The Impact of Adjuster Moral Hazard on Driving Records

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I. Introduction

Insurance mechanisms for paying for property damage arising from an automobile accident vary by jurisdiction. In most jurisdictions the settlement of a claim for property damage as a result of an accident involving more than one vehicle typically involves two insurers. Usually, damage to property arising from an auto accident is compensated by the third party insurer, to the extent that the first party is not at-fault. First party property losses are typically covered by add on coverages such as collision and comprehensive. Some jurisdictions, however, have a first party recovery scheme for physical damage. In this scheme, the not-at-fault portion is provided by the insured’s coverage. This coverage is mandatory in some jurisdictions (like Ontario) and not in others (like Michigan). At-fault coverage is still provided by the (typically) optional first party collision insurance.

In a first party recovery scheme for property damage, the claimant’s insurer pays both the not-at-fault and the at-fault (if the insured carries collision coverage) portions of the loss. This situation may result in moral hazard on behalf of the claims adjuster since adjusters are less likely to be concerned about the correct assignment of fault when adjusting claims for their own insureds. The reason for this is two-fold: adjusters do not have to coordinate with a third party adjuster (as in a tort jurisdiction) in order to settle a claim, and furthermore, for insureds that also carry at-fault collision coverage, the assignment of fault does not appreciably affect the compensation paid out. The difference in the amount paid by the insurer would typically be a portion of the insured’s collision deductible.

Although not assigning fault correctly has a relatively minor impact on the claims settlement process, in terms of the amounts paid, it has a more significant impact on pricing and risk classification. Because of the experience rating component in automobile insurance pricing, if adjusters are less likely to assign fault, the experience rating component will be less effective. Some drivers, who are actually high risk drivers, will be misclassified as low risk.

In this paper we examine the impact of first party recovery schemes for property damage (PD) on adjusters’ incentives in assigning fault and its impact on experience rating misclassification. Because we cannot easily measure the cost empirically, we construct a theoretical model of an insurance company and look at the impact of adjuster moral hazard and the resulting misclassification upon the portfolio of drivers. We examine the differences in the
distribution of drivers by driving rate class in the first-best model and the model with adjuster moral hazard. We find that in the model with moral hazard there are relatively more seemingly ‘good’ drivers than ‘poor’ drivers. With misclassification, the overall base premium is higher and the resulting rate differentials between different driving record classes are smaller. More pooling exists in a model in which fault is not correctly assigned. We provide anecdotal evidence from two different insurers that provide support for our model.

The true cost of moral hazard is difficult to measure. In this case it is even more problematic since insurers and regulators may not be aware of the moral hazard that arises in first party recovery schemes. Based on our model, we find that the potential cost of misclassification and the impact it has on the premiums charged to low risk insureds are substantial.

The paper proceeds as follows. We provide an overview of automobile insurance in Canada. This is followed by a discussion on first party recovery of property damage claims, the impact on adjuster incentives and the resulting misclassification of drivers. Using data for two large Canadian insurers, we provide evidence of this adjuster moral hazard in the claims settlement process. Next we develop a theoretical model that describes the system as a discrete-time Markov chain and show the impact of moral hazard on the distribution of driving classes. The paper concludes with a discussion of the consequences of the resulting misclassification of drivers for insurers and implications in a competitive marketplace.

II. Auto Insurance in Canada

Automobile insurance in Canada is the largest line of property/casualty insurance, accounting for 48.5 percent of net premiums written. In 2005, private insurers wrote $16.3 billion in net premiums and government insurers wrote $5.1 billion in net premiums (IBC, 2006). Solvency oversight for most insurers underwriting property/casualty insurance in Canada is undertaken at the federal level\(^1\). However oversight of the products and pricing of property/casualty insurance is undertaken at the provincial level.

The administration of automobile insurance varies across the country. In four provinces, British Columbia, Saskatchewan, Manitoba and Quebec, the mandatory automobile insurance coverages are offered solely by (provincial) government run monopolies. In the remaining provinces, insurance is offered by private insurers. Some degree of no-fault automobile

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\(^1\) Some insurers are provincially registered and these insurers are monitored by provincial superintendents of insurance.
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Insurance is in place in four provinces (Saskatchewan, Manitoba, Ontario and Quebec) and these laws vary substantially between provinces. Quebec and Manitoba have a pure no-fault system where there is a complete prohibition on the right to sue. Saskatchewan has a choice system where drivers select coverage under either the traditional tort system or a modified no-fault system, with no-fault being the default. Ontario also has modified no-fault laws with a verbal threshold that must be pierced in order to obtain the right to sue for non-economic damages, and a dollar threshold to sue for monetary damages.

In addition, Ontario, Quebec and New Brunswick have direct compensation for property damage. The first party coverage, called Direct Compensation – Property Damage (DC-PD) in Ontario, allows the not-at-fault motorist to recover from her own insurer damages to her car and any property inside the car to the extent that the motorist is not at-fault. In Alberta and the Nova Scotia, and Prince Edward Island compensation is provided through both the tort system and mandatory first party accident benefits. In New Brunswick compensation is provided through the tort system for not-at-fault accidents and first party accident benefits. Newfoundland also operates under a tort system, but does not have mandatory first party accident benefits. Outside of Manitoba and Saskatchewan, damage to one’s own automobile (typically collision and comprehensive coverages) is optional.

In all jurisdictions in Canada, there is a level of experience rating attached to the rate making process for automobile insurance. Although this varies slightly between the provinces, typically experience rating involves driving record classes based on a driver’s loss history in which premiums charged for each driving record class are calculated as a multiple of the base class. In addition, insurers may have surcharges for moving violations. We focus here on the experience rating structure that is used in both Ontario and Alberta (the two largest private marketplaces for automobile insurance in Canada).

In this rating structure, drivers are assigned a driving record class based on number of years of at-fault claims free driving. Not at-fault claims, by law, cannot be used to modify premiums and therefore do not impact the driving record classification. Drivers with no years of at-fault claims free driving are placed in driving record class 0, drivers with one year of at-fault claims free driving are placed in driving record class 1, and so on up to driving record class 5. Drivers with 6 or more years of consecutive at-fault claims free driving are in class 6. In

In

2 Some insurers offer an additional discount for class 6 drivers with 10 or more years of consecutive at-fault claims free driving.

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addition, most insurers offer modified accident forgiveness for class 6 drivers. Class 6 drivers with an at-fault claim are placed in class 5*. A driver in class 5* who has an at-fault claim moves to class 0 at the next renewal. Drivers in class 5* move back to class 6 if they have 5 years of consecutive years of at-fault claims free driving.

Some insurers have separate driving record classes for third party liability, first party accident benefits and first party property damage claims. Table 1 illustrates third party liability differentials in 2007 for a large Canadian property/casualty insurer (denoted insurer A).

### III. Impact of First Party Recovery on Adjuster Incentives

One of the key arguments for first party as opposed to third party recovery for property damage arising from automobile accidents is to eliminate the adversarial relationship that often results from two insurers having to negotiate the fair amount to be paid for a claim involving their own insureds. Mehr and Eldred (1974) specifically addressed physical damage losses and refuted this supposition. They concluded that a first party recovery scheme for physical damage losses provided few benefits. Because of the speed at which collision claims were typically settled, first party recovery would not provide any significant increases in the time to settlement of property damage claims. In addition, Mehr and Eldred argued that there would be no reduction in the cost to settle property damage claims because amounts for such claims typically were easily determined and very few (less than 10 percent) claims required attorney involvement.

However, as shown by Kelly, Kleffner and Tomlinson (2007), third party recovery can result in a significant time delay in receiving payment and may also affect the compensation received. Typically, in tort jurisdictions, insureds are compensated for property damage caused by an at-fault driver by their own insurer, who then subrogates against the at-fault driver’s insurer. Therefore, even in the absence of any observed benefits to the insureds, the reduction of subrogation arising from a first party recovery scheme would significantly reduce the expense of settling claims.

In a third party recovery scheme, because of the involvement of two insurance companies, the allocation of fault and settlement of a claim involves agreement on the part of the adjusters for both drivers. In contrast, in first party recovery schemes, adjusters do not have to reach agreement with the other party’s insurer concerning both fault assignment and the amount of the claim. Although this may be advantageous from the point of view of more efficient claim settlement, it may also result in adjusters not correctly assigning fault. If the insured carries
collision coverage, then the insured would receive the same settlement for at-fault and not at-fault claims, with the minor difference being the collision deductible. The incentive, from the adjuster’s viewpoint, to correctly assign fault is therefore reduced: when settling a claim for his own insured, it may be easier for the adjuster to assume his insured is not at-fault. Settling in favour of the adjuster’s own insured may reduce settlement costs\(^3\) and also increase good will.

If adjusters in a first party recovery scheme are more likely to not assign fault to their own insureds, one would expect that the percentage of not-at-fault property damage claims for an insurer to be higher in a first party recovery scheme than under a third party scheme. Using data from another large Canadian property/casualty insurer (denoted insurer B) for 1998-2002, Kelly, Kleffner and Tomlinson (2007) compared the percentage of at-fault to total PD claims in a traditional third party regime (Alberta) and a first party property damage recovery regime (Ontario). Their results are shown in Table 2. They found that the percentage of not-at-fault claims is significantly higher in Ontario than Alberta, which did not contradict the hypothesis that adjusters have the incentive to not assign fault to their own insureds in a first party recovery scheme. We confirm these results using data from insurer A. Insurer A reports that the average percentage of at-fault to total PD claims for 1996 – 2006 is significantly higher in Alberta (62 percent) than in Ontario (44 percent).

Thus, the anecdotal evidence above and in Table 2 does not refute the hypothesis that claimants are less likely to be found at-fault in a first party recovery jurisdiction. If each insurer underwrites similar risks in both jurisdictions then adjusters for insurer A misclassify at-fault claims 29 percent of the time and adjusters for insurer B misclassify at-fault claims 33 percent of the time. Given that in 2001, 24 percent of reportable collisions in Ontario were single vehicle accidents (Road Safety Program Office, 2003), and assuming that all single vehicle accidents are classified as at-fault accidents, we can use the data from insurer B to examine misclassification for multiple vehicle accidents. If insurer B incurs the same proportion of single vehicle accidents in both jurisdictions then 40 percent of drivers in multiple vehicle accidents are classified as at-fault drivers in Alberta while 18 percent of drivers in multiple vehicle accidents are classified as at-fault drivers in Ontario.

This incorrect assignment of fault has a long term impact on the insurer’s rate making process: if fault is not assigned correctly then the experience rating component of automobile

\(^3\) Kelly, Kleffner and Tomlinson (2007) collected data for one year’s automobile property damage claims for an insurer in Ontario (first party recovery). The expenses attached to claims in which fault assignment was actively disputed by the insured were 1500% higher than for claims in which fault was not disputed.
insurance becomes less accurate and premiums charged to insureds will not reflect the risk of each insured. When fault is not correctly assigned, the driving record class does not represent the true risk of some drivers. When a driver has an at-fault accident which the adjuster codes as not at-fault, the driver is not moved to driving record class 0 or 5* the next period, but instead moves to a higher driving record class (or stays in class 5* or 6, depending on the current driving record class).

The overall impact of misclassification should be that drivers appear ‘better’ in the first party recovery scheme. Due to improper assignment of fault, driving records of individuals in first party recovery regime should be ‘better’ than driving records in a third party recovery regime. Kelly, Kleffner and Tomlinson (2007) compared the distribution of driving record classes in the tort regime (Alberta) and the first-party recovery regime (Ontario) for both insurer B and for all insurers in the province (their results are shown in Table 3). They find that Ontario had statistically higher distribution of driving records than Alberta and therefore they could not reject the hypothesis that for both this insurer and the industry, driving records were better in Ontario than in Alberta.¹

From the insurance company's perspective, there are two implications of this incorrect assignment of fault. First, when higher risk drivers are rated as relatively better drivers, their insurance premiums do not reflect their risk. Thus their moral hazard increases as these drivers do not pay the expected cost of their driving. Second, insurance premiums for the entire portfolio of drivers must increase to cover the pooling effect caused by the misclassification.

IV. Theoretical Model

Following from the previous section and the empirical results given in Kelly, Kleffner and Tomlinson (2007), it appears reasonable to conclude that company adjusters may have less of an incentive to find an insured at-fault since the insurer would pay the damage in either case. This may be expeditious from the point of view of minimizing settlement costs, but it creates a distortion in the experience rated component of the automobile insurance premium. To assess the importance of this distortion, we build a stochastic model to look at the impact of incorrect assignment of fault.

¹ However, it could be that drivers are simply better in Ontario than in Alberta. Historically, Alberta has had a higher automobile collision rate and fatality rate than Ontario and more accidents per insured vehicle than Ontario. This could be the reason why driving records are better in Ontario. Hence, we cannot use empirical data to look at the impact of (suspected) incorrect fault assignment.
fault assignment on driving record and the premiums charged by insurers. We focus on the driving record class component of automobile insurance. The stochastic model has seven states, representing zero, one, two, up to six (and greater) years of claims-free driving. Drivers in the system are assigned a constant annual at-fault accident rate intensity and move between the states of the model according to their claims history. Transition probabilities between the states arise from the movement of drivers according to their claims histories and insurer's underwriting policies.

We begin first by constructing a stochastic model for a single driver. We then expand this model to account for a portfolio of independent drivers. For the portfolio model, using the at-fault accident frequencies generated, and after assigning an expected severity per claim, we can derive the expected losses for the entire portfolio of drivers and for each cohort of drivers in each of the different driving record classes. We assume that all drivers carry collision coverage, and therefore the insurer pays the resulting claims. This allows us to calculate the actuarially fair base premium that must be charged to the driver, and the correct rate differentials for the driving record class variable. This base model provides us with the first-best outcome (that is absent of moral hazard) given the design of the driver rating classes.

**Single Driver Model**

For the single driver model, we focus on the movement between the driving record classes and the impact of moral hazard on the probability that a single driver is in any driving record class. We assume that the at-fault accident rate is independent of the adjuster incentives and introduce moral hazard in the following manner. There exists a non-zero probability, $\mu$, that once an at-fault accident is reported, the claims adjuster records the accident as not-at-fault. In this case, we assume the insurer would still pay the claim (via first party recovery coverage as opposed to collision coverage), but the movement of the insured between states is different than if the claim is classified as at-fault. Based upon steady state equilibrium, we can calculate the probability that the insured is in a given driving record class for both the base model and the model with moral hazard.

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5 To simplify our discussion we assume that the deductible on collision coverage is zero and so the same amount is paid under first party recovery whether or not the insured is at-fault.
We build a theoretical model based on the experience rating mechanism previously discussed and solve for the steady-state equilibrium of the driver. The assumptions are given below:

- Insured classes: 0, 1, 2, 3, 4, 5, 5*, and 6;
- If insured has \( j \) \((j=0,1,2,3,4,5)\) years free of at-fault accidents, the insured is classified as being in state \( j \);
- If insured in class \( j \) \((j=0,1,2,3,4,5)\) has an at-fault accident, she goes to class 0 in the next period;
- If insured has 6 or more years of at-fault accidents, she is classified as being in class 6;
- When an insured in class 6 has an at-fault accident, she goes to class 5* in the next period and remains there for 5 years if she has no at-fault accidents in that period. At the end of this period she goes back to class 6;
- When an insured in class 5* has an at-fault accident she goes to class 0;
- The probability of an at-fault accident, \( \lambda \), is constant over time;
- Probability that an at-fault accident is classified as not at-fault by insurance company, \( \mu \), is constant over time and independent of \( \lambda \);
- Let \( p \) be the probability that an insured moves to state 0 (from states 0, 1, 2, 3, 4, 5 and 5*) or from state 6 to state 5*. This will occur if insured has an at-fault claim that is classified as at-fault. Therefore \( p = \lambda (1 - \mu) \).
- \( 1 - p \) is the probability that no at-fault accident is recorded;
  - Insureds in state \( j \) move to state \( j + 1 \) (for \( j = 0,1,2,3,4,5 \))
  - Insureds in state 6 stay in state 6.
  - Insureds in state 5* either stay in 5* or move to state 6.

We solve analytically for the steady state equilibrium for a driver with accident rate \( \lambda \). Let \( X = \{ X(n) : n = 0,1,2,... \} \) denote the class of the insured in year \( n \). Then the state space of \( X \), \( E \), is given by \( E = \{ 0, 1, 2, 3, 4, 5, 6, 5*0, 5*1, 5*2, 5*3, 5*4 \} \). The original model is not a Markov chain because of the memory associated with class 5*. For class 5*, we need
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information about how many years a person has been in that class. Class 5* is judiciously separated into 5 distinct states to preserve the memoryless property. Class 5* j denotes the fact that the person has already spent j years in class 5*. Using this adjustment, we can build a completely Markovian system in the following manner. Each time period is 1 year. Let the states of the system be 0, 1, 2, 3, 4, 5, 6, 5*0, 5*1, 5*2, 5*3, 5*4. We now have a discrete time Markov chain describing the transitions of a person between all possible classes.

The one step transition probability matrix, $P$, of the discrete time Markov chain is given by the following matrix.

$$
P = \begin{bmatrix}
0 & 1 & 2 & 3 & 4 & 5 & 6 & 5*0 & 5*1 & 5*2 & 5*3 & 5*4 \\
0 & (p & 1-p & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0) \\
1 & p & 0 & 1-p & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
2 & p & 0 & 0 & 1-p & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
3 & p & 0 & 0 & 0 & 1-p & 0 & 0 & 0 & 0 & 0 & 0 \\
4 & p & 0 & 0 & 0 & 0 & 1-p & 0 & 0 & 0 & 0 & 0 \\
5 & p & 0 & 0 & 0 & 0 & 0 & 1-p & 0 & 0 & 0 & 0 \\
6 & 0 & 0 & 0 & 0 & 0 & 1-p & p & 0 & 0 & 0 & 0 \\
5*0 & p & 0 & 0 & 0 & 0 & 0 & 0 & 1-p & 0 & 0 & 0 \\
5*1 & p & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1-p & 0 & 0 \\
5*2 & p & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1-p & 0 \\
5*3 & p & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1-p \\
5*4 & p & 0 & 0 & 0 & 0 & 0 & 1-p & 0 & 0 & 0 & 0 
\end{bmatrix}
$$

From inspecting the matrix $P$, we note that the process is aperiodic, positive recurrent and has a finite number of states. As such a unique stationary distribution, $\{\pi(j), j \in E\}$, exists for $X = \{X(n): n = 0,1,2,\ldots\}$. It is obtained by solving the system of equations $\pi(j) = \sum_E \pi(i)P(i,j)$ and $\sum_E \pi(j) = 1$ where $\pi(j)$ denotes the steady state probability that an insured is in state $j: [j = 0, 1, 2, 3, 4, 5, 5*, 6]$. Solving the above system of equations, we obtain
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\[
\pi(0) = \frac{p \left[ 1 - (1 - p)^5 \right]}{1 - p(1 - p)^5}
\]

\[
\pi(j) = (1 - p)^j \pi(0); \quad j = 1, 2, 3, 4, 5
\]

\[
\pi(5^*) = \left[ 1 + (1 - p) + (1 - p)^2 + (1 - p)^3 + (1 - p)^4 \right] p \pi(6) - \left[ 1 - (1 - p)^5 \right] \pi(6)
\]

\[
\pi(6) = \frac{(1 - p)^6}{1 - p(1 - p)^5}
\]

We can easily interpret these probabilities, starting with \(\pi(0).\) \((1 - p)^5\) is the probability that a person has had no at-fault accidents in 5 consecutive years. Hence \(1 - (1 - p)^5\) is the probability that a person has had an at-fault accident at least once in the last 5 consecutive years. Therefore, \(p \left[ 1 - (1 - p)^5 \right]\) which is the numerator of \(\pi(0),\) is the probability that a person has had an at-fault accident in the past year and at-least one at-fault accident in the preceding 5 years. The denominator is the normalizing constant. \(\pi(j)\) is \((1 - p)^j \pi(0)\) - the probability that an insured had been in class 0 and has had \(j\) years of accident free driving. This holds true only for classes 1 to 5. For a person to be in class 6, the person must have had no at-fault accidents in the past 6 years and this probability is given by \((1 - p)^6.\) For an insured to be in class 5*, the person should have been in class 6 and had one, but only one, at-fault accident in the previous 5 years. Therefore \(\left[ 1 + (1 - p) + (1 - p)^2 + (1 - p)^3 + (1 - p)^4 \right] p \pi(6)\) is the probability of having been in class 6, and then subsequently having an at fault accident in the last 5 years. Mathematically this term reduces to \(1 - (1 - p)^5\) \(\pi(6).\)

**Portfolio of Drivers Model**

We expand the above model to consider a portfolio of independent drivers. We assume that this portfolio is closed. We do not allow entry or exit from the portfolio, but instead are interested in a steady-state equilibrium for a constant cohort of drivers. The assumptions required to extend the single driver model are given below

- Each driver has a probability of an at-fault accident, \(\lambda \sim \text{Gamma}(\alpha, \beta),\) which is constant over time and independent of other drivers. We randomly choose \(\lambda_k\) for the \(k^{th}\) driver to develop a portfolio for the insurance company;
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- The probability that an at-fault accident is classified as not at-fault by insurance company, $\mu$, is constant over time and independent of each driver's actual experience.

Because of the independence of drivers, the transition matrix and accident probabilities derived in the single driver model hold for each individual driver in the portfolio.

For each of the 10,000 drivers in our portfolio, we randomly chose a $\lambda_k$ from the underlying risk distribution. We then derive the steady state probabilities for each driver, and sum across all outcomes to construct a portfolio of 10,000 drivers. The insurance company observes an at-fault accident rate for drivers in driving record class $j$, $\bar{p}_j$, which is given by the formula given below.

$$\bar{p}_j = \frac{\sum_{k=1}^{10,000} (1 - \mu)\lambda_{jk}\pi_{jk}}{\sum_{k=1}^{10,000} \pi_{jk}}$$

The portfolio of drivers model allows us to examine the impact of adjuster misclassification on the premiums charged by insurers. After assigning a constant severity per claim, we can simulate the expected losses for the entire portfolio of drivers and for drivers in each of the driving record classes. This allows us to calculate the actuarially fair base premium that must be charged to all drivers, and the correct rate differentials for the driver rate class variable. This base model, that is absent of moral hazard, provides us with the first-best outcome given the design of the driver rating classes.

Based upon the constant claim severity, we can then recalculate the observed at-fault accident frequency, the actuarially fair base premium and the changes in rate differentials caused by moral hazard.

V. Model Results

Using the single driver model developed in Section IV, we first simulate the probability that a driver is in state $j$, with and without adjuster misclassification. To calibrate the model, we assume that the true probability of an at-fault accident is 3.5 percent (that is $\lambda=0.035$). The Insurance Bureau of Canada (2004) records this as the average claims rate for third party liability claims in urban Alberta for 2000 to 2003. From Table 2, we assume that the level of adjuster misclassification in a first party recovery model is $\mu = 0.30$. This results in the observed
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probability of an at-fault accident in the first party recovery system of \( p = \lambda (1 - \mu) = 0.0245 \). In the absence of misclassification, the insurer ‘sees’ the true accident probability of 3.5 percent.

Table 4 shows the probability that a single driver will be in a given driving record class without \( (\mu = 0) \) and with \( (\mu = 0.30) \) adjuster misclassification.

As expected, with adjuster misclassification, drivers look better to the insurance company than they really are. The probability of an individual belonging in class 6 goes up by about 5 percent. Correspondingly, the probability that the insured is in a lower driving class has fallen by 25 percent to 50 percent.

We next focus our attention on the case of multiple drivers. We construct the model assuming that the insurance company underwrites 10,000 independent drivers. The true at-fault accident frequency for each driver will be unobservable to the insurer. We assume that the probability of a driver having an at-fault accident has a gamma distribution with a mean equal to 0.035. The two parameters of the gamma distribution are chosen to roughly calibrate to the claims frequency by driving record in Alberta (Insurance Bureau of Canada, 2004). Figure 1 displays the gamma distribution used. As previously stated, we assume that \( \mu \) is constant across all drivers and independent of \( \lambda_k \), the risk level of the driver.

We once again present the results for two cases – one with adjuster misclassification equal to \( \mu = 0.30 \) and the other where there is no misclassification \( (\mu = 0) \). Table 5 is the portfolio of drivers version of the single driver distribution given in Table 4.

From the above table we note that drivers are more likely to be classified as good (driving record 6) in the presence of adjuster misclassification – 88.3 percent of drivers as compared to 86.6 percent of drivers. In addition, there is a smaller proportion of drivers in classes 0 to 5 and 5* under the assumption of adjuster misclassification. Similar to Table 4, the probability that the insured is in a lower driving class has fallen by 25 percent to 50 percent in the presence of incorrect assignment of fault.

This has some significant implications that we explore further: if fault is not assigned correctly then less heterogeneity exists between each driving record class. Driving record loses some of its predictive power in predicting accident frequencies. We illustrate this in the next part of the paper by first determining the at-fault accident rate for drivers belonging to each class.
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with and without adjuster misclassification. Table 6 gives the at-fault accident frequencies that will be observed by the insurer under the assumption of incorrect and correct assignment of fault.

The column with $\mu = 0$ indicates the “true” accident frequency for each class of driver. As anticipated, the best drivers (driving record 6) have an observed accident frequency less than the average accident frequency of 3.5 percent, and all other driving record classes have higher accident frequencies. Also, as anticipated, the accident frequencies increase for the poorer driving records.

The accident frequencies for the insurer with adjuster misclassification are lower in all driving records because 30 percent of the time ($\mu = 0.30$) an at-fault accident is settled as a not-at-fault accident and therefore does not affect driving record. For driving record 6, the observed accident frequency with misclassification is 71.5 percent of the observed accident frequency without misclassification. For driving record 0, the observed frequency with misclassification is 70.4 percent of the observed accident frequency without misclassification.

Insurance companies use differences in observed accident frequencies to develop rate class differentials. Following practice, we use driving record class 6 as the base class (as this has the greatest proportion of drivers). We obtain the rate differentials for the classes by dividing the accident frequency of each class by the accident frequency of class 6. Table 7 gives the rate class differentials for the models with and without adjuster misclassification.

For both regimes, driving record 6 has a differential of 1.000 by design. What is of interest is the difference between driving record 6 and the other driving records under misclassification as opposed to correct assignment of fault. As predicted, in the presence of adjuster misclassification, there is less heterogeneity between driving records 6 and 0. The implied differential for driving record 0 with adjuster misclassification is 1.7419 compared to 1.7658 in the model without adjuster misclassification. There is more similarity between driving record classes 5 and 5* and class 6 with adjuster misclassification than if fault were correctly assigned.

However insureds are not interested as much in rate class differentials as in the absolute premiums they pay. To develop actuarially fair premiums, we assume that the cost of an accident is $1000. In a first party recovery regime, fault assignment will not impact total claims.
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paid; claims incorrectly coded as not-at-fault will be paid under DC-PD (or similar coverage) and at-fault claims will be paid under collision coverage. In the third party recovery regime, all of the recorded accidents are properly coded as at-fault, and will be paid by the insurer under collision coverage. Thus the total dollar paid by insurers in each model – with and without adjuster misclassification – are the same. Given an average accident frequency of $\lambda = 3.5\%$, a severity of $\$1000$ per accident and a portfolio of 10,000 insureds, the insurance company needs to collect $\$350,000$ in actuarially fair premiums to pay claims. Let $r_0$ be the premium or rate that must be charged to a driving record 6 driver. Therefore $r_0$ solves the following equation

$$10,000 \times r_0 \times \sum_j \text{diff}_j \times \text{prop}_j = \$350,000,$$

where $\text{diff}_j$ is the differential for driving record class $j$ as given in Table 7, and $\text{prop}_j$ is the proportion of drivers in driving record class $j$ as given in Table 5. The premium then for an individual in driving record $j$ is $R_j = r_0 \times \text{diff}_j$. Solving for premiums under both adjuster behaviours gives rise to the actuarially fair premiums in Table 8.

The most important implication is this: under misclassification of fault, drivers pay more for insurance in most driving record classes. The reason for this is two-fold. First, there are substantially fewer drivers in the poorer classes in the presence of adjuster moral hazard. Second, the difference in differentials between the driving record class 0 and other drivers under misclassification of fault is smaller than if fault were assigned correctly. Thus the contribution of premium dollars from the poorer classes is much less than if adjusters correctly assigned risk.

VI. Discussion and Conclusion

This paper begins with the examination of the impact of first part recovery schemes on adjusters’ incentives in assigning fault. We find evidence that for the marketplace as a whole and for two large insurers, the distribution of driving records for insureds differ across two provinces: there is a greater proportion of low risk drivers, as measured by past driving record, in Ontario (a first party recovery scheme) than in Alberta (a third party recovery scheme). Furthermore, for the two insurers, fewer drivers are found to be at fault in property damage accidents in Ontario than Alberta.
A more exact test of the presence of adjuster moral hazard would be to examine on an individual claims basis whether the total assignment of fault is, on average, less than 100 percent in the first party recovery mechanism in the province of Ontario. Although this data is not readily available, future work should attempt to use such data in order to conduct a stronger test of adjuster moral hazard.

To examine the impact of incorrect fault assignment upon driving record class, we develop a theoretical model of experience rating. The results of the theoretical model show that if fault is not assigned correctly then there will be less heterogeneity between each driving record class and more drivers rated as ‘low risk’ drivers than should be.

Since fault assignment will not impact total claims paid in a first party recovery jurisdiction the same amount of premium dollars must be collected regardless of fault assignment. We had anticipated, in the first party recovery regime, that low risk drivers would pay higher premiums than they would in the absence of misclassification and high risk drivers would pay lower premiums. However, our simulation suggests that drivers in almost all risk classes pay a higher premium because there are fewer drivers in the poorer driving record classes and smaller rate differentials between classes.

This result has interesting implications for insurers from a competitive standpoint. If, in practice, an insurer could observe the change in adjuster behaviour, then it could gain a competitive advantage by designing adjuster contracts so that the adjuster did not misclassify. Although settlement costs would likely increase, the experience rating component would once again classify insureds correctly. The result would be a reduction in premiums charged to low risk drivers, and perhaps to drivers in all classes. Currently insurers’ tendency to isolate claim settlement practices from pricing makes it less likely that they will identify this cost.

First party recovery schemes for property damage have been shown to provide benefits to insurers and insureds through lower expenses and faster time to settlement. However we find that there are also costs related to adjuster moral hazard. If insurers take a silo approach to claim settlement and pricing, they will incur the costs of driver misclassification which we demonstrate to be significant.

References

The Impact of Adjuster Moral Hazard on Driving Records


Table 1 – Driving Record Rate Differentials for 3rd Party Liability for Insurer A

<table>
<thead>
<tr>
<th>Driving Record</th>
<th>Ontario (1st party recovery)</th>
<th>Alberta (3rd party recovery)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>5* &amp; 5</td>
<td>1.050</td>
<td>1.100</td>
</tr>
<tr>
<td>4</td>
<td>1.100</td>
<td>1.225</td>
</tr>
<tr>
<td>3</td>
<td>1.150</td>
<td>1.300</td>
</tr>
<tr>
<td>2</td>
<td>1.225</td>
<td>1.350</td>
</tr>
<tr>
<td>1</td>
<td>1.300</td>
<td>1.400</td>
</tr>
<tr>
<td>0</td>
<td>1.375</td>
<td>1.450</td>
</tr>
</tbody>
</table>

Table 2 - Moral Hazard and Fault Assignment: Percentage of At-Fault PD Claims In First Party & Third Party Recovery Regimes For Insurer B

<table>
<thead>
<tr>
<th>Year</th>
<th>Ontario</th>
<th>Alberta</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>36.50%</td>
<td>56.50%</td>
</tr>
<tr>
<td>1999</td>
<td>36.10%</td>
<td>56.60%</td>
</tr>
<tr>
<td>2000</td>
<td>38.30%</td>
<td>58.90%</td>
</tr>
<tr>
<td>2001</td>
<td>37.50%</td>
<td>54.50%</td>
</tr>
<tr>
<td>2002</td>
<td>37.90%</td>
<td>52.60%</td>
</tr>
</tbody>
</table>

Table 3 - Moral Hazard and Fault Assignment: Evidence on the Impact on Driving Record

<table>
<thead>
<tr>
<th>Driving record class</th>
<th>Distribution of DR for Insurer B</th>
<th>Distribution of DR for industry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ON</td>
<td>AB</td>
</tr>
<tr>
<td>6</td>
<td>76.9%</td>
<td>71.7%</td>
</tr>
<tr>
<td>5 &amp; 5*</td>
<td>5.6%</td>
<td>10.3%</td>
</tr>
<tr>
<td>4</td>
<td>2.1%</td>
<td>2.7%</td>
</tr>
<tr>
<td>3^</td>
<td>9.9%</td>
<td>11.7%</td>
</tr>
<tr>
<td>2</td>
<td>2.4%</td>
<td>1.5%</td>
</tr>
<tr>
<td>1</td>
<td>2.0%</td>
<td>1.4%</td>
</tr>
<tr>
<td>0</td>
<td>1.2%</td>
<td>0.8%</td>
</tr>
</tbody>
</table>


^ The bulge for driving record 3 arises because the table details driving records for all driver types (for example, private passenger, fleet, farm). For some specialty coverages, the highest driving record class is 3.
Table 4 – Impact of Moral Hazard in the Single Driver Model

<table>
<thead>
<tr>
<th>Driving Record</th>
<th>$\mu = 0.30$</th>
<th>$\mu = 0$</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>88.08%</td>
<td>83.19%</td>
</tr>
<tr>
<td>5 &amp; 5*</td>
<td>10.27%</td>
<td>14.06%</td>
</tr>
<tr>
<td>4</td>
<td>0.26%</td>
<td>0.51%</td>
</tr>
<tr>
<td>3</td>
<td>0.27%</td>
<td>0.53%</td>
</tr>
<tr>
<td>2</td>
<td>0.28%</td>
<td>0.55%</td>
</tr>
<tr>
<td>1</td>
<td>0.28%</td>
<td>0.57%</td>
</tr>
<tr>
<td>0</td>
<td>0.29%</td>
<td>0.59%</td>
</tr>
</tbody>
</table>

Table 5 – Impact of Moral Hazard in the Portfolio of Drivers Model

<table>
<thead>
<tr>
<th>Driving Record</th>
<th>$\mu = 0.30$</th>
<th>$\mu = 0$</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>88.3%</td>
<td>83.6%</td>
</tr>
<tr>
<td>5 &amp; 5*</td>
<td>9.96%</td>
<td>13.05%</td>
</tr>
<tr>
<td>4</td>
<td>0.32%</td>
<td>0.6%</td>
</tr>
<tr>
<td>3</td>
<td>0.33%</td>
<td>0.63%</td>
</tr>
<tr>
<td>2</td>
<td>0.35%</td>
<td>0.67%</td>
</tr>
<tr>
<td>1</td>
<td>0.36%</td>
<td>0.71%</td>
</tr>
<tr>
<td>0</td>
<td>0.38%</td>
<td>0.75%</td>
</tr>
</tbody>
</table>
The Impact of Adjuster Moral Hazard on Driving Records

Table 6 – Average Observed Accident Frequency in Portfolio of Drivers Model

<table>
<thead>
<tr>
<th>Driving Record</th>
<th>$\mu = 0.30$</th>
<th>$\mu = 0$</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>2.33%</td>
<td>3.26%</td>
</tr>
<tr>
<td>5 &amp; 5*</td>
<td>3.09%</td>
<td>4.31%</td>
</tr>
<tr>
<td>4</td>
<td>3.91%</td>
<td>5.47%</td>
</tr>
<tr>
<td>3</td>
<td>3.95%</td>
<td>5.54%</td>
</tr>
<tr>
<td>2</td>
<td>3.96%</td>
<td>5.61%</td>
</tr>
<tr>
<td>1</td>
<td>4.02%</td>
<td>5.68%</td>
</tr>
<tr>
<td>0</td>
<td>4.05%</td>
<td>5.75%</td>
</tr>
</tbody>
</table>

Table 7 – Implied Rate Differentials for Portfolio of Drivers Model

<table>
<thead>
<tr>
<th>Driving Record</th>
<th>$\mu = 0.30$</th>
<th>$\mu = 0$</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>1.0000</td>
<td>1.0000</td>
</tr>
<tr>
<td>5 &amp; 5*</td>
<td>1.3291</td>
<td>1.3242</td>
</tr>
<tr>
<td>4</td>
<td>1.6821</td>
<td>1.6797</td>
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<tr>
<td>3</td>
<td>1.6966</td>
<td>1.7003</td>
</tr>
<tr>
<td>2</td>
<td>1.7114</td>
<td>1.7215</td>
</tr>
<tr>
<td>1</td>
<td>1.7265</td>
<td>1.7433</td>
</tr>
<tr>
<td>0</td>
<td>1.7419</td>
<td>1.7658</td>
</tr>
</tbody>
</table>
Table 8 - Implied Rating Structure for Portfolio of Drivers Model for PD Claims

<table>
<thead>
<tr>
<th>Driving Record</th>
<th>$\mu = 0.30$</th>
<th>$\mu = 0$</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>$33.49$</td>
<td>$32.81$</td>
</tr>
<tr>
<td>5 &amp; 5*</td>
<td>$44.51$</td>
<td>$43.45$</td>
</tr>
<tr>
<td>4</td>
<td>$56.33$</td>
<td>$55.12$</td>
</tr>
<tr>
<td>3</td>
<td>$56.81$</td>
<td>$57.89$</td>
</tr>
<tr>
<td>2</td>
<td>$57.31$</td>
<td>$56.49$</td>
</tr>
<tr>
<td>1</td>
<td>$57.81$</td>
<td>$57.19$</td>
</tr>
<tr>
<td>0</td>
<td>$58.33$</td>
<td>$57.94$</td>
</tr>
</tbody>
</table>

Figure 1 – Gamma Distribution of Accident Frequencies for Portfolio of Drivers Model
The Impact of Adjuster Moral Hazard on Driving Records