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"Influence of the claimant's behavioural features on motor compensation outcomes"

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Abstract

The decision to settle a motor insurance claim by either negotiation or trial is analysed. This decision may depend on how risk and confrontation adverse or pessimistic the claimant is. The extent to which these behavioural features of the claimant might influence the final compensation amount are examined. An empirical analysis, fitting a switching regression model to a Spanish database, is conducted in order to analyze whether the choice of the conflict resolution procedure is endogenous to the compensation outcomes. The results show that compensations awarded by courts are always higher, although 95% of cases are settled by negotiation. We show that this is because claimants are adverse to risk and confrontation, and are pessimistic about their chances at trial. By contrast, insurers are risk /confrontation neutral and more objective in relation to the expected trial compensation. During the negotiation insurers accept to pay the subjective compensation values of claimants, since these values are lower than their estimates of compensations at trial.

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***Keywords*:** Risk aversion, Negotiation, Trial, Switching regression, Confrontation preference.

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1. Introduction

Under fault-based systems injured victims involved in a motor collision are entitled to claim compensation for damages from the at-fault driver. When the driver is insured, and in the European Union motor liability insurance is compulsory, victims are compensated by insurance companies. The amount of financial compensation depends on numerous factors, such as the extent of the victim's bodily injury, the economic losses sustained as a consequence of the accident, or whether the responsibility for the collision is shared with the insured driver. All these factors are derived from the accident, although the amount of compensation may also be influenced by external aspects such as the disputing skills of litigants or the resolution procedure followed, i.e. negotiation or trial.

A widely accepted belief is that compensations awarded by trial are greater than those settled by negotiation. However, if this is the case why do victims prefer a negotiation procedure when claiming compensation for damages caused by an automobile accident? In Spain most motor bodily injury claims are settled by negotiation, with fewer than five per cent of cases going to court. Similar percentages are observed in other countries like the UK or the USA (Derrig and Rempala, 2006; Lewis, 2006). Given this apparent paradox we decided to conduct an empirical study, using a Spanish database, in order to investigate how the risk/confrontation behaviour of claimants might influence both the choice of conflict resolution procedure and the compensation outcomes achieved by motor injury victims.

The selection of resolution mechanism for legal disputes has been broadly analysed in the economic and law literature (see, among others, Cooter and Rubinfeld, 1989; Daughety, 2000; Sieg, 2000; Shavell, 2004). In the next section we will summarize the work of Cooter and Rubinfeld (1989), who define the litigation process as a bargaining model in which the cooperative and non-cooperative solutions correspond, respectively, to out-of-court and in-court settlements. In order to find a formal solution within the bargaining model, numerous studies assume that both parties are risk-neutral (among others, Crocker and Tennyson, 2002; Nalebuff, 1987; P'ng, 1983). However, it remains to be established whether the risk-neutral assumption is realistic, and how the game theory model might be affected when this assumption is relaxed.
To this end we investigate whether there are differences in compensation outcomes in Spain depending on the conflict resolution procedure followed, and in the event that such differences are observed we aim to identify their causes. Three alternative hypotheses are investigated: (i) differences in settlements arise because the two resolution mechanisms deal with claims with different levels of severity, with seriously injured victims tending towards judicial resolutions; (ii)

differences are attributable to the resolution mechanism itself, with one mechanism being more generous than the other; and (iii) differences are explained by the behaviour of claimants, with those victims who are more averse to risk and confrontation being compensated with lower amounts.

Let us briefly consider each of these hypotheses in more detail. Compensation differences between out-of-court and in-court settlements may arise because claims dealt with by the courts are more severe than those settled by negotiation. This hypothesis is consistent with empirical evidence showing that the higher legal costs associated with the judicial procedure act as a barrier which makes it unprofitable for litigants with low claims to pursue judicial resolutions (Browne and Puelz, 1999; Hughes and Snyder, 1995). Furthermore, claims involving seriously injured victims are normally more complex cases, and the literature suggests that greater complexity leads to an increased likelihood of litigation (Browne and Schmit, 2008; Shavell, 2004; Santolino, 2010).

Another source of compensation differences could be the mechanism itself, such that one of the two mechanisms systematically awards greater compensation to claims and claimants with the same characteristics. Some studies point out that court settlements are increasingly large, and have grown well beyond inflation (de Castries, 2005; Wright, 1987). Actuaries have called this effect 'judicial inflation', and the Society of Actuaries defines it as the upward tendency of courts in interpreting the scope of liability (SOA, 2008). The National Health Service Litigation Authority estimates that judicial inflation in clinical negligence claims is now ten per cent per annum in the United Kingdom (NHSLA, 2010). One explanation for this is that injury litigation is seen by the courts as an unbalanced dispute between bodily injured victims and faceless insurers with an unlimited budget, a David versus Goliath scenario.

Finally, and related to the main purpose of this paper, it may be that the attitude of claimants has an influence on the size of payouts. An aversion to risk and confrontation can affect a claimant's willingness to reach a friendly settlement, with risk-adverse victims preferring negotiated (and more certain) settlements over the uncertainty of a court settlement. Similarly, the psychological costs of confrontation, as well as the time required by negotiation, can lead victims with greater conflict aversion to opt for friendly agreements reached in shorter negotiations. Preference for negotiated settlements is expected to influence negatively on the size of compensation. Indeed, previous studies suggest that uncertainty about the amount of financial compensation which might be awarded at trial results in risk-adverse individuals accepting lower negotiated settlements in

exchange for certainty over payment (Doerpinghaus et al., 2008; Stuhlmacher and Walters, 1999).

In order to investigate these three hypotheses the present paper applies a switching regression model to a Spanish database. A switching model is structured on two regression equations, which describe the compensation awarded under each one of the two conflict resolution procedures, and a criterion function that determines which conflict resolution procedure is followed. This structure allows the comparison of out-of-court and judicial settlements, taking into account the influence of observed and unobserved characteristics of motor claims on the settlement level.

Regarding observed characteristics, information related to the severity of injuries is included as regressors in the model equations and the selection function. Hence, factors do not need to have the same effect on the expected financial compensation of both resolution procedures. Rather, we can analyse which factors determine the expected financial compensation awarded to victims when the conflict resolution is amicable, and which have explanatory power when the settlement is reached by judicial decision.

The regression model with endogenous switching allows for dependence between the choice of settlement mechanism and the compensation the individual receives once this mechanism is fixed. We can then analyse whether randomness of the settlement procedure for motor victims may be assumed. Non-randomness is due to self-selection of individuals, and would occur because individuals who decide to reach an agreement with the insurer are systematically different from those who choose to go to court. Consequently, unobserved factors that influence the decision regarding the conflict resolution procedure also affect the financial compensation awarded for injuries.

It is important to note that model endogeneity may be generated by two different types of unobserved factors. The first concerns claim information that was not collected but may be observed a priori without a large cost. An example in our application would be the amount of compensation claimed by the plaintiff for economic losses. The second factor involves claim information which is almost never perfectly observed, such as the risk attitude and confrontation behaviour of claimants. The empirical results are interpreted by taking into account both these sources of endogeneity.

As regards the results of the switching regression model, a series of indicators are computed here to analyse whether out-of-court settlements show different levels of compensation to those awarded by judicial decision. These indicators are constructed as the difference between financial compensations estimated under the two different states, negotiation and trial. One resolution mechanism will be more generous than the other if the expected value of settlements reached via this mechanism is always higher, regardless of the observed and unobserved characteristics of claims. Additionally, conditional indicators are computed in order to isolate the effect of unobserved characteristics on the expected financial compensation outcomes. These indicators are used to discuss how the aversion to risk and confrontation influences on the financial compensation payouts.

The structure of the paper is as follows. The next section describes the theoretical bargaining model, while section 3 outlines the switching regression model and the construction of the performance indicators for the conflict resolution mechanisms. Section 4 presents the main characteristics of the Spanish compensation system, along with a description of the Spanish database used in the empirical application. This is followed in section 5 by a discussion and interpretation of the results. Concluding remarks are summarized in section 6.

2. The game theory model

The game theory model defined by Cooter and Rubinfeld (1989) is followed. In this basic model the cooperative and non-cooperative solutions correspond, respectively, to an out-of-court settlement and an in-court settlement. Both parties are assumed to have expectations regarding trial outcome. The claimant's subjective expected gain in bringing the suit to trial is T_c-c_{tc}, where T_c is the subjective value to the claimant of the possible compensation awarded by court and c_{tc} is the cost to the claimant if the case is settled by court. Similarly, the subjective expected loss of the defendant (in this case, the insurer) is T_i+c_{ti}, where T_i and c_{ti} are the subjective value and cost to the insurer if the case is tried in court.

The magnitude of T_c depends on the claimant's estimate of the compensation that will be awarded at trial if he/she wins, A_c, as well as on his/her subjective view regarding the probability of victory at trial, p_c; hence, $T_c = f(p_c, A_c)$. Similarly, T_i is defined as a function of the insurer's expectations about the compensation which will be awarded to the claimant at trial and his/her subjective view regarding the probability of the claimant's victory at trial, $T_i = f(p_i, A_i)$. For purposes of simplification, both court compensation expectations and subjective victory probabilities are characterized as scalars. However, they may be defined as vectors, to allow partial victories, or as functions of other variables, for instance, based on court costs in order to measure parties' efforts to win.

For risk-neutral agents the subjective value of the court outcome is equal to the expected court compensation multiplied by the subjective probability of claimant victory, i.e. $T_c = p_c \times A_c$ and $T_i = p_i \times A_i$. However, risk aversion generates the following inequalities among agents: $T_c < p_c \times A_c$ and $T_i > p_i \times A_i$. The same effect can be derived for agent aversion to confrontation. Pessimism also influences an individual's expectations regarding the trial outcome. When parties are relatively pessimistic in this regard the claimant expects to win less than the insurer expects to pay, which is expressed as $p_c \times A_c < p_i \times A_i$. The opposite holds when parties are optimistic.

The subjective values of the claimant and the insurer when the claim is settled by negotiation are N_c and N_i, while the associated transaction costs are c_{nc} and c_{ni}, respectively. In game theory terms, the players' assessment of the value of the game is computed as the difference between their subjective values plus the associated costs. When a friendly compensation agreement is reached between parties their subjective values are equal, and thus the net transfer between them is zero. The cooperative value of the game (CV) is therefore determined by the transaction costs incurred by parties in the negotiation, $CV = -(c_{nc}+c_{ni})$. In the non-cooperative game the net

transfer is not necessarily equal and, therefore, the non-cooperative value is $NCV = (T_c - T_i) - (c_{tc} + c_{ti})$. The difference between the values of these two games determines the surplus of the negotiated resolution:

$$S = CV - NCV = (c_{tc} + c_{ti}) - (c_{nc} + c_{ni}) + (T_i - T_c).$$

We consider in this model that parties show non-strategic behaviour. The sole interest of both parties is to know the amount the defendant will pay to the claimant. Disputes are then settled out of court if S takes a positive value, while a negative value means that a judicial settlement is preferred. Both risk/confrontation aversion and pessimism of parties regarding court outcomes can widen the gap between the parties' subjective values of trial outcomes, and it is therefore more likely that a friendly settlement is reached. Under Spanish motor law all injured victims must initiate a legal action in order to be eligible for motor injury compensation no matter what resolution procedure is finally followed. Consequently, differences in the associated costs of resolution mechanisms are not too large. The surplus of the negotiation resolution is then mainly determined by the subjective values of trial outcomes.

Hypothesis related to the behavioural features of parties

We hypothesize that insurers have a systematic disputing behaviour that is based exclusively on their accurate expectation of the compensation payment which might be awarded at trial. It is presumed that courts systematically apply the same criteria to resolve disputes, these court criteria being defined by Priest and Klein (1984) as 'the decision standard'. However, insurer and claimant do not have the same information about possible trial outcomes, and we assume that the insurer has superior information in this regard. Indeed, insurance firms deal with legal disputes as part of their daily routine, and they typically call on experts from different disciplines (lawyers, medical experts, actuaries, etc.) to take part in legal proceedings. We therefore consider that this multidisciplinary team has better knowledge about how the legal system is likely to be interpreted - and applied - by judges. Obviously, knowledge about how a court (or judge) may behave on average does not eliminate uncertainty about the amount of compensation that this court (or judge) will award in a particular case. As regards insurer behaviour, we assume that the insurer seeks to settle the claim at the minimum cost, regardless of the time of payment and the resolution procedure followed. Therefore, the insurer will prefer the resolution procedure associated with the lower expected compensation. This means that the insurer shows neither risk aversion nor confrontation aversion behaviour (Grochulski and Kareken, 2004; Santolino, 2010).

As already implied above, the decision to pursue a judicial resolution or to reach an agreement will mainly depend on the claimant. We consider throughout this paper that the judicial process and the negotiation process are separated. Although this does not have implications for our modelling, in practice the court verdict is observed when the negotiation process fails. The negotiation process consists of a round of bids/demands before an agreement is reached, but if such agreement proves impossible then the claim is resolved by judicial decision (Ayuso and Santolino, 2011). The strategy followed by the risk-neutral insurer in the negotiation process would be to make relatively low initial bids to the victim. If these bids are rejected by the victim, the insurer would then progressively increase the amount of compensation offered in subsequent bids. The number of rounds before accepting the bid will depend on how risk and confrontation adverse or pessimistic the claimant is. The size of the maximum bid that the insurer is willing to pay will be based on his accurate expectation of the compensation payment which might be awarded at trial. In the event that the victim rejects this maximum bid, then the claim is settled by judicial decision. The judicial resolution is then pursued for those claimants with higher risk/confrontation preference and who are more optimistic regarding the compensation outcome at trial.

It is important to note that the analysis relies on a number of simplifying assumptions. We define the claimant as the victim and the insurer as the defendant, both of whom are usually represented by a lawyer. Furthermore, the defendant is the insured driver, even though he or she is covered by the insurance company. We therefore ignore incentive problems between the lawyer and the represented party, and between the insurer and the insured. The former are due to the moral hazard resulting from the superior information which the lawyer has compared to the claimant (Hay, 1996). The latter are especially important when the insurance policy has coverage limits (Sykes, 1994). The rules regarding the cost allocation of fees, where each party bears its own costs or where losers at trial pay the winner's legal fees, also have effects on the litigation decision (Hughes and Snyder, 1995). An excellent review of these and other extensions of the basic model can be found in Shavell (2004).

3. Statistical methodology

Selection models can be used to model compensation payments when the selection of the resolution mechanism by parties is not random. In this section, we introduce an endogenous switching regression model to account for selection correction. The regression model with endogenous switching allows for dependence between the choice of the resolution mechanism and the compensation outcome. In subsequent sections this model will be used to examine how characteristics related to both the victim and the accident may affect decisions regarding the choice between trial and negotiation, as well as the compensation received in both cases.

Based on the general framework described in Maddala (1983) and Lokshin and Sajaia (2004), let us consider the following model which describes the selection of the conflict resolution mechanism and the compensation awarded to the victim under the mechanism followed:

$I_i = 1$ (the *i*-th claim is settled by judicial decision) if $z_i \gamma + u_i > 0$

$I_i = 0$ (the i-th claim is settled by negotiation) if $z_i \gamma + u_i \leq 0$

$y_{1i} = x_{1i}\beta_1 + \varepsilon_{1i}$ if $I_i = 1$

$y_{0i} = x_{0i}\beta_0 + \varepsilon_{0i}$ if $I_i = 0$.

In this model, y_{1i} and y_{0i} are the dependent variables that indicate the compensation to the *i*-th victim under the trial and the negotiation procedures, respectively. γ, β_1 and β_0 are vectors of parameters subject to estimation. zi is a vector of characteristics that influence on the selection of the conflict resolution procedure; x_{1i} and x_{0i} are two vectors of characteristics that affect victims' compensation under each resolution mechanism. To facilitate the interpretation of results, we include the same regressors in both the trial and negotiation equations. The notation may be then simplified as $x_{1i} = x_{0i} = x_i$. Finally, u_i, ε_{1i}, and ε_{0i} are three random error terms that follow a trivariate normal distribution with mean vector zero and the covariance matrix

$$\Sigma = \begin{pmatrix} \sigma_u^2 & \sigma_{1u} & \sigma_{0u} \\ \sigma_{1u} & \sigma_1^2 & - \\ \sigma_{0u} & - & \sigma_0^2 \end{pmatrix}$$

where σ_u^2 is the variance of the error term in the selection equation, and σ_1^2 and σ_0^2 are the variances of the error terms in the continuous equations. σ_{1u} and σ_{0u} are the covariances of u_i

and ε_{1i} and ε_{0i}, respectively. Finally, the covariance of ε_{1i} and ε_{0i} is not defined, as y_{1i} and y_{0i} are never observed simultaneously.

After parameter estimation the following conditional and unconditional expectations can be calculated:

$$E\left(y_{1i}|x_i\right)=x_i\,\beta_1 \tag{1}$$
$$E\left(y_{0i}|x_i\right)=x_i\,\beta_0 \tag{2}$$
$$E\left(y_{1i}|I_i=1,x_i\right)=x_i\,\beta_1+\sigma_1\,\rho_1\,f\left(\gamma Z_i\right)/F\left(\gamma Z_i\right) \tag{3}$$
$$E\left(y_{0i}|I_i=1,x_i\right)=x_i\,\beta_0+\sigma_0\,\rho_0\,f\left(\gamma Z_i\right)/F\left(\gamma Z_i\right) \tag{4}$$
$$E\left(y_{1i}|I_i=0,x_i\right)=x_i\,\beta_1-\sigma_1\,\rho_1\,f\left(\gamma Z_i\right)/\left[1-F\left(\gamma Z_i\right)\right] \tag{5}$$
$$E\left(y_{0i}|I_i=0,x_i\right)=x_i\,\beta_0-\sigma_0\,\rho_0\,f\left(\gamma Z_i\right)/\left[1-F\left(\gamma Z_i\right)\right] \tag{6}$$

where $\rho_1=\sigma_{1u}/\sigma_u\sigma_1$ is the correlation coefficient between u_i and ε_{1i} and $\rho_0=\sigma_{0u}/\sigma_u\sigma_0$ is the correlation coefficient between u_i and ε_{0i}, We assume that $\sigma_u^2=1$. Then, f is the standard normal density distribution function and F is the standard cumulative normal distribution function.

Based on equations (1) to (6), three indicators can be introduced to compare the victims' compensation payment when they decide to go to court with that obtained when they decide to negotiate with the insurance company,

$$\begin{aligned}\alpha_1&=E\left(y_{1i}|x_i\right)-E\left(y_{0i}|x_i\right)\\ \alpha_2&=E\left(y_{1i}|I_i=1,x_i\right)-E\left(y_{0i}|I_i=1,x_i\right)\\ \alpha_3&=E\left(y_{1i}|I_i=0,x_i\right)-E\left(y_{0i}|I_i=0,x_i\right)\end{aligned} \tag{7}$$

where α_1 is equal to the expected compensation of the i-th victim under trial minus his/her expected compensation under negotiation (irrespective of his/her choice of conflict resolution procedure). The mean of α_1 would measure the average profitability of victims when claims are settled by judicial decision. From an insurance company point of view, it would measure its average profitability from negotiating. When the analysis is restricted to the trial sample or the negotiation sample, we therefore obtain α_2 and α_3, respectively.

Two additional indicators are computed to compare the level of compensation from different samples,

$$\begin{aligned}\lambda_1&=E\left(y_{1i}|I_i=1,x_i\right)-E\left(y_{1i}|I_i=0,x_i\right)\\ \lambda_2&=E\left(y_{0i}|I_i=1,x_i\right)-E\left(y_{0i}|I_i=0,x_i\right)\end{aligned} \tag{8}$$

λ_1 compares the expected compensation of the i-th victim in trial given the litigants pursued a judicial resolution with the expected compensation in trial whether litigants went to negotiation. A positive mean of λ_1 indicates that under the judicial procedure, victims who actually went to court tended to receive larger compensation than those who did not. For λ_2 a similar deduction can be obtained for the negotiation case.

Finally, four indicators are constructed to measure the effect of victims' selection correction,

$$\begin{aligned}
\delta_1 &= E\left(y_{1i} \mid I_i = 1, x_i\right) - E\left(y_{1i} \mid x_i\right) \\
\delta_2 &= E\left(y_{0i} \mid I_i = 0, x_i\right) - E\left(y_{0i} \mid x_i\right) \\
\delta_3 &= E\left(y_{1i} \mid I_i = 0, x_i\right) - E\left(y_{1i} \mid x_i\right) \\
\delta_4 &= E\left(y_{0i} \mid I_i = 1, x_i\right) - E\left(y_{0i} \mid x_i\right)
\end{aligned} \qquad (9)$$

where δ_1 compares the compensation of the sample trial victim under the trial choice with the expected compensation of a general victim with the same characteristics and also under the trial choice. A positive mean of δ_1 indicates that under the trial procedure, victims who actually went to court tended to receive greater compensation than did a general victim. The same conclusions can be obtained for δ_2 in the negotiation case. δ_3 compares the compensation of a sample negotiation victim under the trial choice with the expected compensation of a general victim under the trial choice. A positive mean of δ_3 indicates that under the trial procedure, victims who did not go to court tended to receive greater compensation than did a general victim. The same conclusions can be obtained for δ_4 in the negotiation case.

4. Empirical analysis: data

Motor compensations awarded for personal damages in Spain have to be assessed in compliance with a legislative compensation system. In fact, scheduled systems are used in most European countries to guide the assessment of compensation for bodily injuries resulting from traffic collisions. The aim of these systems is to reduce uncertainty over the amount of awards and, consequently, to avoid litigation (Rogers, 2001; Rothley, 2003). The Spanish compensation system is relatively straightforward. A basic compensation is stipulated for non-economic damages, such as pain and suffering, and correction factors are then applied to account for economic damages. Victims are entitled to receive a basic compensation for temporary disability and another for permanent disability. The amount of basic compensation depends on the duration and severity of injuries. Economic correction factors are based on the victim's annual income. Claimants may request either financial compensation for the damages sustained, filing a tort suit, or the additional punishment of the criminal offence committed by the driver, in which case a criminal suit is required. Criminal proceedings are the common procedure. Santolino (2010) showed that fewer than 15% of suits followed a tort procedure.

For the present analysis data were provided by one of the largest insurance companies operating in Spain. The database consists of a random sample of 24,938 non-fatal victims involved in traffic collisions in Spain, of which 23,816 claims were settled by a friendly agreement between the insurer and the claimant and 1,122 were settled by judicial decision. All sample victims were compensated in the year 2007. The mean compensation awarded in claims settled by judicial decision was 18,385.34 Euros, with a standard deviation of 27,657.83 Euros. For negotiated settlements the mean compensation and standard deviation were 10,302.12 Euros and 22,168.91 Euros, respectively. Therefore, negotiated settlements show a greater relative dispersion, with a Pearson variation coefficient of 1.504 and 2.154, respectively.

The information included in the database was recorded by the insurer during the processing of claims in order to track them until settlement. The description of variables is shown in Table 1. Explanatory variables are classified as general factors or factors related to information about injuries. General factors include attributes of the victim, such as gender and age. In this regard, it is worth noting that previous studies have found differences in risk aversion and negotiation preference that affect settlements as a function of age and gender (Doerpinghaus et al., 2008; Stuhlmacher and Walters, 1999; Garbarino et al., 2011).

[INSERT TABLE 1]

The remaining general factors record information related to the type of victim (driver, passenger, and pedestrian or cyclist) and information about the insured driver, such as his/her age. The road safety literature shows that the victim's position and the age of the at-fault driver influence the severity of injuries (Newgard, 2008; Boucher and Santolino, 2010). These two factors may also explain the victim's attitude to conflict resolution (Derrig and Weisberg, 2004; Doerpinghaus et al., 2003). The negotiation strategy depends on the relationship between agents and the conflict behaviour of the opposing party. Derrig and Weisberg (2004) suggested that passengers obtain lower settlements than do non-passengers due to the familiarity effect. Consistent with the hypothesis of different conflict behaviour in the insured driver, Doerpinghaus et al. (2003) found fault assessment differences as a function of the driver's age.

Injury factors provide a description of injuries resulting from the accident, such as the nature of injuries, their severity, evolution and the body region that was injured. The injury information recorded is based on medical assessments carried out by the insurer during the period in which victims are recovering from their injuries. The final medical assessment is made when the victim is fully recovered or with stable injuries. There are three variables related to the period during which the victim is temporarily disabled; time in hospital, time out-of-hospital with inability to work, and time out-of-hospital without inability to work. Under the Spanish system these three types of temporary disability entitle the victim to a daily basic compensation. The period 'out-of hospital with inability to work' refers to the out-of-hospital recovery period during which the victim is on sick leave. The period 'out-of hospital without inability to work' relates to the out-of-hospital recovery period during which the victim is able to work but requires some form of therapy.

The next two factors relate to permanent disability and aesthetic damage. Basic compensation for permanent disability depends on an injury score that ranges between 0 and 100 (from minimum to maximum severity). The score is derived from a medical scale that describes 475 injuries and provides severity scores for each one. Up to 50 points may be additionally awarded if the victim suffered aesthetic damage (for more details, see Boucher and Santolino, 2010). A further four variables indicate whether variation occurred between the initial and final medical assessments as regards the temporary disability duration and the permanent disability severity. Variations across medical assessments may influence the settlement expectations of claimants and, consequently, their behaviour as regards conflict resolution.

In addition to the injury's duration and severity, other characteristics may also affect settlements. For instance, some types of injuries are associated with greater suspicion of fraud (Crocker and Tennyson, 2002; Derrig and Weisberg, 2004), while economic damages may vary in function of the injury type. Furthermore, information about the influence of injury type on settlements may have implications for the economic analysis of road safety policies. Injuries described in the legislative scale are classified according to their nature and the body location in order to reduce the number of injuries to a manageable number of diagnostic categories, this approach being inspired by the Barell diagnostic matrix (Barell et al., 2002). There are six factors that relate to the body location and seven to the nature of the injury. Victims may suffer more than one injury and, therefore, these factors are not mutually exclusive.

Note that most of the observed characteristics are related to the nature and severity of the injuries, whereas information about financial losses incurred by claimants as a consequence of the accident is not observed in this study. According to the Spanish legislative compensation system, economic damages such as the compensation for loss of earnings are upper-limited, especially for those projected to the future. As a general rule, the amount is stipulated as a percentage of the compensation awarded for non-economic losses, which increases with annual incomes, whereas non-economic losses depend strictly on injury severity (Santolino, 2010). Consequently, economic damages are partially captured by those factors related to the type and severity of injuries.

5. Empirical analysis: results

The switching regression model was fitted to the data. Parameters were estimated by maximum likelihood by means of the QLIM procedure implemented in SAS. Regressors that did not show significant coefficients were removed from equations, while the same covariates are used in both compensation regressions. The results for the selection equation of the conflict resolution procedure are reported in Table 2. The results of the compensation regressions in the trial and negotiation procedures are reported in Table 3.

[INSERT TABLE 2]

It should first be noted that two factors from Table 1, x_1 (*Gender*) and x_{25} (*Superficial*), were dropped from the final regressions due to the lack of significance for parameters in all the equations of the switching regression model. Other studies suggest that higher risk/confrontation aversion among women, coupled with gender discrimination, result in women receiving lower amounts of compensation than men (Doerpinghaus et al., 2008).
Two different groups of variables are included in the selection regression. The first comprises general factors, including attributes of the victim and the insured driver: victim and at-fault driver ages (and their squared value) and type of victim (driver, passenger, and pedestrian or cyclist). The second consists of injury variables such as the nature of injuries, their severity, evolution and the body region that was injured: disabled days, severity score, aesthetic damage, hospital days variation, non-disabled days variation, head, upper torso, sprain/strain and muscle.

In addition to the variables included in the selection regression the compensation equations include other injury factors: hospital days, non-disabled days, disabled days variation, severity score variation, lower torso, upper extremities, lower extremities, multiple regions, fracture, unconsciousness, abrasion and internal injury. The hypothesis of joint independence of the three equations is rejected (the likelihood-ratio test for joint independence is reported in the Table 3 where LR test = 25.02 and p = 0.000). The following subsections discuss different aspects of the results obtained after estimation of the switching regression model.

[INSERT TABLE 3]

5.1. Endogeneity assumption between conflict resolution procedure and compensation payouts

The correlation coefficients ρ_0 (correlation between the conflict resolution procedure selection equation and the negotiation compensation equation) and ρ_1 (correlation between the conflict resolution procedure selection equation and the trial compensation equation) are both significantly different from zero (see Table 3). This shows that the endogeneity assumption is realistic for these data, and therefore the use of an endogenous switching regression model is appropriate to account for the unobservable selection bias in deciding whether to go to court or negotiate with the insurance company.

It should be remembered that the regression model with endogenous switching assumes that the choice of settlement mechanism is not independent of the compensation the individual receives once the settlement mechanism is fixed, and that non-randomness is due to self-selection of individuals. In this case, non-randomness occurs because individuals who decide to reach an agreement with the insurer are systematically different from those who go to court. Hence, unobserved factors that influence the decision regarding the conflict resolution procedure also affect the financial compensation awarded for injuries.

Since ρ_0 is positive the model suggests that victims who choose negotiation to resolve the conflict receive lower compensation in the negotiation than a random individual from the sample would have received (eq. 6). Likewise, since ρ_1 is negative the model suggests that victims who choose negotiation receive higher compensation in trial than a random individual from the sample would have received (eq. 5). With the help of the indicators defined in section 3, these last assertions will be discussed in more detail in subsection 5.3, where we also discuss which source of endogeneity, or unobserved factors, are more consistent in our case. Before doing so, the following subsection considers the estimation results for the selection function and the compensation functions.

5.2. Coefficient estimates of the selection and compensation functions

Coefficient estimates for the selection function are shown in Table 2, from which the following conclusions can be drawn. Firstly, driver victims of middle age who are involved in an accident caused by young or elder drivers of the other vehicle are more likely to go to court. Secondly, the injury factors indicate that victims who are more seriously injured (with more disabled days or higher severity score) are more likely to go to court. Thirdly, victims for whom the number of hospital recovery days stated in the first medical examination is larger than in the last one, as well as victims with head injuries, are both more likely to go to court. However, victims are less likely to go to court if the insurance company recognizes they suffered aesthetic damage.

The estimation results for the compensation functions according to the type of conflict resolution procedure are reported in Table 3. When the compensation payout is the result of a negotiation procedure the following results are obtained. Pedestrian and cyclist victims of middle age are more likely to obtain a higher compensation. However, the age of the at-fault driver is not significant in this case. As was expected, victims with more hospital, disabled and non-disabled days and a higher severity score are more likely to obtain a higher compensation. Similarly, victims for whom the number of hospital recovery days or severity score stated in the first medical examination is larger than in the last one are more likely to obtain a higher compensation. By contrast, victims for whom the number of disabled or non-disabled days stated in the first medical examination is larger than in the last one, as well as victims with injuries to multiple regions or abrasion injuries, are more likely to obtain a lower compensation.

When the compensation is the result of a trial procedure the following results are obtained. Passengers in the at-fault vehicle, pedestrian and cyclist victims, and victims from an accident caused by a middle-aged driver are more likely to obtain a higher compensation. However, the victim's age is not significant in this case. Regarding injury factors, victims with more disabled and non-disabled days and a higher severity score are more likely to obtain a higher compensation. Hospital days are not significant here. Victims with injuries in the upper or lower torso, sprain/strain or muscle injuries, and victims with aesthetic damage are all more likely to obtain a higher compensation.

5.3. Level of compensation after sample selection correction

In this subsection, and with the help of indicators (7) to (9), we analyse the variations in the estimates of the mean compensation payouts after sample selection correction. Table 4 shows the mean and standard deviation of these indicators for our data set.

[INSERT TABLE 4]

Alpha indicators

The first group of indicators (α_1, α_2 and α_3) helps to compare victims' expected compensation payouts under the trial and negotiation conditions, regardless of the resolution mechanism that is eventually followed by litigants. The fact that they all have a positive value means that in all cases court settlements produce, on average, larger compensation payouts than do friendly agreements with the insurance company. These estimates take into account the endogeneity caused by the choice of procedure. The first conclusion to be drawn is therefore that in-court settlements are expected to be larger than out-court settlements, regardless of the characteristics of the claim and claimant. Thus, it can be stated that the judicial resolution mechanism is more generous than the one based on negotiation.

As previously indicated, we assume that insurers are well-informed about the behaviour of courts, and they can therefore make a reasonably good estimate of the compensation that might be awarded by court. Consistent with our hypothesis that insurers have a systematic disputing behaviour based on their deep knowledge of court performance, the results of the alpha indicators show that negotiated compensation does not, on average, exceed judicial compensation. We therefore conclude that maximum compensations offered by insurers in negotiation are lower than the amounts awarded by courts.

The values of alpha indicators provide some insight into the type of unobserved characteristics that influence the choice of conflict resolution procedure and the compensation payout. In addition to accurate estimates of judicial compensations, we assume that insurers are risk-confrontation neutral. Risk and confrontation neutrality imply that insurers do not have a particular preference as regards the resolution procedure. Therefore, the maximum offer that insurers are willing to pay in the negotiation should be approximately their expectation of the compensation payment which might be awarded at trial. Insurers would offer then higher compensation amounts to victims with lower risk aversion and a stronger preference for confrontation. Even if the victim is overly

optimistic without due basis regarding the compensation that might be awarded by a court, insurers who reach a friendly agreement with this victim would offer higher compensation than they would to a victim with the same damages but who is less optimistic about his/her chances. Interpreting the negotiation process as a succession of bids/demands, these victims would need more rounds before accepting the bid.

The alpha values support the assumption of risk/confrontation neutrality and accurate estimates of judicial outcomes of insurers, and risk/confrontation aversion of claimants. The mean of α_1 measures the victim's average profitability from going to court, irrespective of his/her choice of conflict resolution procedure but taking into account general and injury factors of the claimant. Remember that compensations are considered on a natural log scale. When we take into account the victim's choice of conflict resolution procedure, and after correcting for selection bias, we observe that the victim's average profitability from going to court is much less for the trial sample (α_2) than for the negotiation sample (α_3). The large value of α_3 may be explained by the high level of risk and confrontation aversion of those sample victims who were compensated through negotiation. On average, judges would have awarded them drastically higher compensation than was agreed in friendly negotiation. By contrast, victims compensated by courts would have obtained only a slightly lower compensation in negotiation, as indicated by the value of α_2. Victims who seek a judicial resolution are less risk/confrontation adverse[2] and more optimistic about their chances in court than victims who decide to negotiate. And insurers are risk/confrontation neutral and make accurate estimates of trial outcomes. That means, during negotiation insurers would be willing to offer these victims a compensation payment close to the compensation finally awarded in trial.

Lambda indicators

The previous interpretation relies on the hypothesis that the source of unobserved claim characteristics that influences the compensation payout is related to the attitude of claimants regarding risk aversion, their confrontation preference and how optimistic they are. It is important to note that model endogeneity may be generated by other type of unobserved factors. There are claim characteristics that affect the final payout and they were not collected, but may be observed a priori without a large cost. For instance, although economic damages are partially captured by

[2] In Spain, the confrontation preference of victims who pursue a judicial resolution may be an important issue. As previously mentioned, most suits follow the criminal procedure and, therefore, injured victims with a stronger preference for a judicial resolution may seek not only financial compensation but also punishment of the criminal offence committed by the driver.

injury factors, information related to the financial losses incurred by claimants as a consequence of the accident is unobserved in our study. Different levels of compensation associated to each resolution route could be then because victims who settled by judicial decision sustained different economic damages, on average, than did victims who settled by negotiation. The lambda indicators are consistent with this hypothesis. In particular, lambda results suggest that the both sources of endogeneity act on opposite direction over the expected compensation payout.

The negative sign of λ_1 indicates that victims who settled through negotiation are associated with a higher expected compensation payout by court than was actually obtained by those who were compensated by judicial decision. This result may be explained by taking into account the two sources of endogeneity. Firstly, victims who settle by negotiation show higher risk and conflict aversion in disputes, but these attitudinal characteristics play a minor role in the in-court assessment. Therefore, judges would award them higher compensation than was obtained through the negotiation procedure. However, this interpretation is not sufficient to explain why these victims have larger expected compensations than do those who settled by judicial decision. We hypothesize that victims who settled by judicial decision sustained, on average, lower recoverable economic damages. Following the same reasoning of risk and confrontation neutrality and deeper knowledge of court behaviour, the insurance company accurately estimates the compensation payouts that might be awarded by courts for economic damages and includes them in the compensation bids made in the negotiation process. Therefore, victims who go to court are more likely to claim damages that are either legally not recoverable or not properly proven, or simply did not exist.

On the other hand, the positive λ_2 indicates that victims who went to court would have obtained a higher compensation in negotiation than did those who actually reached a friendly agreement. This result is mainly explained because victims who go to court have a lower level of risk/confrontation aversion. They would obtain higher compensation in negotiation than would victims who prefer friendly agreements reached in shorter negotiations because they are most likely only willing to accept larger bids through the negotiation. To be consistent with the previous arguments made regarding λ_1, the positive sign of λ_2 indicates that in the negotiation process the effect of risk/confrontation aversion is higher than the level of recoverable economic damages sustained. Victims who settled by judicial decision are optimistic regarding their chances at trial, and this optimism influences the possibility of reaching an agreement with the insurer for a higher amount of compensation. If a trial finally takes place, however, these victims could receive relatively lower compensation amounts for the recoverable economic damages.

To conclude, the lambda indicators strengthen the supposition that the attitude of litigants is the main source of unobserved characteristics that explains compensation differences between resolution mechanisms. By contrast, unobserved characteristics related to recoverable economic damages would reduce these differences.

Delta indicators

Finally, we compute delta indicators to measure the selection bias correction in relation to the victim's average compensation. As already mentioned, the same covariates are used in both compensation functions to facilitate the interpretation of indicators. Therefore, the delta indicators coincide with the average of the selection correction terms of equations (3) to (6). δ_1 and δ_3 refer to the selection bias corrections for compensation under the trial procedure, while δ_2 and δ_4 correct the compensation under the negotiation procedure. δ_1 is the correction for the level of compensation under the trial procedure given the characteristics of each victim, $E\left(y_{1i}|x_i\right)$, and when the victim decides to go to court, $E\left(y_{1i}|I_i=1,x_i\right)$. δ_3 is the correction for the level of compensation under the trial procedure given the characteristics of each victim, $E\left(y_{1i}|x_i\right)$, and when the victim decides to negotiate, $E\left(y_{1i}|I_i=0,x_i\right)$. Similar interpretation holds for δ_2 and δ_4 under the negotiation procedure. This group of indicators can also be used to decompose the λ_1 and λ_2 indicators, since $\lambda_1=\delta_1-\delta_3$ and $\lambda_2=\delta_4-\delta_2$.

6. Concluding remarks

Game models define the cooperative solution as the out-of-court settlement and the non-cooperative solution as the in-court settlement. The cooperative value of the game mainly depends on negotiation costs. In the non-cooperative game this value is the difference between the subjective values of litigants when settling the claim by trial minus the transaction costs incurred by the parties in court. Disputes are settled by negotiation when the difference between these two game values is positive, while a trial court settlement is preferred if the value is negative. Theoretical bargaining models often assume that parties are risk-neutral in order to find a formal solution to the game. However, the results of this empirical analysis with Spanish motor data lead us to conclude that the assumption of risk-neutral behaviour is barely fulfilled by claimants.

The analysis demonstrates that larger amounts of compensation are always awarded by judicial decision than by negotiation, regardless of the type of claims. However, most motor claims are settled by negotiation. We argue that claims are settled by negotiation because claimants are either risk/confrontation adverse or pessimistic about their chances at trial, or a combination of both. Risk/confrontation aversion and pessimism regarding court outcomes increase the gap between the subjective value of the trial outcome as perceived by claimants and by insurers. Consequently, the probability of the parties reaching a friendly settlement also increases.

Unlike in the case of claimants, the risk and confrontation neutrality of insurers is consistent with our results. The greater expertise of insurers makes them more objective than victims regarding the compensation payouts that might be awarded by courts. Insurers would start the negotiation process with relatively low initial compensation bids, and would increase these progressively as victims reject these offers. The judicial resolution route is only preferred by insurers when victims do not accept a maximum compensation offer that is close to the expected in-court compensation. Therefore, the point at which the negotiation process is successfully (or unsuccessfully) stopped will depend on how risk/confrontation adverse the victim is, and how optimistic he/she is regarding the compensation payout that might be awarded by court. As a consequence, risk and confrontation adverse victims obtain relatively lower amounts of compensation. By contrast, victims who are overly optimistic or who have a clear confrontation preference will eventually go to court, and in those cases the compensation awarded by courts will be lower than that for a random individual.

These results may have policy implications in terms of the characteristics that a motor compensation system should fulfil. In traditional motor compensation systems the settlement is the result of a negotiation between parties. In case that the negotiation fails, then the compensation is awarded by judicial decision. However, we argue here that these systems could be favouring the characteristics of one of the involved parties. We demonstrate that the higher expertise of insurers enables them to have an advantageous position in the negotiation process, where more than 95% of claims are settled. The incorporation of elements of arbitrage in the negotiation stage may be useful to balance the position of parties in the dispute. In this regard, motor compensation systems in which an objective assessment of possible compensation is provided to both parties without increasing the courts' workload may be desirable. Examples such as the Irish system, which incorporates a non-partial intermediary agency that provides an objective assessment of motor compensation during the negotiation process, could be an interesting alternative.

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APPENDIX

Table 1. Description of variables and some statistics

Variable	*Label*	*Description*	*Mean*	*Std.Dev.*
Dependent variables				
I	*Resolution procedure*	1 if the compensation is awarded by judicial decision; 0 if the compensation is agreed by negotiation.	0.045	0.207
y_0	*Negotiated compensation*	Victim compensation agreed between parties (on natural log scale).	8.666	0.759
y_1	*Trial compensation*	Victim compensation awarded by court (on natural log scale).	9.145	0.891
General regressors				
x_1	*Gender*	1 if the victim is a male; 0 otherwise.	0.221	0.415
x_2	*Victim's age*	Age of the victim (divided by 100).	0.378	0.168
x_3	*Victim's age squared*	Victim's age squared (divided by 10000).	0.171	0.150
x_4	*At-fault driver's age*	Age of the at-fault driver (divided by 100).	0.405	0.146
x_5	*At-fault driver's age squared*	At-fault driver's age squared (divided by 10000).	0.185	0.131
x_6	*Driver*	1 if the injured party was the driver; 0 otherwise.	0.505	0.500
x_7	*Passenger in no-fault vehicle*	1 if the injured party was a passenger in the no-fault vehicle; 0 otherwise.	0.219	0.413
x_8	*Passenger in at-fault vehicle*	1 if the injured party was a passenger in the at-fault vehicle; 0 otherwise.	0.154	0.361
x_9	*Pedestrian/Cyclist*	1 if the injured party was either a pedestrian or a cyclist; 0 otherwise.	0.122	0.328
Regressors related to injury information recorded by the insurer				
x_{10}	*Hospital days*	Number of recovery days in hospital.	0.002	0.010
x_{11}	*Disabled days*	Number of out-of-hospital recovery days with inability to work.	0.076	0.076
x_{12}	*Non-disabled days*	Number of out-of-hospital recovery days without inability to work.	0.027	0.039
x_{13}	*Severity score*	Assessment of injury severity (in points).	0.042	0.073
x_{14}	*Aesthetic damage*	1 if the victim suffers aesthetic damage; 0 otherwise.	0.222	0.415
x_{15}	*Hospital days variation*	1 if the number of hospital recovery days stated in the last medical examination is lower than in the first one; 0 otherwise.	0.024	0.153
x_{16}	*Disabled days variation*	1 if the number of out-of-hospital recovery days with inability to work stated in the last medical examination is lower than in the first one; 0 otherwise.	0.352	0.478
x_{17}	*Non-disabled days variation*	1 if the number of out-of-hospital recovery days without inability to work stated in the last medical examination is lower than in the first one; 0 otherwise.	0.280	0.449
x_{18}	*Severity score variation*	1 if the assessment of injury severity stated in the last medical examination is lower than in the first one; 0 otherwise.	0.253	0.435
x_{19}	*Head*	1 if injury located in head; 0 otherwise.	0.131	0.337

x_{20}	*Upper torso*	1 if injury located in upper torso (thorax/dorsal); 0 otherwise.	0.243	0.429
x_{21}	*Lower torso*	1 if injury located in lower torso (abdomen/lumbar); 0 otherwise.	0.188	0.391
x_{22}	*Upper extremities*	1 if injury located in upper extremities; 0 otherwise.	0.260	0.439
x_{23}	*Lower extremities*	1 if injury located in lower extremities; 0 otherwise.	0.247	0.431
x_{24}	*Multiple regions*	1 if contusions in multiple body regions; 0 otherwise.	0.054	0.227
x_{25}	*Superficial*	1 if superficial injury (e.g. contusions or wounds); 0 otherwise.	0.569	0.495
x_{26}	*Fracture*	1 if fracture; 0 otherwise.	0.179	0.383
x_{27}	*Unconsciousness*	1 if unconsciousness after the accident; 0 otherwise.	0.024	0.154
x_{28}	*Sprain/strain*	1 if sprain/strain; 0 otherwise.	0.724	0.447
x_{29}	*Muscle*	1 if a muscle injury other than a sprain or strain; 0 otherwise.	0.026	0.160
x_{30}	*Abrasion*	1 if abrasion/ burn; 0 otherwise.	0.064	0.245
x_{31}	*Internal injury*	1 if internal injury (nerves, blood vessels, etc.); 0 otherwise.	0.014	0.119

Table 2. Parameter estimates and standard errors of the resolution procedure selection function

Variable	*Label*	*Coeff.*	*Estim.*	*Std. Error*
	Intercept		-1.455	0.135***
x_2	*Victim's age*	γ_2	0.647	0.432
x_3	*Victim's age squared*	γ_3	-0.820	0.493*
x_4	*At-fault driver's age*	γ_4	-1.158	0.500**
x_5	*At-fault driver's age squared*	γ_5	1.209	0.556**
x_7	*Passenger in no-fault vehicle*(*)	γ_7	-0.087	0.036**
x_8	*Passenger in at-fault vehicle*(*)	γ_8	-0.447	0.051***
x_9	*Pedestrian/Cyclist*(*)	γ_9	-0.235	0.053***
x_{11}	*Disabled days*	γ_{11}	1.032	0.218***
x_{13}	*Severity score*	γ_{16}	1.094	0.205***
x_{14}	*Aesthetic damage*	γ_{17}	-0.152	0.043***
x_{15}	*Hospital days variation*	γ_{13}	0.321	0.053***
x_{17}	*Non-disabled days variation*	γ_{15}	-0.125	0.033***
x_{19}	*Head*	γ_{19}	0.183	0.041***
x_{20}	*Upper torso*	γ_{20}	-0.121	0.035***
x_{28}	*Sprain/strain*	γ_{28}	-0.104	0.037***
x_{29}	*Muscle*	γ_{29}	-0.239	0.065***

N = 24,938.

(*) Base category is driver, x_6.

*** 1% significance level; ** 5% significance level; *10% significance level.

Table 3. Parameter estimates and standard errors of the financial compensation regression equations

		Negotiated compensation			*Trial compensation*		
Variable	*Label*	*Coeff.*	*Estim.*	*Std. Error*	*Coeff.*	*Estim.*	*Std. Error*
	Intercept	$\beta_{0,0}$	7.771	0.023***	$\beta_{1,0}$	9.054	0.190***
x_2	*Victim's age*	$\beta_{0,2}$	0.581	0.070***	$\beta_{1,2}$	0.805	0.487*
x_3	*Victim's age squared*	$\beta_{0,3}$	-0.704	0.079***	$\beta_{1,3}$	-0.958	0.562*
x_4	*At-fault driver's age*	$\beta_{0,4}$	0.137	0.086	$\beta_{1,4}$	1.063	0.539**
x_5	*At-fault driver's age squared*	$\beta_{0,5}$	-0.157	0.096*	$\beta_{1,5}$	-1.181	0.597**
x_7	*Passenger in no-fault vehicle*(*)	$\beta_{0,7}$	-0.014	0.006**	$\beta_{1,7}$	0.064	0.040
x_8	*Passenger in at-fault vehicle*(*)	$\beta_{0,8}$	-0.021	0.007***	$\beta_{1,8}$	0.374	0.064***
x_9	*Pedestrian/Cyclist*(*)	$\beta_{0,9}$	0.040	0.009***	$\beta_{1,9}$	0.135	0.063**
x_{10}	*Hospital days*	$\beta_{0,10}$	1.334	0.299***	$\beta_{1,10}$	-0.284	0.962
x_{11}	*Disabled days*	$\beta_{0,11}$	5.610	0.044***	$\beta_{1,11}$	4.248	0.236***
x_{12}	*Non-disabled days*	$\beta_{0,12}$	3.202	0.064***	$\beta_{1,12}$	2.426	0.343***
x_{13}	*Severity score*	$\beta_{0,13}$	3.840	0.052***	$\beta_{1,13}$	3.686	0.253***
x_{14}	*Aesthetic damage*	$\beta_{0,14}$	0.031	0.007***	$\beta_{1,14}$	0.202	0.049***
x_{15}	*Hospital days variation*	$\beta_{0,15}$	0.117	0.016***	$\beta_{1,15}$	-0.174	0.078**
x_{16}	*Disabled days variation*	$\beta_{0,16}$	-0.032	0.005***	$\beta_{1,16}$	0.038	0.032
x_{17}	*Non-disabled days variation*	$\beta_{0,17}$	-0.036	0.005***	$\beta_{1,17}$	0.065	0.039*
x_{18}	*Severity score variation*	$\beta_{0,18}$	0.016	0.006***	$\beta_{1,18}$	0.027	0.035
x_{19}	*Head*	$\beta_{0,19}$	0.045	0.008***	$\beta_{1,19}$	-0.088	0.048*
x_{20}	*Upper torso*	$\beta_{0,20}$	0.018	0.006***	$\beta_{1,20}$	0.101	0.041**
x_{21}	*Lower torso*	$\beta_{0,21}$	0.063	0.006***	$\beta_{1,21}$	0.068	0.038*
x_{22}	*Upper extremities*	$\beta_{0,22}$	0.032	0.006***	$\beta_{1,22}$	0.003	0.034
x_{23}	*Lower extremities*	$\beta_{0,23}$	0.023	0.006***	$\beta_{1,23}$	0.035	0.037
x_{24}	*Multiple regions*	$\beta_{0,24}$	-0.041	0.011***	$\beta_{1,24}$	-0.090	0.072
x_{26}	*Fracture*	$\beta_{0,26}$	0.155	0.008***	$\beta_{1,26}$	0.057	0.043
x_{27}	*Unconsciousness*	$\beta_{0,27}$	0.014	0.017	$\beta_{1,27}$	0.186	0.086**
x_{28}	*Sprain/strain*	$\beta_{0,28}$	0.067	0.007***	$\beta_{1,28}$	0.101	0.041**
x_{29}	*Muscle*	$\beta_{0,29}$	0.080	0.010***	$\beta_{1,29}$	0.177	0.078**
x_{30}	*Abrasion*	$\beta_{0,30}$	-0.092	0.015***	$\beta_{1,30}$	0.018	0.098
x_{31}	*Internal injury*	$\beta_{0,31}$	0.069	0.021***	$\beta_{1,31}$	-0.181	0.120
		σ_0	0.363	0.002***	σ_1	0.716	0.048***
		ρ_0	0.137	0.054**	ρ_1	-0.826	0.035***

H_o: $\rho_0 = \rho_1 = 0$; LR test = 25.02 (p = 0.000).

N = 24,938; *Log-likelihood*= -14,756; AIC= 29,671; Schwarz criterion= 30,313.

(*) Base category is driver, x_6.

*** 1% significance level; ** 5% significance level; *10% significance level.

Table 4. Mean and standard deviation of alpha, lambda and delta indicators

Indicator	*Description*	*Mean*	*Std. Dev.*
α_1	$E(y_{1i}\|x_i)-E(y_{0i}\|x_i)$	1.562	0.213
α_2	$E(y_{1i}\|I_i=1,x_i)-E(y_{0i}\|I_i=1,x_i)$	0.183	0.113
α_3	$E(y_{1i}\|I_i=0,x_i)-E(y_{0i}\|I_i=0,x_i)$	1.625	0.189
λ_1	$E(y_{1i}\|I_i=1,x_i)-E(y_{1i}\|I_i=0,x_i)$	-1.330	0.098
λ_2	$E(y_{0i}\|I_i=1,x_i)-E(y_{0i}\|I_i=0,x_i)$	0.111	0.008
δ_1	$E(y_{1i}\|I_i=1,x_i)-E(y_{1i}\|x_i)$	-1.273	0.125
δ_2	$E(y_{0i}\|I_i=0,x_i)-E(y_{0i}\|x_i)$	-0.005	0.002
δ_3	$E(y_{1i}\|I_i=0,x_i)-E(y_{1i}\|x_i)$	0.058	0.029
δ_4	$E(y_{0i}\|I_i=1,x_i)-E(y_{0i}\|x_i)$	0.107	0.010

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