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Personal Bias in Automobile Claims Settlement

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Abstract

Despite the importance of claims handling practices to consumers and insurers, relatively little research has been done in this area. Our purpose here is to consider one aspect of automobile bodily injury liability claims management: the assignment of fault across parties as judged by the insured defendant's claims adjuster. Because legal fault assessment directly affects whether a defendant is held liable, and if so, for how much, this aspect of claims management is significant. We use accident data from the 1997 Insurance Research Council Closed Claim Survey to test for relationships between fault assessment and gender, age, and state comparative negligence rules. Controlling for actual fault, we find a greater assessment of fault against female, young, and elderly drivers. The results of the study are of interest to insurers seeking to provide better customer service, to consumer advocacy groups interested in claims settlement practices, and to insurance regulators.

Introduction

In 1998, the average cost of automobile insurance in the United States was $705 per year per vehicle, and expenditures on private passenger automobile insurance totaled $119 billion (Insurance Information Institute, 2001). Approximately 15 percent of personal auto premiums were used for loss adjustment (A. M. Best, 2001). In addition to being costly, claims adjusting represents the most important direct contact between insurers and customers after sale. Despite the importance of claims handling practices to consumers and insurers, relatively little research has been done in this area. A few

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studies focus on the insurer's role in claims settlement, such as how organizational characteristics affect claims service quality, or the effect of claims payment practices on insurer total costs (see Doerpinghaus, 1991; Barrese et al., 1995; Browne and Wells, 1999). Others have analyzed the effect of the legal system on the claims process, including the plaintiff's willingness to litigate or settle, and circumstances under which an attorney is more likely to be involved in the negotiations (see Cummins and Tennyson, 1996; Kritzer, 1998; Kritzer and Krishnan, 1999).

The purpose of this article is to provide information on a previously unexamined aspect of claims management, namely, the potential for bias associated with personal demographic characteristics and state liability rules on claims adjuster assessment of fault. To test for claims adjuster bias, we use a rich data set from the Insurance Research Council (IRC) on automobile insurance claims closed within a two-week period during 1997. Each time a claim was closed during this period, the claims adjuster was asked to complete a detailed record of the claim, containing approximately 250 pieces of information.

We examine data for 17,367 bodily injury liability claims in which two cars were involved. The percentage of fault assigned by the claims adjuster against the insured defendant is not necessarily a figure that has been resolved or agreed on by the parties or by a court, which would be the case with the claims payment amount. Using fault assignment percentages strengthens the model's measure of the perspective or "bias" of the claims adjuster versus measuring the claims payment amount, which reflects the outcome of a bargaining process. A significant number of cases report either 100 percent or 0 percent fault assessed against the insured defendant. Since these cases may involve less opportunity for claims adjuster judgment, we also consider a reduced sample of 2,130 observations in which 0 percent and 100 percent fault claims are omitted.

Consistent with previous economic literature, we find higher assessed fault against female, young, and elderly insured defendants, all else remaining equal. These findings are of interest to insurers seeking to provide better customer service, to consumer advocacy groups interested in fair claims settlement practices, and to insurance regulators.

CLAIMS ADJUSTMENT PRACTICES

Acting as profit maximizers, insurers will attempt to minimize overall costs for any given level of revenue. Overall costs include loss payments, claims administration (adjusting), and sales costs. One method of reducing claims administration costs is to use formal and informal standards or "rules of thumb" for claims adjusting, rather than to uniquely negotiate each claim. For example, a common informal standard is to apply a "two-to-one ratio" between general and special damages in bodily injury liability claims.[1] Such rules are more likely to exist when the cost of arguing over the distribution of financial responsibility exceeds the benefit to the insurer of engaging

[1] The "two-to-one ratio" sets general damages compensating for nonmonetary losses, such as pain and suffering, at no more than two times the value of monetary losses.

in the argument. When such economic incentives exist, informal standards need not be articulated by management to be applied relatively consistently.[2]

As early as 1970, Ross identified the use of informal claims adjusting patterns, presenting evidence that certain accident conditions tend toward particular outcomes. For instance, a driver who hits another vehicle from behind is more likely to be held responsible for the accident than the driver whose car is hit. In fact, the informal rules have become so common that a general perception exists that the driver hitting from behind is *always* at fault. While such rules are not universally followed, rule-of-thumb decision making is sufficiently widespread to offer the potential benefits of lower premiums (through greater efficiency in claims adjusting), but it may come at the expense of selected individuals or groups of consumers.

The potential for informal standards to affect *groups* of consumers is particularly significant if those groups are protected classes. An important body of literature in this regard generates from mortgage lending practices, where certain behaviors have been considered illegal even when they could be shown to align with economic rationale (see Ladd, 1998). The mortgage lending field is just one aspect of a rich literature on the economics of discrimination, which has grown from Becker's (1957) seminal work. Most of the literature dealing with discrimination in insurance markets has focused on race, considering such issues as availability (Klein, 1997), price (Harrington and Niehaus, 1998), and service (Chan, 1998). In the research reported here, we extend the insurance discrimination literature by considering gender and age effects on assignment of fault.[3] We also test for rules of thumb derived from incentives associated with state negligence rules. Those rules specify thresholds of fault necessary for recovery and as a result offer claims adjusters potentially large time and negotiation savings from assigning small differences in fault.

GENDER BIAS

A potential source of rule-of-thumb decision making for claims adjusters involves risk attitudes across insured defendants and claimants. Individuals who are more risk averse would accept lower-valued settlements with certainty rather than subject themselves to larger risky judgments. If claims adjusters could identify (consciously or unconsciously) more risk-averse claimants, they would effect lower settlements. Similarly, claims adjusters would offer lower settlements to less aggressive negotiators, given that the psychic and perhaps economic costs of extended negotiations are higher for this group. The adjuster, the insured defendant, and the claimant are influenced consciously or unconsciously by the risk and negotiation preference of both self and others.[4]

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[2] Prior research indicates a tendency for parties in negotiations to combine what is fair with what benefits oneself, especially where several different settlement outcomes are viewed as fair (Schelling, 1960; Babcock and Loewenstein, 1997). Even seasoned negotiators and professionals are subject to this self-serving bias (Babcock and Loewenstein, 1997). Adjusters, therefore, are likely to implement informal standards when they benefit oneself, even when not articulated by management.

[3] While no previous literature exists on gender effects and insurer claims practices per se, Tracy and Fox (1989) provide empirical evidence of driver gender effects on auto repair estimates.

[4] While it would be interesting to consider the effect of the claims adjuster's gender and age on assignment of fault, the research reported here ought not be affected by such factors. Our

Evidence suggests that women on average are more risk averse and less aggressive negotiators than men, all else remaining equal. Gender differences in risk perceptions and preferences have been observed in a number of settings. Using data from the 1992 survey from Wave I of the University of Michigan Health and Retirement Study, Haleck and Eisenhauer (2001) test the effects of various demographic characteristics, including gender and age, on relative risk aversion. Across all of their tests, Haleck and Eisenhauer find that women demonstrate greater relative risk aversion than men, both regarding pure and speculative risks. This is consistent with Sorrentino et al. (1992), who find that women demonstrate preference for a moderate payoff with certainty over a higher payoff with uncertainty. Jianakoplos and Bernasek (1998) find single women to be more risk averse than single men. Experimental studies provide additional evidence of greater risk aversion among women than men (Levin et al., 1988; and Powell and Ansic, 1997).[5]

Researchers have also observed gender differences in negotiations. Stuhlmacher and Walters (1999) demonstrate that women have different negotiating styles than men, are more conflict averse in dispute settlement, and negotiate less successful outcomes than men. Graddy and Pistaferri (2000) observe that women are concerned with interpersonal aspects of the negotiation (e.g., being perceived as fair-minded or reasonable), whereas men are oriented toward maximizing economic outcome. Women also demonstrate greater self-doubt about their perceptions than men (Gallos, 1993), and therefore may be more likely to perceive lower settlements as fair.

As Bajtelsmit and Bernasek (1996) note, the causes of gender differences in risk attitude and negotiating styles are difficult to establish. They may result from innate differences or may reflect the influence of long-standing expectations of others and self. That is, pervasive stereotypes tend to create expectations about another's behavior, and those expectations themselves drive behaviors (Snyder et al., 1977; King et al., 1991; Matheson, 1991; Akerlof and Kranton, 2000). For instance, if the social expectation is that women are more risk averse than men, the existence of such an expectation is itself likely to promote risk averse behavior. Akerlof and Kranton (2000) argue that a sense of self, such as being cooperative or reasonable, may even cause people to behave in ways that appear detrimental to their own well-being. Whether due to innate differences or because of behavioral expectations, we hypothesize that claims adjusters will assign relatively more fault to women than to men, all else remaining equal.

AGE BIAS

Evidence suggests that the elderly (i.e., persons age 65 or older) on average demonstrate greater risk aversion relative to the population at large.

hypotheses indicate that adjusters will be less generous to risk-averse and passive negotiators, regardless of the adjuster's own demographics. That is, male adjusters as well as female adjusters are expected to be less generous to women than men. We might find, however, that on average, male adjusters are less generous to *all* claimants relative to female adjusters. However, data are not available to test for this.

[5] Outside of the financial context, Davidson and Freudenburg (1996) report too greater risk aversion among women, noting the importance of context. For example, the difference in risk attitude about environmental hazards is greatest for hazards considered local and of large potential effect (e.g., building a nuclear power plant in the vicinity).

Haleck and Eisenhauer (2001) provide empirical evidence of relative risk aversion associated with financial decision making across age (using data from the University of Michigan Health and Retirement Study). They find decreasing risk aversion with age until one passes age 65. Individuals over age 65 demonstrate greater risk aversion than others. Their findings are consistent with Brown (1987), who observed that relative risk aversion in wealth was highest for the elderly, and with Riley and Chow (1992), who, in examining asset allocation decisions, found risk aversion to decline until age 65, when it increased. Economic theory, in fact, suggests that older people will demonstrate greater (financial) risk aversion because the cost of risk is greater at older ages than at younger ages due to the shorter time horizon within which to recover from adverse consequences (see, for example, Fuchs, 1982; Posner, 1995). In addition to greater risk aversion, tenuous negotiating skills in the elderly may coincide with physical fragility and dependency. Researchers have offered cultural and contextual arguments as well. The elderly have been exposed to war and economic depression and thus may be more risk averse. They may have an outdated sense of the value of a dollar and so overvalue a settlement offer.

Age effects on auto claims management are relevant where there is (1) an age difference between insured defendant and claimant; (2) where one or both parties is/are very young, defined here as less than 22 years old;[6] and (3) where one or both parties is/are elderly, defined here as age 65 or older. Claimants or insured defendants on the extremes of the age continuum (i.e., younger than 22 or ages 65 and older) are expected to differ from those in-between (i.e., the middle-aged, ages 22 to 64). Claims adjusting bias would favor a middle-aged insured defendant who is sued by a younger claimant, per Haleck and Eisenhauer (2001) and Riley and Chow (1992), since risk aversion declines with age (up to age 65). In addition, middle-aged individuals have the advantage of greater experience with negotiation. Note that both the very young and the very old are also likely to be viewed as being more often at fault, given the generally higher frequency of accidents at these ages. Given the evidence to date, we expect higher average fault assessment against very young and elderly insured defendants, all else remaining equal.

COMPARATIVE NEGLIGENCE RULES

In addition to demographic factors, a second potential source of rule-of-thumb decision making by claims adjusters is the legal negligence standard in the state of jurisdiction. Three comparative negligence standards are observed in the United States: the "50 percent comparative negligence rule," the "49 percent comparative negligence rule," and the "pure comparative negligence rule". The 50 percent and 49 percent rules (also known as the "modified" comparative negligence standards) both impose a ceiling on plaintiff fault for the plaintiff to receive compensation. The plaintiff must be "no more at fault than the defendant" in the 50 percent states, and "less at fault than the defendant" in the 49 percent states. Otherwise, the insured defendant is free of liability in those states. The imposition of this ceiling contrasts with pure comparative negligence, where no such threshold exists. To illustrate, an insured defendant in a 49 percent rule state who is found equally at fault as the plaintiff (i.e., 50 percent at fault)

[6] Previous literature does not consider actions by especially youthful decision makers. Rather, the analyses typically begin at approximately age 35.

TABLE 1
Negligence Rules by State[a]

States With Pure Comparative Negligence			
Alaska	Kentucky	New Mexico	
Arizona	Louisiana	New York	
California	Missouri	Rhode Island	
Florida	Mississippi	Washington	
States With 50 Percent Comparative Negligence			
Connecticut	Iowa	New Hampshire	Pennsylvania
Delaware	Massachusetts	New Jersey	South Carolina
Hawaii	Michigan	Nevada	Texas
Illinois	Minnesota	Ohio	Vermont
Indiana	Montana	Oklahoma	Wisconsin
		Oregon	Wyoming
States With 49 Percent Comparative Negligence			
Arkansas	Kansas	South Dakota	
Colorado	Maine	Tennessee	
Georgia	Nebraska	Utah	
Idaho	North Dakota	West Virginia	
Other (including contributory negligence and no specific rule)			
Alabama			
District of Columbia			
Maryland			
North Carolina			
Virginia			

[a]The remaining four states and the District of Columbia follow no set standard or a stated contributory negligence standard whereby a plaintiff cannot receive damages unless completely free of fault. We have omitted these states from the analysis because of confusion about application of the rule. In fact, even though the stated application is no payment if the plaintiff is even remotely to blame in the accident, we find at least 200 (out of 4,000 possible) cases where this rule is violated in the data set.

pays nothing but at 51 percent fault could be required to pay 51 percent of the claim.[7] Table 1 presents the negligence rules as they apply to each state.

If claims adjusters engage in rule-of-thumb settlements, we would expect to observe bias in application of the threshold. That is, where thresholds exist (the 49 and 50 percent rules), the difference of a single percent in fault assessment can free the insured

[7] Note that across rules, comparative negligence holds that an eligible plaintiff receives payment equal to the size of the claimed damages times the percentage fault of the defendant (when payment is appropriate). However, negotiations between the plaintiff and defendant often result in other outcomes. Our use of fault assessment rather than payment allows a better measure of potential bias.

defendant of any legal responsibility whatsoever. Therefore, we expect a disproportionate number of claims with insured defendant fault just above the threshold, 50 percent in the 50 percent rule states and 51 percent in the 49 percent rule states.[8]

Flanigan et al. (1989) provide one of the few empirical studies specifically focused on these negligence rules, although their primary interest is on the distinction between contributory (where even slight fault can deny the plaintiff recovery) and comparative negligence, an issue not considered here. In reporting their results, however, Flanigan et al. also investigate differences across comparative negligence rules, finding higher insurance premiums in pure comparative negligence states than in modified (both 49 and 50 percent) comparative negligence states. This is consistent with insured defendants (and therefore their insurers) paying damages more often under the pure rule. Given this argument, we expect that insured defendants are assigned greater fault more often under the pure rule than under the modified negligence rules, all else remaining equal.

RESEARCH METHODS

Following Browne and Wells (1999), we present a model of insurer decision making behavior and then describe the data used for testing. Following Yinger (1998), we employ regression analysis to investigate potential bias in claims adjustment practices.

Model

Browne and Wells (1999) develop a model of insurer claims practices in personal automobile insurance residual markets. Their specific objective is to consider insurer incentives to be generous in claims payment across different types of residual market mechanisms. We employ Browne and Wells' theory to consider the effects of various demographic characteristics, legal rules, and claim characteristics on claims management practices. We anticipate that insurers will be more generous (assess a higher percentage fault to their insured driver relative to the total fault assigned for the claim) when the financial rewards for doing so are greater than the costs.

We model insurer practices as follows:

$$\text{Maximize } \pi = P - O - L(g) - A(g),$$

where π = profit ; P is the premium; O is overhead costs; $L(g)$ is loss costs; and $A(g)$ is administrative costs.

Both loss costs, $L(g)$, and administrative costs, $A(g)$, are assumed to be functions of generosity (g). The more generous the insurer, the higher is L, but the lower is A. We posit that the insurer's generosity is observed in the percentage fault attributed to the insured defendant. We hypothesize that insurers will assess higher fault to their insureds when the cost of argument about percentage fault exceeds the cost of loss payment. Specifically, we hypothesize that insured defendant fault as a percentage of total fault will be affected by:

[8] For the 50 percent rule, a defendant must be at least 50 percent at fault (of total assessed fault) to have responsibility; for the 49 percent rule, a defendant must be at least 51 percent at fault.

1. demographic biases
2. state negligence rules
3. claim characteristics (i.e., actual fault, severity of the accident, claim size, attorney involvement, difficulty of proving fault, whether the claim is a fatality)
4. other control variables

To test the hypotheses, we estimate the following model:

$$G_i = \alpha + D_i\beta + L_i\gamma + C_i\chi + O_i\lambda + e_i,$$

where G_i is insured defendant fault as a percentage of total fault assessed of the ith claim; α is the intercept term; D_i is a vector of demographic characteristics of the ith claim; β is a vector of regression coefficients for the demographic characteristics; L_i is a vector of legal rules for the ith claim; γ is a vector of regression coefficients for legal rules; C_i is a vector of claim characteristics of the ith claim; χ is a vector of regression coefficients for the claim characteristic variables; O_i is a vector of other control variables for the ith claim; λ is a vector of regression coefficients for the other control variables; and e_i is the random error term.

Data and Variable Measures

Tables 2a and 2b describe the 1997 IRC Closed Claim Survey data. The tables report the variables and their measurement units, as well as the expected signs of the regression coefficients. We augment IRC data with state economic and demographic data from the U.S. Statistical Abstracts (i.e., METROPOP, EMPPOP) and the U.S. Bureau of the Census (i.e., NOHLTHINS).

We measure the dependent variable, INSURED FAULT, as the claims adjuster's assessment of the insured defendant's fault in a bodily injury liability claim relative to total fault assessed in the case.[9] To illustrate, consider a two-vehicle accident in which a claims adjuster estimates the insured defendant's fault at 60 percent and the claimant's fault at 20 percent, with the remaining 20 percent unaccounted for in the file. In this case, the dependent variable will equal 60/80, or 0.75.

We estimate demographic bias using several independent variables. DFEMALE equals one where the insured defendant is female and the claimant is male. DMALE equals one where the insured defendant is male and the claimant is female. BOTHMALE equals one where both the insured defendant and the claimant are male. The holdout group is for both the insured defendant and the claimant to be female. The expected sign of the coefficient for DFEMALE is positive, and the coefficients for the other two gender variables are expected to be negative. That is, women will be assessed a greater percentage of fault against men than men are against women. Likewise, women will be assessed a greater percentage of fault against men than men are against other men.

To test for age effects, we use the variable AGEDIFF, equal to the difference between the insured defendant's age and the claimant's age. The expected sign for AGEDIFF is negative because the greater the age spread, the more negotiating experience the insured defendant has relative to the claimant.

[9] The empirical results are virtually unchanged using assessed insured fault as the dependent variable.

Table 2a
Summary Statistics and Expected Signs for Independent and Dependent Variables: Full Sample (N = 17,367)

Variable Names	Variable Definition	Mean	Standard Deviation	Minimum	Maximum	Expected Sign
INSUREDFAULT	insured defendant fault as a percent of total assessed fault	96.11	13.45	0.00	100.00	N/A
DFEMALE	1 if insured defendant female, claimant male; 0 else	0.19	0.39	0.00	1.00	+
DMALE	1 if insured defendant male, claimant female; 0 else	0.29	0.46	0.00	1.00	–
BOTHMALE	1 if both male; 0 else	0.26	0.44	0.00	1.00	–
AGEDIFF	Insured defendant age – claimant age	4.36	23.95	–76.00	70.00	–
YOUTHFUL	1 if insured defendant <22 yr; 0 else	0.24	0.42	0.00	1.00	+
YMALE	Interaction of youthful and male insured defendant	0.13	0.34	0.00	1.00	+
ELDERLY	1 if insured defendant ≥65 yr; 0 else	0.13	0.34	0.00	1.00	+
PURE	1 if pure comparative negligence rule; 0 else	0.39	0.49	0.00	1.00	+
TORT	1 if tort state; 0 if no-fault	0.83	0.38	0.00	1.00	?
DVIOLATION	1 if insured defendant with violation, claimant not; 0 else	0.53	0.50	0.00	1.00	+
CVIOLATION	1 if claimant with violation, insured defendant not; 0 else	0.04	0.20	0.00	1.00	–
DSEVERE	1 if insured defendant with severe violation and claimant not; 0 else	0.03	0.18	0.00	1.00	+
CSEVERE	1 if claimant with severe violation and insured defendant not; 0 else	0.002	0.05	0.00	1.00	–
LnLOSS	ln (special damages)	7.50	1.46	2.30	14.46	–
ATTORNEY	1 if attorney involvement, 0 else	0.57	0.50	0.00	1.00	?
STRAINS	1 if strain or sprain injury; 0 else	0.86	0.35	0.00	1.00	+
FATALITY	1 if fatality; 0 else	0.002	0.04	0.00	1.00	–
METROPOP	% state population in metropolitan area	79.99	15.22	27.70	100.00	?
EMPPOP	% state population employed	63.73	3.38	51.60	72.10	+
NOHLTHINS	% state population without health insurance	16.73	4.91	7.30	25.60	+

TABLE 2b
Summary Statistics and Expected Signs for Independent and Dependent Variables: Data Subset (N = 2130)

Variable Names	Variable Definition	Mean	Standard Deviation	Minimum	Maximum	Expected Sign
INSUREDFAULT	insured defendant fault as a percent of total assessed fault	70.78	22.27	1.00	99.01	N/A
DFEMALE	1 if driver female, claimant male; 0 else	0.19	0.39	0.00	1.00	+
DMALE	1 if driver male, claimant female; 0 else	0.29	0.45	0.00	1.00	–
BOTHMALE	1 if both male; 0 else	0.27	0.44	0.00	1.00	–
AGEDIFF	Insured defendant age – claimant age	5.22	23.29	–76.00	70.00	–
YOUTHFUL	1 if insured defendant <22 yr; 0 else	0.23	0.42	0.00	1.00	+
YMALE	Interaction term of youthful and male insured defendant	0.13	0.33	0.00	1.00	+
ELDERLY	1 if driver ≥65 yr; 0 else	0.13	0.33	0.00	1.00	+
PURE	1 if pure comparative negligence rule; 0 else	0.35	0.48	0.00	1.00	+
TORT	1 if tort state; 0 if no-fault	0.70	0.46	0.00	1.00	?
DVIOLATION	1 if insured defendant with violation, claimant not; 0 else	0.37	0.48	0.00	1.00	+
CVIOLATION	1 if claimant with violation, driver not; 0 else	0.06	0.23	0.00	1.00	–
DSEVERE	1 if insured defendant with severe violation and claimant not; 0 else	0.02	0.14	0.00	1.00	+
CSEVERE	1 if claimant with severe violation and insured defendant not; 0 else	0.01	0.11	0.00	1.00	–
LnLOSS	ln ($ loss amount)	7.83	1.39	3.22	12.75	–
ATTORNEY	1 if attorney involvement, 0 else	0.72	0.45	0.00	1.00	?
STRAINS	1 if strain or sprain injury; 0 else	0.82	0.38	0.00	1.00	+
FATALITY	1 if fatality; 0 else	0.003	0.06	0.00	1.00	–
METROPOP	% state population in metropolitan area	81.73	14.78	29.70	100.00	?
EMPPOP	% state population employed	64.07	3.78	51.60	72.10	+
NOHLTHINS	% state population without health insurance	15.92	5.30	7.30	25.60	+

We control for very young insured defendants with the variable YOUTHFUL, which equals one if the insured defendant is under age 22 and zero otherwise. The correct cutoff value for "youthful" is not obvious. Because we are seeking a test of bias, we do not use insurer age rating factors, which generally lower premiums for insureds once they reach age 25. We use age 22 as the cutoff for our youthful variable because it reflects the approximate age by which most youth live away from parents and therefore are likely to demonstrate more independence and maturity. We include an interaction term between YOUTHFUL and male insured drivers, represented by YMALE.[10]

A third age indicator controls for differences in risk and negotiating preferences at or above age 65. The variable, ELDERLY, equals one if the insured defendant is age 65 or above. We expect a positive relationship between ELDERLY and percentage of fault assessed to the insured defendant.

In order to test for differences across state negligence rules, the independent variable, PURE, equals one for "pure rule" states where the insurer pays some percentage of the other party's loss, regardless of the insured defendant's fault. By contrast, under the modified comparative negligence rules the insurer is responsible for a portion of the other party's loss only if the insured defendant's fault exceeds the threshold of 50 or 51 percent. There is an incentive for rule-of-thumb decision making for cases where fault lies close to a threshold percentage.[11] The expected sign for PURE is ambiguous.

In order to test for legal rule threshold effects (50 or 51 percent, depending on the modified comparative negligence rule), we employ a second model, a logistic regression model, where the dependent variable equals the probability that insured defendant fault equals 50 or 51 percent of total assessed fault. We expect a concentration of 50 or 51 percent assessments in the modified states but not the pure rule states. In addition to using independent variables to identify state comparative negligence rules, we recognize that a tort or no-fault system may also affect the distribution of fault, and we include the variable TORT (equal to one in tort states and zero otherwise) as a control.

Claim characteristics also may affect the claims adjuster's assignment of fault. First, we control for the actual or true fault of the insured defendants. If, for example, female, elderly, and young drivers are assessed greater levels of fault, this could be due to relatively greater levels of true fault or negligence. We can estimate bias only after controlling for true fault. Since true fault is unobservable, we use proxies, namely, whether the insured defendant or the claimant is assessed a driving violation and whether or not the violation is severe.[12] Where the insured defendant is assessed a violation and the claimant is not, DVIOLATION equals one and CVIOLATION equals zero. We anticipate greater assigned fault to the insured defendant in this case. Where the claimant is assessed a violation and the insured defendant is not, CVIOLATION equals one and DVIOLATION equals zero. Lower insured defendant fault is

[10] We considered various interaction terms across the demographic variables but only this one is significant.

[11] Since the data used are restricted to claims closed with payment, some selection bias may exist against slower-to-close, less clear cut cases.

[12] Differences across states and other jurisdictions in how driving violations are issued by law enforcement personnel could affect measurement of "actual fault," but no ready correction for this is apparent.

anticipated in this case. The holdout group represents the situation when neither or both parties have been issued violations (where DVIOLATION and CVIOLATION both equal zero). We expect that fault will be relatively evenly split in this situation, all else remaining equal.

However, the types of violations assessed also affect fault assignment. Therefore, we control for severity of violation as well. We define severe violations as those involving driving under the influence of drugs or alcohol (DUI), reckless driving, or hit and run. Those defined as not severe include driving with a suspended or no license, speeding, stop sign or traffic light violations, failing to yield the right of way, improper lane usage, improper turns, and failing to wear a seat belt or use a child restraint. We expect that when the insured defendant is assessed a severe violation and the claimant is not (DSEVERE equals one), insured defendant fault will be higher, all else remaining equal. We also anticipate that when the claimant is assessed a severe violation and the insured defendant is not (CSEVERE equals one), the insured defendant's fault will be lower. Again, our holdout group represents the similar case of neither or both parties being assessed severe violations.

We control for several claim-specific characteristics that are expected to affect adjusting practices: claim size, attorney involvement, and the type of injury resulting from the accident. Claims adjusters are expected to find generosity in claims payment more cost-effective for smaller valued claims than for larger ones. We use the natural logarithm of economic loss, equal to the claimant's special damages[13] (i.e., medical expenses and lost wages) to measure size effects, and we expect LnLOSS to be negatively related to the dependent variable.

We also expect the claimant's use of an attorney to influence the claims adjusting process. Here ATTORNEY equals one if the claimant has an attorney and zero otherwise. Attorney involvement strengthens the negotiating position of the claimant and could particularly affect the hypothesized weaker bargaining position of female and elderly claimants. However, attorney involvement is complex. For example, claims with attorney involvement may include larger demands for general damages, which are not included in our size measurement. Furthermore, attorney involvement may be more likely in situations where fault is ambiguous (see Ross, 1970). Thus, the relationship between attorney involvement and percent fault is ambiguous ex ante.[14]

Similarly, we can expect certain types of injuries to influence claims management. Strains and sprains are considered open to greater levels of fraud than other injuries, given the difficulty of proving the extent of loss. As a result, strains and sprains are likely to receive greater adjuster attention per dollar of claim than other injuries and thereby be worthwhile to claimants only when fault is relatively easy to demonstrate. Here STRAINS equals one if a strain or sprain is part of the claim and zero otherwise. We posit a positive relationship between strains and sprains and fault assessment. Similarly, where the claim involves a fatality, proof of damages is generally straightforward and unlikely to involve fraud. Here claims adjusters will give less attention

[13] Only a relatively small percentage of the observations provide data on noneconomic (general) damages.

[14] We examine interaction effects between ATTORNEY and the demographic variables, and they are not statistically significant.

to measurement of damages, making it more cost-effective for claimants to pursue cases with less clear insured defendant fault. Consequently, we expect a negative relationship between FATALITY and fault assessment.

We also control for several state economic and demographic characteristics that are expected to affect adjusting practices. Inclusion of METROPOP, the percentage of the population living in metropolitan areas, follows Danzon's (1986) use of "urbanization" to control for the frequency of social interactions, the degree of sophistication of the parties involved, resources available, etc. Note that Grace et al. (2002) found evidence contradicting the standard "urban hypothesis," suggesting that the influence of urban and rural factors is more complex than previously thought. The percent of the state population that is employed, EMPPOP, captures the effect of employment rates on claims practices. In states with lower employment rates, we expect quicker but less generous settlements because the claimant has more to lose in waiting for a good outcome (see Cummins and Tennyson, 1996). The expected sign of the coefficient estimate is positive. In states with relatively high employment rates, the claimants have more resources on which to rely and could therefore wait longer for a more generous settlement. NOHLTHINS, the percent of the state population without health insurance, identifies claims where automobile insurance is needed as a substitute for health insurance. We expect a positive relationship between the dependent variable and the health insurance control.

We conduct two types of analyses to test the hypotheses regarding claims management practices. First, we use an ordinary least-squares (OLS) estimation with the dependent variable equal to the percent insured defendant fault divided by the total percent fault assessed in the case. Since the dependent variable is contained in (0,1), OLS is problematic. We also estimate the fractional dependent variable using a generalized linear model (GLM) described by Papke and Wooldridge (1996). Second, in order to further investigate the effect of legal rules on fault assignment, we employ an ordinary logistic regression model in which the likelihood of a 50 or 51 percent fault assessment is estimated. We also report results of this logistic using quasi-maximum likelihood estimation (QMLE).

EMPIRICAL FINDINGS

Tables 3 and 4 show the results of the analyses. Table 3a reports the OLS and GLM results for the full sample, with the dependent variable equal to the insured defendant fault as a percent of total assessed fault between the insured defendant and claimant. Table 3b uses the same dependent and independent variables but excludes observations in which the insured defendant is either assessed full responsibility or no responsibility. The F-values for Tables 3a and 3b are 72.12 and 43.27, respectively, both of which have a *p*-value of less than 0.0001, indicating that the overall OLS regression model is statistically significant despite the low R^2. Both OLS models show a low degree of multicollinearity, as indicated by the fact that variance inflation factors of all variables are smaller than 3. Table 4a reports the estimation of the logistic regressions (both ordinary logit and logit using QMLE), with 50 or 51 percent insured defendant fault as the dependent variable for the full sample, and Table 4b reports results of the same models on the reduced sample. The Hosmer and Lemeshow goodness-of-fit tests suggest that the fitted logistic models are adequate.

TABLE 3a
Estimation Results: Full Sample
Dependent Variable: Insured Defendant Fault (N = 17,367)

	OLS		GLM	
Predictor Variable	Coefficient	*t*-statistic	Coefficient	*z*-statistic using robust standard error
INTERCEPT	95.579	39.02***	4.265	5.82***
DFEMALE	−0.358	−1.20	−0.095	−1.15
DMALE	−0.765	−2.67***	−0.214	−2.63***
BOTHMALE	−0.928	−3.13***	−0.236	−2.90***
AGEDIFF	−0.015	−2.83***	−0.004	−2.53**
YOUTHFUL	−0.492	−1.35	−0.159	−1.59
YMALE	0.887	1.91*	0.246	1.89*
ELDERLY	0.847	2.41**	0.228	2.14**
PURE	−0.628	−2.59***	−0.277	−4.11***
TORT	2.195	7.36***	0.339	4.75***
DVIOLATION	3.892	18.79***	1.232	20.43***
CVIOLATION	−5.806	−11.59***	−0.712	− 6.86***
DSEVERE	4.816	8.44***	1.246	6.35***
CSEVERE	−25.589	−12.61***	−2.522	−9.89***
LnLOSS	−0.174	−2.10**	−0.032	−1.44
ATTORNEY	−2.368	−9.95***	−0.803	−11.00***
STRAINS	2.196	7.69***	0.558	7.95***
FATALITY	−7.188	−2.92***	−0.803	−1.74*
METROPOP	−0.043	−6.05***	−0.012	−5.53***
EMPPOP	−0.006	−0.17	−0.013	−1.27
NOHLTHINS	0.136	5.78***	0.041	5.53***

*Statistically significant at 0.10 level, **statistically significant at 0.05 level, ***statistically significant at 0.01 level. $R^2 = 0.068$, adjusted $R^2 = 0.0757$.

As discussed above, in order to identify possible biases in claims adjuster practices, the estimation must distinguish between true or actual insured defendant fault and any remaining consistent pattern of fault assessment. We use insured defendant and claimant violation as proxies for actual fault, and as expected, Table 3a indicates that insured defendant fault is higher when the insured defendant is charged with a violation (and the claimant is not) and lower when the claimant is charged with a violation (and the insured defendant is not). We find similar relationships with severe violations. These variables account for a significant proportion of the explained variance and give credibility to the analysis.

After controlling for true fault through insured defendant and claimant violations, we find evidence of rule-of-thumb decision making in fault assessment. Specifically, we find evidence that male insured defendants are assessed lower percentage fault than are female insured defendants. This relationship is strongest in the full model, showing a lower percent fault attributed to male drivers both when the claimant is

TABLE 3b
Estimation Results: Data Subset (excluding 0% and 100% fault cases)
Dependent Variable: Insured Defendant Fault (N = 2130)

	OLS		GLM	
Predictor Variable	Coefficient	*t*-statistic	Coefficient	*z*-statistic using robust standard error
INTERCEPT	47.960	4.43***	−0.168	−0.30
DFEMALE	1.471	1.18	0.073	1.16
DMALE	−3.468	−2.84***	−0.169	−2.64***
BOTHMALE	−0.194	−0.16	−0.007	−0.11
AGEDIFF	−0.036	−1.58	−0.002	−1.53
YOUTHFUL	−1.679	−1.11	−0.092	−1.28
YMALE	1.064	0.54	0.046	0.47
ELDERLY	3.664	2.52**	0.191	2.45**
PURE	−9.732	−9.12***	−0.510	−9.62***
TORT	−0.919	−0.84	−0.062	−1.05
DVIOLATION	14.237	15.99***	0.785	17.72***
CVIOLATION	−17.284	−9.76***	−0.701	−6.95***
DSEVERE	11.392	3.65***	0.557	3.41***
CSEVERE	−16.699	−4.15***	−0.797	−4.09***
LnLOSS	0.479	1.32	0.025	1.42
ATTORNEY	−5.618	−5.10***	−0.314	−5.81***
STRAINS	2.657	2.46**	0.139	2.56**
FATALITY	−21.743	−2.99***	−0.903	−1.78*
METROPOP	−0.097	−3.11***	−0.005	−3.15***
EMPPOP	0.293	1.99**	0.014	1.76*
NOHLTHINS	0.677	7.06***	0.039	7.63***

*Statistically significant at 0.10 level, **statistically significant at 0.05 level, ***statistically significant at 0.01 level. $R^2 = 0.2910$, adjusted $R^2 = 0.2842$.

a female and when the claimant is male (relative to the holdout, which is a female insured driver sued by a female claimant). The reduced sample (shown in Table 3b) shows this relationship when male insured defendants are considered relative to female claimants. Note that the full-sample model (where N = 17,367) suggests the need for a large sample adjustment. Following the formula by Connolly (1989), from a Bayesian standpoint the critical *t*-value in favor of the alternative hypothesis for this sample size is 3.12, which would suggest that some of the demographic variables (i.e., DMALE, AGEDIFF, ELDERLY) exhibit only weak significance.

We also find evidence of an age effect, again more pronounced in the full than in the reduced sample. As the age difference between the insured defendant and the claimant increases, estimated fault decreases. This is consistent with increased negotiating experience resulting in lower assessed fault. Furthermore, elderly and young male insured defendants are assessed higher percentages of fault than others. The ELDERLY

TABLE 4a
Estimation Results: Full Sample
Dependent Variable: Probability of 50 or 51 Percent Insured Defendant Fault (N = 17,367)

	Logistic		GLM	
Predictor Variable	Coefficient	Chi-Square	Coefficient	*z*-statistic using robust standard error
INTERCEPT	−1.1123	0.6162	−1.113	−0.87
DFEMALE	0.1298	0.7200	0.130	0.85
DMALE	0.093	0.3923	0.093	0.62
BOTHMALE	0.072	0.2286	0.072	0.48
AGEDIFF	0.002	0.4254	0.002	0.68
YOUTHFUL	0.060	0.0957	0.060	0.31
YMALE	−0.058	0.0559	−0.058	−0.24
ELDERLY	−0.272	2.0427	−0.272	−1.42
PURE	0.4327	10.6202***	0.433	3.45***
TORT	−0.251	3.7678*	−0.251	−1.89*
DVIOLATION	−2.056	189.9972***	−2.056	−13.63***
CVIOLATION	−0.381	3.4520*	−0.381	−1.77*
DSEVERE	−1.071	13.4260***	−1.071	−3.89***
CSEVERE	2.695	38.1536***	2.695	5.64***
LnLOSS	−0.023	0.2870	−0.023	−0.56
ATTORNEY	1.000	47.4413***	1.000	6.75***
STRAINS	−0.600	20.9018	−0.600	−4.55***
FATALITY	0.526	0.4551	0.526	0.64
METROPOP	0.020	23.3050***	0.020	4.37***
EMPPOP	−0.051	6.1219**	−0.051	−2.83***
NOHLTHINS	−0.029	4.5529**	−0.029	−2.28**

*Statistically significant at 0.10 level, **statistically significant at 0.05 level, ***statistically significant at 0.01 level. $R^2 = 0.0314$, max-rescaled $R^2 = 0.1504$.

variable remains significant in the reduced sample. All of these results are consistent with our hypotheses.

Where the claimant is represented by an attorney, insured defendant assessed fault is lower, which is consistent with the hypothesis that attorneys are involved in more complex cases where argument might be valuable to the claims adjuster. In addition, as anticipated, strains and sprains are associated with higher insured defendant assessed fault while fatalities are associated with lower insured defendant assessed fault. Interestingly, the size of economic loss is only weakly significant in explaining variation in assessed fault, and only in the full sample.

The results in Tables 4a and 4b allow investigation of the relationship between the state's comparative negligence law and the probability of the insured defendant being assigned 50 or 51 percent fault, the threshold values under modified comparative negligence standards. Interestingly, we find more threshold values in the pure

TABLE 4b
Estimation Results: Data Subset (excluding 0% and 100% fault cases)
Dependent Variable: Probability of 50 or 51 Percent Insured Defendant Fault (N = 2130)

	Logistic		GLM	
Predictor Variable	Coefficient	Chi-Square	Coefficient	*z*-statistic using robust standard error
INTERCEPT	2.036	1.5928	2.036	1.36
DFEMALE	−0.020	0.0121	−0.019	−0.11
DMALE	0.012	0.0045	0.012	0.07
BOTHMALE	−0.099	0.3176	−0.099	−0.56
AGEDIFF	−0.0025	0.5968	−0.002	−0.81
YOUTHFUL	−0.050	0.0506	−0.050	−0.23
YMALE	0.108	0.1449	0.108	0.38
ELDERLY	−0.188	0.7781	−0.188	−0.89
PURE	0.767	25.7645***	0.767	5.34***
TORT	0.306	4.0866**	0.306	1.97**
DVIOLATION	−1.569	97.8322***	−1.569	−9.89***
CVIOLATION	−0.665	8.1369***	−0.665	−2.76***
DSEVERE	0.130	0.1178	0.129	0.34
CSEVERE	0.968	3.8439**	0.968	1.98**
LnLOSS	−0.071	1.9074	−0.071	−1.39
ATTORNEY	0.527	10.0200***	0.527	3.18***
STRAINS	−0.202	1.7811	−0.202	−1.38
FATALITY	0.111	0.0161	0.111	0.12
METROPOP	0.0149	10.6358***	0.015	3.14***
EMPPOP	−0.060	6.8763***	−0.060	−2.93***
NOHLTHINS	−0.035	5.4491**	−0.034	−2.49**

**Statistically significant at 0.05 level, ***statistically significant at 0.01 level. $R^2 = 0.1206$, max-rescaled $R^2 = 0.1893$.

comparative negligence states than in the modified states. This result might be due in part to the censored nature of the data, involving only claims closed *with payment*. This result is also consistent with economic incentives for adjusters to share or split losses (to enable premium increases) rather than to manipulate the comparative negligence rules. Table 5 presents the distribution of fault across the three comparative negligence categories of states. Note the similarity between the pure states and modified rule states, especially for cases with less than 50 percent fault. Further research is warranted to better understand the relationship between comparative negligence rules and fault assignment.

RESULTS AND IMPLICATIONS

Our purpose here is to investigate the effect of gender, age, and negligence rules on the percent fault of an insured defendant as estimated by the insured's claims adjuster. We find evidence of bias associated with both gender and age, in the full as well as

TABLE 5
Percent Insured Defendant Fault Across State Negligence Rules

	Negligence Rules		
Percent Driver Fault	Pure	Rule 50	Rule 49
0–25	1.43	1.07	0.24
26–49	0.55	0.24	0.00
50	3.44	2.18	0.43
51–75	2.07	2.21	1.81
76–85	1.93	3.16	1.57
86–95	1.74	5.86	3.24
96–99	0.12	0.15	0.19
100	88.72	85.15	92.52
Total	100.00	100.00	100.00

the reduced sample of cases. We also observe differences in fault assessment across comparative negligence standards, but they are not consistent with our hypotheses (which may be due to the nature of the data set).

Controlling for true fault, the evidence suggests that female, elderly, and young drivers are assessed a higher percentage of fault than are others, all else remaining equal. In addition, during the middle years (between ages 22 and 64), relatively older insured defendants are assessed relatively less fault than are relatively younger insured defendants. One possible explanation for the results is that the control for true fault is weak. Alternatively, the results are consistent with rule-of-thumb decision making in claims handling which adversely affects women, the young, and the elderly. Table 6 provides some support for this alternative explanation: while both male and female insured drivers are assessed traffic violations about 70 percent of the time that they are in accidents, male drivers account for a much higher percent of the severe violations than do women. This is consistent with true fault being greater for males while assessed fault is greater for females, and is also consistent with the explanation of gender bias in claims handling.

For much of the past 40 years, there has been extensive debate in the United States over the method by which parties injured in automobile accidents are compensated.

TABLE 6
Relative Traffic Violations by Insured Driver's Gender

	No Violation	Non-Severe	Severe	Total
Male	2864	6302	375	9541
	0.300	0.661	0.039	1.00
Female	2289	5354	183	7826
	0.293	0.684	0.023	1.00
Total	5153	11656	558	17367
	0.297	0.671	0.032	1.00

Most of that attention has focused on the economics of tort versus no-fault laws. The evidence here suggests that insurer claims management practices also warrant investigation when judging the efficiency and fairness of victim compensation.

As noted above, the evidence presented here on insurer claim management practices follows to a degree research focused on mortgage lending discrimination. As Ladd (1998) notes, even behavior undertaken for pure profit-maximizing purposes may be illegal. For example, even though loan default rates are higher for black applicants than white applicants, the lender cannot use race as a factor in deciding whether to accept a loan applicant. Variations in insurance claims management practices by gender and age might meet the legal definition of discrimination and therefore be prohibited under current laws.

Initial mortgage lending studies have found strong differences in the likelihood of loan denial between whites and blacks, but insufficient control data weakened the results. Legal changes in 1975 altered data reporting requirements for lending institutions, promising a richer data set for empirical testing. The Federal Reserve Bank of Boston ultimately conducted a comprehensive study that incorporated *all* data available to lenders at the time of loan application and corroborated earlier evidence of difference in loan denial rates by race. The insurance evidence reported here demonstrates the need for richer data sets on insurer claims management practices as well as incorporation of demographic factors into analysis of insurer practices.

Both the mortgage lending and insurance claims adjusting fields have begun to move toward online systems of doing business that are independent of personal decision makers. Claims adjusting online involves a series of double-blind settlement offers between the insurer and claimant (or the claimant's attorney on behalf of the claimant).[15] Demographic factors do not enter into negotiation. In fact, it is possible that the claims adjuster and attorney/claimant never meet. Similar systems are used in mortgage lending and may have a role in reducing the effects of personal bias in business decision making.

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[15] http://www.cybersettle.com.

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