michigan, a no-fault state, would remain a no-fault driver while traveling through either North Carolina or Utah. In New Jersey, a choice state, resident drivers can choose no-fault or tort status but non-resident drivers are generally automatically accorded no-fault status while driving within the state.[11,12] If driver behavior is related to their basic policy characteristics and drivers do not dynamically adjust behavior to correspond to liability rules that may be in effect in the state of travel, we predict similar behavior among out-of-state drivers from no-fault states driving in New Jersey as in Utah or North Carolina. In particular, we might expect out-of-state drivers from no-fault states to have higher accident rates than out-of-state drivers from tort states. However, if drivers do dynamically update, then even when no-fault affects driver behavior, we should observe similar accident rates among tort and no-fault drivers in New Jersey, albeit differing rates in Utah and North Carolina. Table 2 summarizes these predictions.

Data for each accident include the time, date, location, cause, and nature of each accident; the date of birth, ZIP code, and gender of each driver; vehicle make, model, year, and insurance carrier; and detailed information about driving conditions and injuries to all occupants of involved vehicles.[13] We match driver ZIP code when available to Census 2000 ZIP code tabulations to obtain additional controls for driver race, income, and commuting patterns. In our

[11] Actual liability assignment in accidents involving out-of-state drivers in New Jersey is slightly more complex. N.J.S.A. 17:28-1.4 (the "deemer" statute) requires that out-of-state drivers under tort automatically be given PIP protections when their vehicles enter New Jersey. However, this statute only applies to insurance carriers operating New Jersey, and the extent of its applicability has been the subject of litigation.

[12] Joost (2002) provides further discussion of liability during interstate travel.

[13] Although reporting quality is generally high, selected variables are absent for some records. In our empirical specifications, we include dummy variables to account for missing data.

primary specifications we exclude accidents involving only drivers from the home state, both because within-state trips likely differ systematically from those taken by out-of-state drivers and because willingness to involve police following an accident may differ for in-state drivers. These exclusions leave a total of approximately 230,000 observations of out-of-state vehicles for New Jersey, 60,000 for North Carolina and 40,000 for Utah. Although our research design precludes the inclusion of a full set of state fixed effects in our analysis, we also include home state indicators in all specifications to account for differences between local and distant drivers. Identification is thus achieved by comparing accident patterns for out-of-state drivers covered by no-fault to those of out-of-state drivers covered by tort.

Our primary explanatory variable is an indicator of no-fault driving status based upon the state of registration of the out-of-state vehicle at the time of the accident.[14] Overall, 45% of all vehicles in the sample came from no-fault states, although this proportion is higher in New Jersey given its close proximity to New York, the largest no-fault state. Table 3 reports summary statistics describing the accidents, vehicles, and drivers in our analysis by accident state, focusing on the out-of-state vehicles. Examining unconditional rates of reckless driving reveal that tort drivers are more likely to have caused accidents in all three states. However, these uncontrolled differences may reflect differences across tort and no-fault drivers in other factors that affect driving behavior, such as driving conditions. Although no-fault drivers and tort drivers are similar on many dimensions, such as driver age and the probability of injury conditional on being in an accident, there are also important differences across insurance regimes

[14] There are 9 no-fault states--Florida, Hawaii, Kansas, Massachusetts, Michigan, Minnesota, New York, North Dakota, and Utah. Although Kentucky is ostensibly a choice state, because of the design of its opt-out provision fewer than 10% of drivers elect tort, so we code Kentucky drivers as being covered by no-fault. Pennsylvania and New Jersey are choice states with substantial numbers of drivers covered under both no-fault and tort systems, so we omit out-of-state Pennsylvania and New Jersey drivers form the analysis. In addition, Colorado drivers are coded as having no-fault for accidents occurring prior to 7/1/2003, when no-fault was repealed in that state.

in specific states. For example, trucks are much more likely to come from tort states in New Jersey and tort accidents are more likely to involve pedestrians in North Carolina. To account for these differences in driving patterns we flexibly control for the factors listed in Table 3 as well as numerous other factors in our empirical specifications. The detailed information available for each vehicle and accident provide us a rich set of controls—for example, we are able to include fixed effects for thousands of individual road segments in each state. We also construct additional specifications to test whether our results may be driven by the differences apparent from Table 3.

Several data limitations deserve mention. Because our data are drawn from police reports, we do not observe accidents which are not reported to police.[15] If drivers from no-fault states are differentially involved in unreported accidents, our analysis will not capture these effects. In our robustness checks we estimate specifications focusing on accidents that are more likely to be reported to police; these checks suggest that differential reporting rates do not explain our results. We also examined a large sample of 2002 auto insurance claims and found no evidence of differential police reporting by no-fault status.[16] Ultimately, however, the relationship between reporting and insurance status remains unknown. In addition, if officers are more likely to assign fault to out-of-state drivers or otherwise provide incorrect information about the nature of the accident, our estimates may exhibit bias.[17] Given that police records

[15] New Jersey, Utah, and North Carolina require that drivers contact police and police submit an accident report for all crashes involving injury. Reporting is also mandatory for accidents causing more than $500 of property damage in New Jersey and $1000 of damage in Utah and North Carolina.

[16] In particular, in a sample of BI, PIP, and Medpay claims involving 5032 out-of-state drivers collected by the Insurance Research Council, we find that 88% of accidents involving drivers under no-fault were reported to police as compared to an 86% reporting rate among tort drivers, a difference that is not statistically significant. These data are described in greater detail in Insurance Research Council (2003).

[17] Makowsky and Stratmann (2007) do in fact present evidence that police officers treat non-local drivers differently than local drivers when writing speeding citations. However, although there may be general bias by police against out-of-state drivers, there is little reason to suspect that police would be particularly biased against drivers who come from no-fault states.

typically form the basis for assigning culpability in auto insurance claims, however, it seems reasonable to expect that these data will accurately reflect the liability risks perceived by drivers. In addition, because no-fault accident coverage is designed to address accidents which result in minor injuries to one or more parties, and reporting is mandatory for accidents involving injury, it appears likely that our data capture the accidents most relevant for no-fault. Finally, our data incorporate information available at the time of the accident, and thus may not completely capture the full extent of injuries or additional information that may become available after more thorough post-accident investigation.[18]

## 5. Results

Table 4 reports naïve estimates of the relative risk of vehicles from different states by directly applying equation 3 using counts of at-fault and not at-fault accidents for each of the home states in our sample. Following the logic of equation 2, prevalence is measured using the proportion of not-at-fault accidents involving vehicles of a given state. The prevalence measure largely accords with intuition, with vehicles from neighboring states and larger states more highly represented in each home state. Raw accident counts do not suggest a strong relationship between no-fault status and relative risk, however. Vehicles from some no-fault states, such as Florida, exhibit relatively low risk while others, such as those from Kansas, demonstrate above average risk. The simple calculations in Table 3, while intuitive, do not account for differences in driving location, conditions, or other factors that may affect the behavior of drivers from different states.

[18] For example, in our data the overall alcohol involvement rate in the New Jersey accidents (3%) is several points below rates reported for other states, probably because in many cases alcohol involvement has not been definitively determined at the time the accident report is completed.

Table 5 reports regression estimates of equation (4), which measures the effect of no-fault on reckless accidents controlling for factors potentially affecting driving behavior. The coefficients represent the percentage change in the probability of causing an accident associated with no-fault insurance coverage.[19] Table 5 also reports the relative accident risk for no-fault versus tort drivers implied by these coefficients. The leftmost column reports the most parsimonious specification and subsequent columns add different sets of vehicle, driver, and accident controls. With the exception of the demographic controls, our controls are entered as fixed effects, allowing for a flexible and potentially nonlinear relationship between recklessness and driver, vehicle, and accident characteristics. Standard errors are clustered on vehicle state.[20]

The top panel contains the results for New Jersey. Specification I suggests that drivers under no-fault cause roughly 10% *fewer* accidents than other drivers. Controlling for vehicle characteristics (specification II) weakens this relationship, however. Specification V, the most comprehensive specification, includes a full set of driver, vehicle, and accident controls. The coefficient estimate of -.01 is marginally significant and indicates that drivers under no-fault are actually slightly safer that those under tort. Unreported coefficients from this regression are of sign and magnitude that accord with intuition--for example, drivers from areas with substantial commutes are less likely to cause accidents, while younger drivers are more likely to cause accidents. Finally, including accident fixed effects (specifications V and VI) essentially reduces the sample by identifying the effects of no-fault using accidents involving drivers with differing liability status, but also controls for unobservable accident-level factors that may affect driver

[19] The models are linear probability models. Few of the predicted probabilities lies outside of the unit interval, and estimation using probit provided similar marginal effects estimates.
[20] An alternative approach for generating standard errors that accounts for the fact that treatment is assigned at the state rather than individual level is to replicate the analysis randomly assigning no-fault status to each state and examine the distribution of the resulting coefficient estimates. We implemented this approach as an additional check and obtained standard errors that are generally smaller than those reported in the paper.

behavior. These specifications do not suggest that no-fault drivers are more likely to engage in unsafe behaviors that result in accidents.

For North Carolina, the second panel, specifications I-II suggest slightly higher accident rates among no-fault drivers, with relative risk estimates at about 1.1. However, after controlling for weather conditions, detailed location, and other accident-level characteristics, the accident rate for no-fault drivers is no longer statistically significantly different from that of drivers under a tort system. For Utah, the results presented in the bottom panel are similar to those for New Jersey, with more parsimonious specifications suggesting a slightly lower accident rate among no-fault drivers. Those specifications with a full set of accident, vehicle, and driver controls and those that control for accident fixed effects cannot reject the null that no-fault drivers are at equal risk for causing accidents. Accident patterns across varying regions of the country thus provide little indication that no-fault induces hazardous driving after controlling for other differences in driving patterns. Because the data reject small positive effects of no-fault in all three states and not simply New Jersey, it also cannot be the case that no-fault does affect safety but drivers dynamically update.

Table 6 examines the robustness of our findings by re-estimating our original specification on different subsets of the data. Each of these specifications includes a full set of vehicle, driver, and accident controls, and results from each of the three states are presented across the table columns. Specification 1 expands the sample to include all accidents in each dataset, including accidents involving exclusively in-state drivers. Specification 2 focuses on two-vehicle accidents. Specification 3 excludes all home-state vehicles from the analysis, including those involved in accidents with out-of-state drivers, so that the covariates are estimated solely using out-of-state drivers. Specification 4 excludes drivers from the home state and neighboring states form the analysis. These sample exclusions permit us to focus on what likely represents a more uniform set of long-distance driving trips. Given that large trucks are much more predominant among tort drivers in some states and commercial drivers may face different incentives than drivers of private passenger vehicles, specification 5 omits accidents involving large trucks from the analysis. To account for the possibility that mandatory insurance rules--which are often enacted at the same time as no-fault statutes—affect driving behavior (Cohen and Dehejia, 2004) we omit Wisconsin and New Hampshire, the two states without mandatory insurance, in specification 6. Specification 7 uses speeding as opposed to any type of reckless driving as the outcome of interest. Specification 8 examines accidents involving SUVs and pickups. Given that larger vehicles are less likely to sustain damage themselves but more likely to cause injury to other vehicles (White, 2004), no-fault has particularly poor incentive effects for these drivers.

These results from these robustness checks support the conclusion that no-fault status has little impact on reckless driving behavior. Expanding the samples to include all accidents or narrowing the samples to exclude home state vehicles or vehicles from nearby states never generates a statistically significant effect of no-fault, despite the fact that effects in most cases are precisely estimated. Focusing on two vehicle accidents or accidents involving smaller vehicles generates relative risk factors that are close to unity. Notably, rates of speeding--a reckless behavior that is particularly salient for drivers behind the wheel—are actually slightly lower among no-fault drivers in New Jersey and North Carolina.

Specifications 8 and 9 limit the analysis to accidents in which one or more vehicles were towed away or accidents in which at least one individual was injured. One concern with the preceding analysis is that observed differences between no-fault and tort drivers may represent differential willingness to report accidents. However, it seems less likely that accidents involving injury or significant damage would go unreported. Although a few of the estimates--such as those for accidents involving substantial damage in New Jersey or injury in Utah--indicate statistically significant salutary effects of no-fault, the overall coefficient pattern across states is not suggestive of a consistent effect. A drawback of limiting the sample in this manner is that accident severity may be in part dependent on driver care, in which case the coefficients in specification 8 and 9 may exhibit selection bias.

The bottom rows of Table 6 report a series of falsification tests of our identification approach. Here we replicate our estimation procedure for groups that should not exhibit a strong effect of no-fault. Statistically significant estimated "effects" of no-fault in these specifications would indicate that our no-fault indicator is actually capturing factors other than the incentive effects of no-fault. The first falsification specification focuses attention on drivers with states of residence that are coded as being different from the state of residence of the owner of the vehicle they are driving. Given that these are non-vehicle owners, there is no strong reason to expect that their incentives for care would be closely linked to no-fault requirements of the state in which their vehicle is registered. Indeed, there is little evidence suggesting a strong relationship between no-fault status, as determined using vehicle registration, and reckless driving for non-owners.

The second specification places an indicator for an accident due to poor road conditions, such as damaged pavement, improper signage, or animals in the roadway, as the dependent variable. Unlike our recklessness indicator, this outcome represents factors that are completely outside of the control of the driver. A significant coefficient in this context would indicate that our extensive set of controls does not adequately capture differences in driving circumstances between no-fault and tort drivers. However, the coefficients in this specification are close to zero in all three states. For New Jersey, the largest sample, the relative risk measure is almost exactly unity, which is what one would expect if encountering adverse road problems is random conditional on our set of controls.

For the New Jersey and North Carolina samples, our data permit additional tests of the effects of no-fault which do not involve direct comparisons between vehicles from different states. The first set of results in Table 7 use drivers who are not owners of their vehicles as an additional control group, essentially performing a difference-in-difference analysis comparing vehicles from no-fault and tort states driven by their owners with vehicles from no-fault and tort states driven by non-owners.[21] One advantage of using non-owners as an additional comparison group is that is permits the inclusion of a full set of state fixed effects in our regressions, which we do for this set of results. These fixed effects absorb all unobservable factors related to a vehicle's state of registration. A drawback of this approach is that the incentives for care faced by non-owners are unclear--for example, some non-owners, such as those who are covered by personal insurance policies while driving rented vehicles, may be subject to tort or no-fault provisions within their own policies.

The difference-in-difference analysis yields relative risk estimates that are close to 1 in both states, neither of which is statistically different from 1. It does not appear that our basic result that no-fault and tort drivers experience similar rates of reckless accidents reflects uncontrolled heterogeneity across vehicles coming from different states.

[21] Non-owners are identified as drivers with a reported state or zip code of residence different from that of the vehicle owner. Thus, there are some vehicles driven by non-owners that will not be identified as such because their driver and owner share the same geographic location.

The second test exploits the fact that in North Carolina, insurance status is coded for each vehicle involved in an accident, permitting identification of individuals who are uninsured.[22,23] As an additional difference-in-differences analysis, we compare uninsured drivers, who are not subject to potential moral hazard effects of no-fault, to covered drivers across no-fault and tort states. As in our analysis comparing owners and non-owners, we include a full set of state fixed effects in this analysis. We also include a separate indicator for uninsured drivers to account for differences in risk preferences or other unobservable factors correlated with insurance status.

The bottom panel of Table 7 reports our analysis comparing insured versus uninsured drivers. As expected, the unreported coefficient on insurance status is negative and highly significant, indicating that those who purchase insurance are also less likely to drive recklessly. However the recklessness differential is similar in no-fault states than tort states when comparing insured and uninsured drivers, providing further evidence against a significant incentive effect of no-fault.

One possibility is that no-fault does not influence the total number of accidents but does affect the severity of accidents. This relationship is particularly likely if the primary effect of increased driver care is to mitigate rather than prevent accidents. Such a pattern could reconcile our findings that drivers under no-fault cause slightly fewer accidents than other drivers with past research finding a substantial effect of no-fault on fatal accidents. To test for this possibility, we estimate regressions measuring the association between driver no-fault status and accident severity. As measures of severity we use vehicle damage and occupant injury. The results of these regressions are presented in Table 8.

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[22] Although New Jersey also includes insurance information, codes have only been assigned for carriers licensed within New Jersey, making coding for out-of-state drivers sporadic.
[23] One drawback of this insurance information is that the implied uninsurance rate for out-of-state drivers is only about 3%, which is well below existing estimates of a 14% uninsurance rate nationwide (IRC 2006). One explanation for the disparity is that drivers who are uninsured may be less willing to report accidents to police.

For New Jersey, the results suggest that no-fault may modestly increase accident severity. Including a full set of controls, incidence of vehicle damage is higher in vehicles driven by no-fault drivers, while the probability of injury is 5% higher among occupants of these vehicles. Although statistically significant, the practical magnitude of these differences is small. However, vehicles with no-fault drivers in New Jersey are no more likely to sustain damage sufficient to require towing or contain more seriously injured occupants. Taken together, these estimates suggest that any effects of no-fault on severity of accidents is limited to less severe accidents, with effects primarily coming through modest increases in damage or additional minor injuries.

The analyses for North Carolina and Utah also suggest that no-fault does not affect incidence of serious injury, although it may have more modest effects. Estimated injury effects for Utah are small and statistically indistinguishable from zero after including a full set of controls. For North Carolina, there is a positive and statistically significant effect of no-fault on the estimated dollar amount of damage, but no evidence of effects across other measures of severity. The magnitude of the no-fault effect is small, representing an increase of about 2.5% in damage costs. The fact that serious injury does not appear to be affected by no-fault in any of the three states we examine contrasts with prior findings of a negative effect of no-fault on accident fatalities, and may reflect our greater ability to account for factors that may impact accident severity.

## 6. Conclusions

No-fault insurance provides a classic application in the economic analysis of liability law and Landes' (1982) study is one of the first empirical studies to find a deterrence effect from tort. Given the importance of deterrence in the law and economics treatments of accidents, Landes and subsequent studies have been extensively cited (Dewees et al. 1996). However, the empirical work relating no-fault to fatal accidents is at best mixed. The sensitivity of results regarding fatal crashes to the choice of statistical specification in part reflects the difficult challenge of separating the effects of what are likely small behavioral changes from the numerous other factors that combine to produce a fatal accident. Such inconclusive findings are likely to persist so long as the outcomes that are examined are only marginally connected with the behavioral changes posited in theoretical models of liability.[24]

In examining non-fatal accidents, we re-focus attention on the types of accidents which generate the largest costs to society. Examining non-fatal accidents also provides an opportunity to more closely match outcomes to models. In particular, by explicitly differentiating reckless and safe driving behavior, we not only better approximate the theory but also obtain a method for identifying differences in conduct by insurance regime. In contrast to prior studies finding a substantial effect of no-fault, we find little evidence that no-fault coverage is associated with more numerous accidents. In New Jersey vehicles under no-fault are more likely to sustain minor occupant injury and damage: however, these results are not observed in Utah and North Carolina. Overall, our results suggest that the behavioral adjustments of drivers induced by no-fault, if any, are modest and affect accident severity more than accident incidence.

More generally, our paper provides a new method for estimating the relative risk and relative prevalence of drivers of different types. Estimating these parameters has become an

[24] Donohue and Wolfers (2005) make a similar point regarding the empirical literature on the deterrent effects of the death penalty.

important tool in evaluating the effects of policies regulating particular classes of drivers.[25] In addition to further elucidating the effects of differing insurance regimes, our approach coupled with the increasing availability of detailed accident records may permit future researchers to examine a host of issues related to driving safety.

[25] For example, Shope and Molnar (2003) review studies estimating crash risk for younger drivers to assess the effects of graduated licensing policies, and Loughran and Seabury (2007) examine driving risk for older drivers.

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**Table 1: Prior Empirical Studies on No-Fault and Auto Fatalities**

| Study | Sample Period | Approach | Estimated Effect of No-Fault on Fatalities |
|---|---|---|---|
| Cohen and Dehejia (2004) | 1970-98 | Panel analysis; differentiate effects of compulsory insurance and no-fault and instrument for adoption of no-fault | 6% increase |
| Derrig et al. (2002) | 1983-96* | Panel analysis, seat belt usage is primary explanatory variable of interest but includes no-fault status as a control and instruments for no-fault | No effect |
| Loughran (2001) | 1967-70 and 1977-80 | Difference-in-difference using both no-fault indicators and dollar thresholds | No effect |
| Cummins et al. (2001) | 1968-94 | Two-step panel analysis designed to account for endogeneity of no-fault adoption | 13% increase |
| Sloan et al. (1994) | 1982-90 | Separate panel analyses by age, measure no-fault using the proportion of accidents with barred tort claims | 5% increase for adults |
| Zador and Lund (1986) | 1967-80 | Panel analysis incorporating variations in dollar thresholds and claim adjudication | No effect |
| Kochanowski and Young (1985) | 1975-77 | Repeated cross-section analysis | No effect |
| Landes (1982) | 1967-76 | Panel analysis incorporating variations in dollar thresholds and claim adjudication | 2-15% increase |

Note: The table lists studies focused on the U.S. no-fault experience, additional international studies include McEwin (1989) and Devlin (1992). For all studies the unit of observation is a state/year, and all studies include all states.

* - All states are available for 1991-1996 and 4 states for prior years.

**Table 2: Predicted Direction of Coefficients Under Various Forms of Driving Behavior**

| | NC | NJ | UT |
|---|---|---|---|
| **Rule for in-state drivers** | Tort | Choice | No fault |
| **Rule for out-of-state drivers** | Home | No-fault | Home |
| *Scenario* | | | |
| No-fault induces reckless driving, no dynamic updating | + | + | + |
| No-fault induces reckless driving, dynamic updating | + | 0 | + |
| No-fault does not induce reckless driving | 0 | 0 | 0 |

**Table 3: Accident Data Summary Statistics**

| | NJ | | NC | | UT | |
|---|---|---|---|---|---|---|
| | No-Fault Drivers | Tort Drivers | No-Fault Drivers | Tort Drivers | No-Fault Drivers | Tort Drivers |
| **Driver** | | | | | | |
| Driving Unsafely | .514 | .542 | .527 | .531 | .548 | .549 |
| | (.500) | (.498) | (.499) | (.499) | (.498) | (.498) |
| Speeding | .0358 | .0376 | .232 | .240 | .120 | .0965 |
| | (.186) | (.190) | (.422) | (.427) | (.325) | (.295) |
| Tailgating | .0344 | .0302 | .0108 | .0131 | .0494 | .0641 |
| | (.182) | (.171) | (.103) | (.114) | (.217) | (.245) |
| Male | .651 | .685 | .664 | .678 | .697 | .679 |
| | (.477) | (.464) | (.472) | (.467) | (.460) | (.467) |
| Age | 39.8 | 38.3 | 38.5 | 37.4 | 36.2 | 35.4 |
| | (15.0) | (13.9) | (16.6) | (15.6) | (15.0) | (15.6) |
| Median Income (ZIP) | 51,400 | 48,900 | 43,000 | 42,400 | N/A | N/A |
| | (20,500) | (19,500) | (15,700) | (15,800) | | |
| % Black (ZIP) | .137 | .175 | .163 | .204 | N/A | N/A |
| | (.197) | (.218) | (.197) | (.202) | | |
| % Hispanic (ZIP) | .158 | .0978 | .0809 | .0438 | N/A | N/A |
| | (.176) | (.146) | (.131) | (.0844) | | |
| % Commuting by Car (ZIP) | .683 | .858 | .885 | .922 | N/A | N/A |
| | (.266) | (.145) | (.144) | (.0730) | | |
| **Vehicle** | | | | | | |
| Truck | .0995 | .318 | .110 | .144 | .0278 | .0239 |
| | (.299) | (.466) | (.312) | (.351) | (.165) | (.153) |
| Rear-ended | .191 | .170 | .379 | .388 | .267 | .311 |
| | (.393) | (.376) | (.485) | (.487) | (.443) | (.463) |
| Towed from scene | .262 | .240 | .619 | .631 | N/A | N/A |
| | (.440) | (.427) | (.486) | (.483) | | |
| **N** | 146971 | 90511 | 24502 | 45483 | 6250 | 35600 |
| **Accident** | | | | | | |
| # Vehicles Involved | 1.92 | 1.87 | 1.95 | 1.97 | 1.81 | 1.94 |
| | (.628) | (.638) | (.717) | (.718) | (.785) | (.910) |
| Pedestrians Involved | .00730 | .00529 | .00285 | .00300 | .00503 | .00528 |
| | (.0851) | (.0726) | (.0533) | (.0547) | (.0707) | (.0725) |
| Anyone Killed | .00177 | .00234 | .0101 | .00905 | .0131 | .00963 |
| | (.0421) | (.0483) | (.1000) | (.0947) | (.114) | (.0977) |
| Anyone Injured | .242 | .210 | .370 | .381 | .374 | .380 |
| | (.428) | (.407) | (.483) | (.486) | (.484) | (.486) |
| Night | .255 | .262 | .240 | .241 | .268 | .247 |
| | (.436) | (.440) | (.427) | (.428) | (.443) | (.431) |
| Weekend | .268 | .249 | .270 | .270 | .252 | .236 |
| | (.443) | (.432) | (.444) | (.444) | (.434) | (.425) |
| Poor Weather | .182 | .177 | .0393 | .0265 | .166 | .164 |
| | (.386) | (.382) | (.194) | (.161) | (.372) | (.370) |
| Alcohol Involved | .0205 | .0245 | .0278 | .0298 | .0566 | .0449 |
| | (.142) | (.155) | (.164) | (.170) | (.231) | (.207) |

| | | | | | | |
|---|---|---|---|---|---|---|
| At Intersection | .281 | .268 | .201 | .208 | .201 | .256 |
| | (.449) | (.443) | (.401) | (.406) | (.401) | (.437) |
| Interstate | .0716 | .0859 | .340 | .308 | .815 | .773 |
| | (.258) | (.280) | (.474) | (.462) | (.389) | (.419) |
| **N** | 138298 | 86875 | 18621 | 42636 | 6164 | 33532 |

Notes: This table presents summary statistics of accident, vehicle, and driver characteristics by state of accident and by no-fault status of the vehicle involved in the accident. The sample consists of out-of-state drivers and their accidents. The accident tabulations include all accidents in which any vehicle involved came from out-of-state and had the denoted no-fault status. Standard errors are reported in parentheses. Data on driver zip code of residence and vehicle towing status were unavailable for Utah.

**Table 4: Simple Estimates of the Relative Risk and Prevalence of Drivers From Different States**

| New Jersey Sample | | | North Carolina Sample | | | Utah Sample | | |
|---|---|---|---|---|---|---|---|---|
| State | Relative Risk | Prevalence | State | Relative Risk | Prevalence | State | Relative Risk | Prevalence |
| NE | 2.97 | 0.01% | SD | 2.29 | 0.03% | KY | 1.85 | 0.12% |
| AZ | 2.59 | 0.21% | ID | 2.11 | 0.03% | MD | 1.61 | 0.21% |
| OK | 1.89 | 0.69% | MT | 2.04 | 0.04% | VT | 1.54 | 0.04% |
| SD | 1.68 | 0.01% | KS | 1.92 | 0.13% | ME | 1.48 | 0.08% |
| UT | 1.56 | 0.06% | HI | 1.77 | 0.04% | NE | 1.48 | 0.31% |
| MS | 1.54 | 0.05% | IA | 1.67 | 0.12% | KS | 1.40 | 0.35% |
| OR | 1.51 | 0.05% | NE | 1.62 | 0.08% | WY | 1.38 | 2.74% |
| IN | 1.47 | 0.53% | DC | 1.60 | 0.15% | MA | 1.37 | 0.23% |
| KY | 1.42 | 0.06% | WY | 1.48 | 0.04% | CA | 1.32 | 8.80% |
| WI | 1.37 | 0.15% | AZ | 1.47 | 0.24% | OR | 1.30 | 1.61% |
| NM | 1.36 | 0.02% | MS | 1.46 | 0.30% | TX | 1.30 | 2.24% |
| ID | 1.36 | 0.02% | CA | 1.45 | 0.79% | RI | 1.27 | 0.03% |
| CA | 1.36 | 0.35% | MI | 1.40 | 0.70% | SC | 1.27 | 0.15% |
| AK | 1.36 | 0.01% | AL | 1.39 | 0.77% | AR | 1.27 | 0.24% |
| AR | 1.33 | 0.04% | MN | 1.37 | 0.17% | NV | 1.26 | 3.38% |
| ND | 1.32 | 0.02% | NV | 1.37 | 0.08% | MO | 1.26 | 0.51% |
| TN | 1.31 | 0.46% | NY | 1.36 | 2.36% | LA | 1.26 | 0.21% |
| MN | 1.30 | 0.12% | ME | 1.35 | 0.13% | SD | 1.24 | 0.26% |
| MI | 1.27 | 0.38% | LA | 1.34 | 0.35% | ND | 1.23 | 0.14% |
| IL | 1.27 | 0.87% | WA | 1.34 | 0.21% | IA | 1.23 | 0.35% |
| KS | 1.25 | 0.05% | OK | 1.33 | 0.24% | DE | 1.23 | 0.04% |
| TX | 1.24 | 0.45% | MA | 1.33 | 0.50% | IL | 1.22 | 0.91% |
| MT | 1.23 | 0.02% | NH | 1.33 | 0.15% | CO | 1.22 | 4.27% |
| WA | 1.22 | 0.07% | IN | 1.31 | 0.50% | MI | 1.19 | 0.59% |
| NC | 1.21 | 1.46% | CT | 1.30 | 0.39% | MS | 1.19 | 0.13% |
| ME | 1.21 | 0.19% | TX | 1.30 | 1.48% | WV | 1.18 | 0.07% |
| MO | 1.20 | 0.17% | TN | 1.29 | 2.28% | IN | 1.18 | 0.34% |
| OH | 1.19 | 0.62% | AR | 1.28 | 0.27% | NM | 1.18 | 0.95% |
| NV | 1.19 | 0.04% | NM | 1.26 | 0.09% | VA | 1.18 | 0.50% |
| IA | 1.19 | 0.12% | IL | 1.25 | 0.68% | NY | 1.17 | 0.63% |
| VT | 1.17 | 0.14% | MO | 1.25 | 0.32% | NH | 1.17 | 0.07% |
| NH | 1.17 | 0.16% | FL | 1.24 | 4.63% | ID | 1.16 | 7.76% |
| CO | 1.12 | 0.09% | AK | 1.24 | 0.08% | AZ | 1.15 | 4.34% |
| AL | 1.12 | 0.12% | NJ | 1.22 | 1.12% | WA | 1.15 | 2.34% |
| WV | 1.11 | 0.09% | CO | 1.22 | 0.25% | MN | 1.15 | 0.47% |
| FL | 1.11 | 2.12% | KY | 1.21 | 0.69% | AL | 1.15 | 0.26% |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| MA | 1.08 | 1.00% | PA | 1.21 | 1.85% | HI | 1.14 | 0.24% |
| PA | 1.07 | 17.99% | ND | 1.20 | 0.03% | OK | 1.13 | 0.43% |
| DE | 1.04 | 1.02% | RI | 1.17 | 0.09% | MT | 1.13 | 1.23% |
| NY | 1.03 | 17.41% | GA | 1.17 | 3.67% | FL | 1.12 | 1.08% |
| GA | 1.02 | 0.53% | WV | 1.15 | 0.87% | PA | 1.11 | 0.42% |
| WY | 1.00 | 0.01% | MD | 1.14 | 1.81% | OH | 1.09 | 0.54% |
| DC | 1.00 | 0.09% | DE | 1.14 | 0.20% | CT | 1.09 | 0.16% |
| VA | 0.99 | 1.61% | UT | 1.12 | 0.08% | NC | 1.02 | 0.37% |
| RI | 0.98 | 0.20% | WI | 1.09 | 0.30% | NJ | 1.01 | 0.21% |
| CT | 0.98 | 1.23% | OR | 1.08 | 0.12% | TN | 1.01 | 0.43% |
| MD | 0.97 | 1.65% | VA | 1.08 | 8.72% | GA | 0.98 | 0.50% |
| LA | 0.95 | 0.07% | OH | 1.04 | 1.87% | AK | 0.98 | 0.41% |
| SC | 0.94 | 0.38% | VT | 1.03 | 0.10% | WI | 0.93 | 0.42% |
| NJ | 0.67 | 46.77% | SC | 1.02 | 10.32% | UT | 0.87 | 47.86% |
| HI | 0.60 | 0.01% | NC | 0.67 | 49.56% | DC | 0.56 | 0.03% |

Note: This table reports estimates of the relative risk and prevalence of drivers by state of accident and state of origin. Relative risk is calculated as the ratio of accidents in which a driver was driving recklessly to accidents in which a driver was not driving recklessly. Prevalence is calculated as the proportion of non-reckless accidents involving drivers from a given state. Entries are ordered by relative risk. States with no-fault systems are highlighted in grey. Colorado was a no-fault state for the entire period of the Utah sample but only part of the sample period for New Jersey and North Carolina.

**Table 5: Relationship Between No-Fault Insurance Coverage and Reckless Driving Resulting in an Accident**

| State | | I | II | III | IV | V | VI | VII |
|---|---|---|---|---|---|---|---|---|
| NJ | No-Fault Coefficient | -.0284* | -.0128 | -.0270* | -.0307* | -.0108* | 1.82E-4 | .00473 |
| | | (.0131) | (.00764) | (.0122) | (.0123) | (.00535) | (.0121) | (.00780) |
| | Implied Relative Risk | .892 | .950 | .897 | .883 | .957 | 1.00 | 1.02 |
| | | [.0272] | [.0932] | [.0242] | [.0114] | [.0451] | [.988] | [.551] |
| | N | 487315 | 487315 | 487315 | 487315 | 487315 | 128179 | 128179 |
| | $R^2$ | 0.016 | 0.039 | 0.028 | 0.069 | 0.112 | 0.178 | 0.285 |
| NC | No-Fault Coefficient | .0244** | .0282** | .00891 | .0228** | .00829 | .0890** | .0900** |
| | | (.00415) | (.00485) | (.00893) | (.00382) | (.00909) | (.0295) | (.0299) |
| | Implied Relative Risk | 1.10 | 1.12 | 1.04 | 1.10 | 1.03 | 1.43 | 1.44 |
| | | [1.04E-6] | [1.49E-6] | [.332] | [7.29E-7] | [.374] | [.0160] | [.0165] |
| | N | 312562 | 312562 | 312544 | 312562 | 312544 | 18396 | 18396 |
| | $R^2$ | 0.003 | 0.015 | 0.049 | 0.037 | 0.084 | 0.128 | 0.202 |
| UT | No-Fault Coefficient | -.00235 | .00201 | -.0151* | .00574 | -.00653 | .0217 | .0345 |
| | | (.00674) | (.00697) | (.00752) | (.00851) | (.00911) | (.0256) | (.0261) |
| | Implied Relative Risk | .991 | 1.01 | .942 | 1.02 | .974 | 1.09 | 1.15 |
| | | [.728] | [.776] | [.0445] | [.508] | [.471] | [.422] | [.225] |
| | N | 67008 | 67008 | 67008 | 67008 | 67008 | 47802 | 47802 |
| | $R^2$ | 0.007 | 0.013 | 0.032 | 0.032 | 0.063 | 0.159 | 0.212 |
| Include vehicle controls? | | No | Yes | No | No | Yes | No | Yes |
| Include accident controls? | | No | No | Yes | No | Yes | No | No |
| Include driver controls? | | No | No | No | Yes | Yes | No | Yes |
| Include accident fixed effects? | | No | No | No | No | No | Yes | Yes |

Note: This table reports coefficients from linear regressions of an indicator for whether a vehicle was driving recklessly when involved in an accident on an indicator for its no-fault status and additional controls. The unit of observation is a vehicle in an accident, and the sample includes all vehicles involved in accidents in which at least one out-of-state vehicle was involved. Each state/column combination reports results form a separate regression. No-fault status is assigned based upon vehicle registration for NJ and NC and upon the driver's license for UT. For NJ, vehicle controls include fixed effects for vehicle model year, vehicle type, and cargo body type . Driver controls include fixed effects for driver gender interacted with age in years as well as the % Black, %Hispanic, median household income, % working out of state, % driving to work, and % driving more than 60 minutes to work in the driver's home zip code, with indicators for missing data. Accident controls include fixed effects for accident year, month, day of week, and hour; intersection type, road system, configuration, surface material, and surface condition; light conditions, weather conditions, construction configuration, ramp presence, posted speed, municipality of occurrence, and road segment of occurrence. NC vehicle controls are vehicle type, year, make, and cargo body type. Driver controls are driver race along with the NJ driver controls. NC accident controls include accident year, day of week, hour, and month; road type, character, surface, and defects; light and weather conditions; traffic control status; posted speed, accident zone land use, county of occurrence, and road segment. UT vehicle controls include vehicle year, body type, and commercial status. Driver controls include type of license and age/gender interactions. Accident controls include accident year, day of week, hour, and month; road type, character, surface, and defects; light and weather conditions; ramp, intersection, and traffic control status; posted speed, accident zone land use, and road segment. The NC and UT accident data include only a subset of roads within each state. All specifications include an indicator for an in-state driver as an additional control. Standard errors clustered on vehicle state are reported in parenthesis. The "Implied Relative Risk" row of the table reports the risk of being involved in an accident while driving recklessly for drivers covered by no-fault relative to that of drivers covered by tort, which is calculated from the estimated regression coefficients. P-values for an F-test that the implied relative risk equals 1 are reported in brackets. * denotes significance at the 5% level and ** at the 1% level.

### Table 6: Robustness Checks of No-Fault/Reckless Driving Relationship

| | New Jersey | | North Carolina | | Utah | |
|---|---|---|---|---|---|---|
| | Coefficient on No-Fault Indicator | Implied Relative Risk | Coefficient on No-Fault Indicator | Implied Relative Risk | Coefficient on No-Fault Indicator | Implied Relative Risk |
| **1. Include all accidents** | -.00922 | .964 | -.00246 | .990 | -.00759 | .970 |
| | (.00617) | [.136] | (.00421) | [.560] | (.00791) | [.335] |
| | N=2938128, $R^2$=.126 | | N=1023235, $R^2$=.085 | | N=418994, $R^2$=.050 | |
| **2. Limit to two vehicle accidents** | -.00196 | .992 | .0151 | 1.06 | 4.71E-4 | 1.00 |
| | (.00539) | [.716] | (.00863) | [.0969] | (.0120) | [.969] |
| | N=359445, $R^2$=.113 | | N=70740, $R^2$=.058 | | N=42567, $R^2$=.034 | |
| **3. Exclude home state vehicles** | -.00408 | .984 | .0109 | 1.04 | -.00723 | .971 |
| | (.00382) | [.288] | (.00774) | [.174] | (.00817) | [.374] |
| | N=236911, $R^2$=.118 | | N=61525, $R^2$=.116 | | N=37834, $R^2$=.080 | |
| **4. Exclude home and neighboring state vehicles** | .00298 | 1.01 | -.00268 | .989 | .00275 | 1.01 |
| | (.00453) | [.516] | (.00935) | [.775] | (.00896) | [.762] |
| | N=116879, $R^2$=.142 | | N=30310, $R^2$=.133 | | N=20701, $R^2$=.090 | |
| **5. Exclude accidents involving trucks** | -.00797 | .968 | .0113 | 1.05 | -.00681 | .973 |
| | (.00571) | [.163] | (.00691) | [.115] | (.00934) | [.463] |
| | N=399591, $R^2$=.102 | | N=88774, $R^2$=.088 | | N=58985, $R^2$=.060 | |
| **6. Exclude vehicles from states without compulsory insurance** | -.00977 | .961 | .0101 | 1.04 | -.00851 | .966 |
| | (.00575) | [.0905] | (.00673) | [.149] | (.00886) | [.333] |
| | N=484496, $R^2$=.109 | | N=107433, $R^2$=.082 | | N=66660, $R^2$=.056 | |
| **7. Speeding indicator as dependent variable** | -.00360* | .986 | -.0110** | .957 | 4.67E-4 | 1.00 |
| | (.00159) | [.0274] | (.00313) | [7.48E-4] | (.00402) | [.908] |
| | N=486744, $R^2$=.086 | | N=112704, $R^2$=.111 | | N=67651, $R^2$=.252 | |
| **8. Limit to SUVs and pickups** | -.0134* | .947 | .00240 | 1.01 | -9.16E-4 | .996 |
| | (.00579) | [.0216] | (.00921) | [.797] | (.0115) | [.937] |
| | N=80466, $R^2$=.136 | | N=29557, $R^2$=.119 | | N=23265, $R^2$=.090 | |
| **9. Limit to accidents with substantial damage** | -.0217** | .916 | .0139 | 1.06 | | |
| | (.00673) | [.00156] | (.00909) | [.143] | N/A | |
| | N=172555, $R^2$=.090 | | N=85498, $R^2$=.065 | | | |
| **10. Limit to accidents with injury** | -.00794 | .968 | .00899 | 1.04 | -.0866** | .706 |
| | (.00467) | [.0910] | (.00460) | [.0611] | (.0164) | [1.24E-7] |
| | N=124588, $R^2$=.079 | | N=43536, $R^2$=.103 | | N=26831, $R^2$=.038 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| ***Falsification Tests*** | | | | | | |
| **11. Limit to non-owners** | -.0113 | .955 | .00363 | 1.01 | N/A | |
| | (.00694) | [.103] | (.00785) | [.649] | | |
| | N=83322, $R^2$=.135 | | N=37172, $R^2$=.113 | | | |
| **12. Indicator for accident due to factors beyond driver's control as dependent variable** | -5.38E-5 | .997 | -8.82E-4 | .956 | .00122 | 1.03 |
| | (.00107) | [.960] | (.00173) | [.613] | (.00136) | [.372] |
| | N=486744, $R^2$=.044 | | N=112704, $R^2$=.061 | | N=67651, $R^2$=.454 | |

Note: This table reports robustness checks of the regressions reported in Table 3. See notes for Table 3. Each row reports estimates form a separate regression, and all regressions include vehicle, driver, and accident level controls (as in Column V of Table 3). Specification 6 excludes drivers from Wisconsin and New Hampshire, the only two states without mandatory auto insurance. Specification 9 limits the sample to accidents in which at least one vehicle required towing. Specification 11 limits the analysis to vehicles driven by individuals residing in states different from the vehicle owner. Specification 12 uses an indicator for unsafe road conditions resulting in an accident as the dependent variable and excludes vehicles being driven recklessly from the analysis. Such road conditions include pavement damage, improper signage, animals in the road, and incorrect lane markings. Some specifications for Utah are omitted because data on vehicle damage and separate owner data were not available for this state.

## Table 7: Differences-In-Differences Estimates of the Effect of No-Fault

| | NJ | NC |
|---|---|---|
| **Owner/Non-Owner Diffs-In-Diffs** | | |
| No-Fault/Owner Coefficient | -.00194 | .00354 |
| | (.00610) | (.00632) |
| Implied Relative Risk | .992 | 1.01 |
| | [.750] | [.581] |
| N | 429204 | 108020 |
| $R^2$ | 0.088 | 0.083 |
| **Insured vs. Uninsured Diffs-In-Diffs** | | |
| No-Fault/Insured Coefficient | | -.00264 |
| | | (.00695) |
| Implied Relative Risk | | .989 |
| | | [.705] |
| N | | 107972 |
| $R^2$ | | 0.082 |
| Include vehicle controls? | Yes | Yes |
| Include accident controls? | Yes | Yes |
| Include driver controls? | Yes | Yes |
| Include state fixed effects? | Yes | Yes |

Notes: The Owner/Non-Owner specifications use a sample and approach similar to that of column V of Table 3, but differentiate no-fault and tort vehicles driven by their owners and no-fault and tort vehicles driven by non-owners. See notes for Table 3. Here the treatment group is no-fault vehicles driven by owners and difference-in-difference estimates are obtained by including a separate non-owner indicator and a full set of state fixed effects (which subsume the no-fault indicator) in all specifications. Identification assumes that being registered in a no-fault versus a tort state is irrelevant for vehicles not driven by their owners. The Insured-Uninsured analysis compares insured and uninsured drivers across no fault and tort states. In addition to the controls from column V of Table 3, this specification includes a full set of state fixed effects and an indicator for driver insurance status as additional controls. The treatment group is insured drivers from no-fault states.

**Table 8: Relationship Between No-Fault Insurance Coverage and Accident Severity**

| | NJ | | | NC | | | UT | | |
|---|---|---|---|---|---|---|---|---|---|
| **Outcome Variable** | **I** | **II** | **III** | **I** | **II** | **III** | **I** | **II** | **III** |
| **Any occupant moderately injured** | Mean=.030, N=438246 | | | Mean=.014, N=112945 | | | Mean=.051, N=71271 | | |
| | .00495 | -.00147 | .00123 | 5.10E-4 | 5.23E-4 | 2.30E-5 | .0170 | .0164 | .00254 |
| | (.00271) | (.00152) | (.00104) | (7.29E-4) | (6.44E-4) | (8.56E-4) | (.0118) | (.0117) | (.00534) |
| **% of occupants injured** | Mean=.123, N=438917 | | | Mean=.255, N=122619 | | | Mean=.205, N=71269 | | |
| | .0263** | .00245 | .00628** | -.00281 | -.00320 | .00281 | .0141 | .0138 | -9.30E-4 |
| | (.00884) | (.00308) | (.00191) | (.00502) | (.00379) | (.00400) | (.0147) | (.0150) | (.00754) |
| **Vehicle towed or left at scene** | Mean=.261, N=455075 | | | Mean=.416, N=173704 | | | | | |
| | .0184 | -.0276** | -.0129** | -.0180 | -.0193* | -.00693 | | N/A | |
| | (.0181) | (.00768) | (.00499) | (.00920) | (.00808) | (.00576) | | | |
| **Vehicle damaged** | Mean=.988, N=436001 | | | Mean=.966, N=112862 | | | | | |
| | .0123** | .00296** | .00307** | .00212 | -5.33E-4 | -8.11E-4 | | N/A | |
| | (.00384) | (.00102) | (9.18E-4) | (.00254) | (.00120) | (.00139) | | | |
| **Log(Estimated cost of vehicle damage)** | | | | Mean=Log(1578), N=109010 | | | | | |
| | | N/A | | .0520* | .0404* | .0260** | | N/A | |
| | | | | (.0207) | (.0175) | (.00785) | | | |
| Include vehicle controls? | No | Yes | Yes | No | Yes | Yes | No | Yes | Yes |
| Include accident controls? | No | No | Yes | No | No | Yes | No | No | Yes |
| Include driver controls? | No | No | Yes | No | No | Yes | No | No | Yes |

Note: This table reports regression of measures of accident severity on an indicator for whether a vehicle was registered in a no-fault state. The unit of observation is a vehicle in an accident, and each table entry represents a coefficient estimate from a separate regression. See notes for Table 3 and 6 for a description of the additional controls. Injury specifications include the proportion of occupants wearing safety restraints as an additional control. "Moderately injured" generally refers to injuries more substantial than bruises or abrasions, although because methods of coding injury severity differ across states the category is not directly comparable across locations. * denotes significance at the 5% level and ** at the 1% level.