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Measurement of the Severity of Opportunistic Fraud in Injury Insurance: Evidence from China

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ABSTRACT: This article assesses the effects of claimant demographics and other claim characteristics on the measurement of the severity of opportunistic fraud using 96 excess claim lawsuits in personal injury insurance in China in 2000–2012. The empirical result indicates that severe opportunistic fraud that results in death is more numerous than it is for fraud that leads to disability and nondisability, which may be due to the fact that more severe injury may create greater openings for opportunistic fraud. Second, the severity of opportunistic fraud in provincial cities is lower than that in small or midsize cities because the former does not imply greater severity of opportunistic fraud. Third, the severity of opportunistic fraud in injuries from daily activity is greater than that for injuries from work and traffic accidents, implying that a higher excess claim probability and greater severity of opportunistic fraud in injuries from daily activity are consistent.

KEY WORDS: death, injury from daily activity, severity of opportunistic fraud

The importance of moral hazard has been long recognized and studied in the insurance markets (Arrow 1963). When asymmetric information exists such that the insurer cannot perfectly observe the objective loss distribution, the insured or claimants may have an incentive to try to affect the probability of accidents, the amount of loss resulting from an accident, or the amount of insured loss following the accident. The last of these is known as the ex post moral hazard. The claimants take advantage of their asymmetric information about the state of nature following the accident, inflating the number of claims filed or exaggerating the amount of the loss claimed (Cummins and Tennyson 1996; Meyer, Viscusi, and Durbin 1995). Cummins and Tennyson (1996) showed that moral hazard contributes significantly to the cost of automobile insurance. It is estimated that in 2007, claim payments on automobile insurance policies about U. S. $4.8 billion to U. S. $6.8 billion, or around 15 percent of the total claim payment (Insurance Research Council 2008). In a survey of property and casualty insurers by the Insurance Research Council (IRC) and Insurance Services Office (ISO) in 2001, half the respondents called insurance fraud "a serious problem" (Viaene and Dedene 2004) . The prior literature on ex post moral hazard focuses primarily on the frequency of fraud (Ai, Brockett, and Golden 2009; Artís, Ayuso, and Guillén 2002; Brockett et al. 2002; Caudill, Ayuso, and Guillén 2005; Derrig and Ostaszewski 1995) and insurance payments, such as for medical expenses for soft-tissue injuries (Derrig, Weisberg, and Chen 1994), sprain and wage claims (Crocker and Tennyson 2002), and medical expenses and wage losses (Doerpinghaus, Schmit, and Yeh 2008). Insurance payments are still based on the frequency of fraud, and a higher settlement amount may infer a lower probability of fraud and lower severity of fraud; however, it does not necessarily imply a lower severity of fraud because it is not directly measured. As a result, an accurate quantification of the severity of fraud is needed more than measures of the frequency of fraud and settlement amount.

A limitation of the most existing studies on ex post moral hazard in the insurance market is the difficulty of estimating the severity of inflated claims attributable to each type of moral hazard, respectively. Despite the importance of the level of excess claims for insurers, the question of how

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the severity of opportunistic fraud is quantified has received scant attention. This is due in part to the difficulty of detecting ex post moral hazard objectively. Previous studies often utilize IRC data in which the lawsuit and the settlement are combined, but the former accounts for a much lower ratio than the latter, so it is inadequate for determining objectively whether it is an excess claim, and let alone for calculating the degree of the severity of opportunistic fraud.

The primary objective of this article is to remedy this situation. This study provides new insights into moral hazard in the filing of insurance claims by distinguishing among excess claims and estimating the severity of inflated claims in personal injury insurance. Personal injury claims are among the most likely sources of bodily injury and the consequences of settlement decisions are far reaching. Personal injury settlement amounts are influenced by many factors, such as claimant demographics, the type and extent of the victim's bodily injury, state negligence rules, and the involvement of attorneys due to moral hazards from the claimants. The extent of personal bodily injury includes nondisability, disability, and fatality, but at present death has been omitted in the claim literature (Crocker and Tennyson 2002; Doerpinghaus, Schmit, and Yeh 2008) because of its severe nature and rare occurrence. Derrig and Weisberg (2003) found that the presence of independent medical exams (IMEs) corresponds to higher claim payments because it reflects a lower probability of fraud, so the insurer willingly pays the claim generously; however, the claimant may be more tempted to exaggerate the claim amount when bodily injury is more severe. Heirs of an insured who is fatally injured are the most apt to exaggerate the claim amount. Our empirical work analyzes the effects of the extent of an insured's bodily injury on inflated claims in lawsuit data relating to legal claims arising from personal bodily injury in China in 2000–2012. To the best of our knowledge, this is the first study to quantify death in the severity of opportunistic fraud. Using a rich dataset from lawsuits regarding actual personal injury legal claims, we are able to test whether accidental bodily injuries, whether fatal or nonfatal, affect the severity of excess claims differently. To clarify, in this article fraud means excess claims, which are also called opportunistic or soft fraud. At the same time, both the claim and the award amount should be considered to evaluate the severity of opportunistic fraud, in terms of the claim amount minus the award amount.

This article mainly addresses two challenging problems: Does fatality create significantly different effect on the severity of opportunistic fraud, from disability and nondisability? Is the severity of opportunistic fraud in provincial cities greater than that in small or midsize cities? China is the largest emerging insurance market; accidental bodily injury by those with insurance has increased greatly, and a considerable number of insurance claim disputes ended up being litigated in court. Kessler (1995) excluded 32 litigated claims from 7,385 bodily injury claims arising from automobile accidents collected by the IRC in 1987 because litigated claims account for only 0.43 of the total, but litigated claims are more objective than settled claims and better suited to measuring the severity of opportunistic fraud. The purpose of this article is to quantify how claimant demographics and other claim characteristics affect the severity of opportunistic fraud using our sample of personal injury insurance claims lawsuits from more than ten courts in China. This article contributes to the existing literature in the following three aspects. First, the severity of opportunistic fraud resulting in death is greater than that resulting in disability and nondisability, which is contrary to the traditional wisdom, namely, that death claims have a lower probability of fraud but a greater severity of excess claims. It is our most important result, extending the current claim literature on bodily injury extent, including disability and nondisability. Second, the severity of opportunistic fraud in provincial cities is lower than it is in small and midsize cities, which is also contrary to our hypothesis, implying a higher probability of excess claims does not surely mean a greater severity of opportunistic fraud. Third, the severity of opportunistic fraud in injuries from daily activity is greater than that for injuries at work and in traffic accidents, which implies that having a higher excess claim probability and larger opportunistic fraud severity is consistent, developing the present claim literature on bodily injury type, including mainly injuries at work and in traffic accidents.

The remainder of this article is organized as follows. The first section discusses the importance and necessity of quantifying the severity of opportunistic fraud and adding additional variable "death" in

the extent of bodily injury by seeking an independent claims lawsuit sample from a source other than insurance companies. Then we develop specific hypotheses to be tested, measures how claimant demographics and other claim characteristics affect the severity of opportunistic fraud differently, and describes the actual lawsuit data on personal injury insurance claims. Following, we present an econometric estimation of the hypotheses and interprets the results. The final section shows some conclusions and discusses some limitations of the article.

Previous Research

The essential components of fraud are the intent to deceive and the desire to induce an insurer to pay more than it otherwise would. A great deal of research focuses on the frequency of fraud, assessing and ranking the suspiciousness of individual claims, based on either the parametric or supervised methods (Artís, Ayuso, and Guillén 2002; Caudill, Ayuso, and Guillén 2005; Derrig and Ostaszewski 1995; Viaene et al. 2002), or unsupervised methods for insurance fraud detection (Ai, Brockett, and Golden 2009, 2013; Brockett et al. 2002). However, a higher frequency of fraud does not necessarily imply greater severity of fraud. The ex post moral hazard often causes soft insurance fraud, that is, opportunistic insurance fraud. It occurs when the claimant takes advantage of a situation that has taken place and makes an inflated claim, such as exaggerating the severity of an injury and claiming injuries or pain beyond the actual damages. For example, a person who is legitimately injured in an auto collision could pretend that the injuries received were worse and more painful than they actually were and claim additional monies. Soft fraud is the most common form of auto insurance fraud because it is easy to commit and difficult to detect. Especially in cases in which neck and back injuries are involved, it is often difficult to determine the true extent of the damage. Because of this fact, policyholders often exaggerate their pain or disability to receive extra compensation. Exaggerating legitimate injuries suffered in accidents is easy to do, even without malicious intent, which is why it is so frequent. Therefore, it is important to analyze the severity of the inflated claims.

Empirical estimates of the extent of excess claim are not available. Some previous research focuses on insurance payouts, and it shows the difficulty inherent in diagnosing the severity of the types of injuries typically suffered in automobile accidents, for example, soft-tissue injury or "sprains and strains", which makes soft fraud in automobile insurance relatively inexpensive to perpetrate and costly to deter. Soft tissue injury is harder to prove than nonsoft tissue injury, such as laceration and disfigurement, since there is no objective standard for it. Tennyson and Salsas-Forn (2002) found that the probability of an audit in auto accident claims is positively correlated with sprain and strain claim. Crocker and Tennyson (2002) reported that claims involving sprain injuries receive lower insurance payments than nonsprain claims. The extent of bodily injury ranges from nondisability, partial disability, total disability, to death. Crocker and Tennyson (2002) eliminated all death and permanent total disability claims from their analysis. Doerpinghaus, Schmit, and Yeh (2008) found that after eliminating all death claims the payouts for permanent disability are larger than those for temporary disability. Fatality is the most severe bodily injury, more likely to be disputed in insurance payouts between the claimant and the insurer, and more likely to be litigated. So it is more meaningful to include death when discussing the severity of bodily injury. Derrig and Weisberg (2003) found that the presence of IME corresponds to higher payouts because IMEs can more easily prove that the insured suffered bodily injury, meaning a lower probability of fraud, so the insurer is willing to give more generous payouts. But, to date no research has estimated the extent of opportunistic fraud in which a disability claimant exaggerates his or her claim amount.

The second branch of related research investigates whether claimant demographics (i.e., gender, age, and marital status) affect economic claim moral hazards. Women and the elderly are more averse to a variety of pure and financial (i.e., speculative) risks (Halek and Eisenhauer 2001; Jianakoplos and Bernasek 1998; Levin, Snyder, and Chapman 1988; Powell and Ansic 1997; Schubert et al. 1999; Sunden and Surette 1998). Women and the elderly are more conflict averse in dispute settlement with greater negotiation costs and less successful outcomes, resulting in a preference for shorter

negotiations with relatively lower payoffs, holding other factors constant (Gallos 1993; Graddy and Pistaferri 2000; Stuhlmacher and Walters 1999). The claimant's bargaining power can be improved greatly with the help of his or her spouse. Bair, Huang, and Wang (2012) found that those who are married receive larger claim amounts than those who are unmarried because the former make claim decisions jointly. It is more meaningful to take these studies one step further to test whether women, the elderly, and married claimants have different economic excess claims for similar injuries.

The third branch of related research is on whether other claim characteristics (e.g., accident location, lawyer involvement, insurance law reform) also affect economic claim moral hazards. In large cities, people are less likely to know one another and therefore are more likely to make a claim, even if those claims are without merit. Kessler (1995) found that more fraud occurs in urban areas than in rural areas. Where fraud is more likely to exist, insurers are less generous in their claim payments, reducing settlement amounts. Doerpinghaus, Schmit, and Yeh (2008) found that the payments are lower in urban areas than in rural areas. Claimant bargaining power can be greatly improved when a lawyer is involved, and the lawyer can encourage the victim to inflate his or her injury. Cummins and Tennyson (1996) found that insured motorists can gain a higher award for pain and suffering for injuries from minor auto accidents when a lawyer is involved. Insurer liability for bad faith increases pressure on the insurer to pay fraudulent or excess claims. Tennyson and Warfel (2008, 2010) found that tort liability for first-party bad faith leads to more paid claims that have characteristics often associated with fraud. Yet up to now no research has estimated the extent of opportunistic fraud for other claim characteristics that cause the claimant to exaggerate his or her claim amount.

Insurance payouts can reflect the severity of inflated claim indirectly, and higher payouts infer a lower severity of inflated claim. But, this kind of estimation of the severity of soft fraud is inaccurate because the amount claimed is not considered. For insurance companies, an accurate measurement of the severity of excess claim is needed and more practical than measurements of the claims payment. Why does available research not quantify inflated claim amount based on claims payment? Scholars are hampered by having utilized empirical pooling data, including on settlements and lawsuits from the IRC, and IRC data come from insurance companies, which have distinguished the fraudulent from the honest claims. Scholars could not detect overstated claims objectively and are much less likely to further calculate opportunistic fraud amount because there is no objective referent point. Kessler (1995) omitted litigated claims from bodily injury claims in automobile accidents because litigated claims account for a much lower proportion than those that are settled, but they are more objective than the settled ones and better suited to measuring the opportunistic fraud amount fairly.

We take these insurance payouts studies one step further to evaluate how claimant demographics and other claim characteristics affect the severity of opportunistic fraud based on our empirical survey of sample court awards with respect to personal injury insurance. This article is devoted to the objective measurement of the severity of excess claim, the first step in obtaining a sample of independent claims lawsuits other than from insurance companies.

Hypotheses, Theoretical Model, Sample, and Data

Hypotheses

We assume that the factors related to the frequency of fraud and claim payments affect the severity of opportunistic fraud equally. The severity of opportunistic fraud is determined by a combination of claimant demographics and other claim characteristics.

Claimant Demographics

Here, claimant demographics mainly include gender, age, and marital status. These characteristics may reflect a greater availability of resources, which in turn are likely to encourage higher levels of litigation. Gender and age have been associated with differences in risk aversion and negotiating

preferences and discrimination. Halek and Eisenhauer (2001) reported evidence of risk aversion differences across gender, age, and marital status in life insurance purchase decisions. Doerpinghaus et al. (2003, 2008) found gender and age effects in both fault assignment and claim payment in automobile liability claims. Viscusi (1988) identified gender and marital status effects in pursuing product liability claims. Men generally have higher incomes, and married people have support from the spouse, which both improve their bargaining power. We expect that the severity of excess claim is greater for males than for females and greater for those who are married than for the unmarried.

Older people (defined as those older than 65 years) (Doerpinghaus, Schmit, and Yeh 2008) demonstrated greater financial risk aversion because the cost of risk is higher at older ages since they have a shorter horizon in which to recover from adverse circumstances (Fuchs 1980; Posner 1995). We group ages into the elderly (greater than or equals to 60 years), and others. According to retirement provisions by the State Council of the People's Republic of China, male and female officials who are 60 or older, female staff who are 55 or older, female workers who are 50 or older are eligible for retirement. For convenience, we uniformly use age 60 and over as the retirement age. We use a definition of elderly claimants that may vary from traditional literature because life and health conditions in China, a developing country, are significantly different from those in a developed country: the level of economic development is different, which creates a gap in the medical and social security conditions. We expect that the severity of excess claim is lower for the elderly than for those of the other ages.

Other Claim Characteristics

In addition to the claimant demographics, there are other claim characteristics, such as lawyer involvement, accident location, legal system reform, third-party payment, injury type, and injury severity.

Claimant negotiating power can be enhanced significantly if a lawyer is involved because the attorney is more expert in dealing with the legal system, which may lessen a claimant's risk estimate as well as encourage accident victims to exaggerate their injuries and provides a buffer that may reduce negotiating costs to the claimant. Cummins and Tennyson (1992) found that the insured motorist can gain a higher award for pain and suffering for bodily injury in a minor auto accident because of a lawyer's involvement. We expect to find that the severity of opportunistic fraud is larger with lawyer involvement than without it.

In urban settings, people are less likely to know one another and therefore are more likely to make a claim, even if it is without merit. Kessler (1995) found that more fraud occurs in urban areas than in rural areas. Where fraud is more likely to exist, insurers are less generous in their claims payment. Doerpinghaus, Schmit, and Yeh (2008) found that the payment is lower in the urban areas than in rural areas. China is undergoing rapid urbanization, and more and more migrant workers from across the country are flowing into cities, including provincial, small, and medium-size cities. Provincial cities have more population mobility and less familiarity among residents. We classify accident location as provincial, medium-size, or small city and expect that the severity of soft fraud is greater in a provincial city than in a small or medium-size city.

Insurer liability for bad faith increases pressure on insurers to pay fraudulent or excess claims. Tort bad faith liability gives rise to higher settlement amounts, and the likelihood that a claim is underpaid is reduced (Asmat and Tennyson 2014; Tennyson and Warfel 2010). The New Insurance Law of the People's Republic of China in effect as of October 1, 2009, stresses protecting the interests of consumers, thus courts may award higher amount, possibly weakening the severity of excess claim. For example, the New Insurance Law constraints the insurer strictly to terminate the personal injury insurance policy. If the personal injury insurance policy has been 2 years since it was in effect, the insurer has to pay the policyholder even if the applicant did not tell the insurer the truth of the insured intentionally or for culpable negligence. We expect to find that the severity of opportunistic fraud will be lower after passage of the New Insurance Law than before it.

Types of bodily injury include those at work and in traffic accidents, and soft-tissue injuries can occur in both. A third type is injury suffered in the course of daily activity. Excess claims related to work injuries have been explored (Autor and Duggan 2003, 2006; Meyer, Viscusi, and Durbin 1995), and so have excess claims related to bodily injury suffered in automobile accidents (Crocker and Tennyson 2002; Loughran 2005). Based on excess claims of soft-tissue injury (Derrig, Weisberg, and Chen 1994; Tennyson and Salsas-Forn 2002), we extend soft-tissue injury to injury suffered in the course of daily activity, such as falls at home or in the park, falling from a height, ingesting poison, and drowning. Like soft-tissue injury, injury from daily activity is hard to prove because the claimant cannot offer authoritative documentation from an official source. For example, some insured parties under great mental pressure took poison or drowned in acts of suicide, and others fell at home or in the park because of chronic illness, so injury from daily activity has a higher probability of being an inflated claim than injuries at work or in a traffic accident. The official Laboring Department considers work injury to have a lower probability of leading to an inflated claim; traffic officials believe that bodily injury as a result of an automobile accident also has a lower probability of being part of an inflated claim. We expect to find that the severity of soft fraud is larger in an injury from daily activity than for injuries from either work or traffic accidents.

We categorize the severity of personal injury into nondisability, disability, and death. Elsewhere death has been omitted (Crocker and Tennyson 2002; Doerpinghaus, Schmit, and Yeh 2008) because of its severe nature and rare occurrence. Disability or death claims require documentation as to the degree of disability or cause of death. Derrig and Weisberg (2003) found that presence of IMEs corresponds to higher claim payments because they are associated with a lower likelihood of soft fraud, so the insurer will pay the claimant generously. Death also has a lower likelihood of fraud, because of documentation offered by the traffic officer or the hospital. We expect to find that the severity of opportunistic fraud is lower for death and disability than for nondisability.

There exists third-party payment in personal injury insurance, such as the work unit of the insured or the driver at fault in a traffic accident. If the third party has compensated the insured in part or in full, the claimant is relieved of economic pressure, implying a lower probability of fraud. We expect to find that the severity of opportunistic fraud is lower in cases of third-party payment than otherwise.

Table 1 presents the independent and dependent variable names and definitions.

Theoretical Model

Before developing the empirical model for the severity of opportunistic fraud, we briefly summarize Doerpinghaus, Schmit, and Yeh (2008)'s model for insurance claim payment, which expresses the

Table 1. Variable name and definition.

Variable name	Variable definition
Severity of opportunistic fraud	Difference between claim and award amount, divided by insurance amount
Claim ratio	Claim amount, divided by insurance amount
CFemale	1 if claimant is female, 0 else
CElderly	1 if claimant is ≥ 60 years, 0 else
CMarried	1 if claimant is married, 0 else
Provincial city	1 if accident occurs in a provincial city, 0 else
After new insurance law	1 if accident occurs in 2010–2012, 0 else
Third-party payment	1 if there exists third-party payment, 0 else
Lawyer	1 if claimant uses a lawyer, 0 else
Disability	1 if accident causes disability,0 else
Death	1 if accident causes death, 0 else
Daily injury	1 if accident is attributed to daily injury, 0 else

claimant's excess demand as the difference between the claimant's and the insurer's perceived value of the claim. Specifically, the claimant's net payment after negotiation in Doerpinghaus, Schmit, and Yeh (2008) is

$$P_n = P - c(y - x)^2, \tag{1}$$

where c is the negotiating cost parameter (such that higher values of c imply higher negotiating costs), and P is the liability claim payment, which is defined as

$$P = x + G(y - x), \tag{2}$$

where x is the insurer's perceived value of the claim and y is the claimant's perceived value. The quantity $(y - x)$ reflects the claimant's excess demand over and above the insurer's valuation of the claim. The random variable, G, ranges from 0 to 1 and is the settlement multiplier, determined by social, cultural, and legal factors that are beyond the control of the claimant. The claimant's optimal claim value, y, is determined by expected utility maximization, where utility is a function of the net payment, Pn, and Doerpinghaus, Schmit, and Yeh (2008) defined the claimant's expected utility as

$$EU(P_n) = EP_n - rVar(P_n) = x + {}_G(y - x) - c(y - x)^2 - r\sigma_G^2(y - x)^2, \tag{3}$$

where r is the claimant's risk-aversion parameter, μ_G and σ_G^2 represent the mean and variance of the settlement multiplier, respectively. The optimal demand for the claimant is $y^* = \frac{1}{2}\frac{\mu_G}{c + r\sigma_G^2} + x$.

Doerpinghaus, Schmit, and Yeh (2008) tested empirically whether female, elderly, and young (as well as married) claimants receive different payments for similar injuries. The results of empirical testing are consistent with differences in settlement amounts, particularly with respect to gender. We take their study one step further to investigate the excess claims and test our survey on personal injury insurance claim lawsuit data in China. Available research on insurance payment (Crocker and Tennyson 2002; Doerpinghaus, Schmit, and Yeh 2008; Loughran 2005) detects excess claims based on the IRC data, which is subjective because it comes from insurers in the United States. Here we substitute the amount of the court's award for the insurer's valuation of the claim, which will be more accurate for evaluating the difference between the claimant's demand and the court's valuation of the claim. This article detects the excess claims, using the court award amount as an objectively fair reference point. If the claim amount is larger than the award amount, it is regarded as excess claim, where the excess claim amount = (claim amount – award amount). To control for the effects of the excess claim amount in different claim cases, we standardize the excess claim amount by insurance amount, and define the severity of opportunistic fraud = [(claim amount – award amount)/insurance amount]. In short, the severity of excess claim is determined by the claim amount and the award amount together. Given that the court award amount is comparatively stable, the severity of soft fraud depends mainly on the claim amount. We develop a model to estimate the severity of opportunistic fraud with our survey on personal injury insurance claim lawsuit data in China as

$$P_i = \beta_0 + \beta_1 D_i + \beta_2 O_i + \varepsilon_i, \tag{4}$$

where Pi = severity of opportunistic fraud for the ith claim;
β_0 = intercept term;
D_i = measures of claimant demographics;
β_1 = a vector of regression coefficients for claimant demographics;
O_i = measures of other claim characteristics associated with the ith claim;
β_2 = a vector of regression coefficients for other claim characteristics;
ε_i = the random error term.

Sample and Data

Personal injury insurance covers the insured accidental death, disability, or nondisability, and the insurer compensates the insured (or heirs) for damages for death or disability and outpatient or inpatient medical expenses within the covered insurance amount, but if the insured suffers chronic illness or a sudden acute disease or commits suicide, all the above-mentioned are excluded by personal injury insurance policies. Sometimes the injury suffered by insured is not completely accidental, for example, if an elderly insured person who has a chronic illness suddenly falls at home or in the park and asks the insurer to cover all medical expenses, both those from accidental injury and from chronic illness. Alternatively, an insured party who ingests poison or willfully engages in other activity that results in death will be seen by the insurers as suicide, but the insured person's heir may insist on the calling the death accidental. In short, some claimants will take the opportunity to ask the insurer to cover death, disability, and outpatient or inpatient medical expenses, some of which are excluded from coverage in personal injury insurance policies, such as chronic illness, sudden acute disease, and suicide, or overstate their injuries to obtain higher payments.

This article uses data from our empirical survey from over ten domestic courts, including eastern, central, and western regions in China, reflecting the legal and overstated claims status quo. Initially we collected all 170 personal injury insurance claim lawsuit cases in 2000–2012. Of the 170, 74 were honest and 96 were opportunistic fraud claims, respectively, and the excess claims comprised 56.47 percent. Because we are interested in the performance of the claimant demographics and other claim characteristics of the severity of opportunistic fraud, we omit the 74 honest samples, leaving 96 excess claims.

Of those 96, 66 cases are male and 30 cases are female; 6 cases for those age 60 years or older and 90 cases for those of other ages; 84 cases for the married, and 12 cases for the unmarried. Thirteen cases are after passage of the New Insurance Law, and 83 cases before it; 12 cases have third-party payment, and 84 cases do not; 81 cases are in provincial cities, and 15 cases in small or midsize cities; 51 cases are with a lawyer and 45 cases without a lawyer; 4 cases are for work injuries, 44 cases for traffic accident injuries, and 48 cases for injuries from daily activity equaling the adding up of work and traffic accidents; 43 cases resulted in nondisability, 29 cases in disability, and 24 cases in death. Table 2 presents the summary statistics for dependent and independent variables for the 96 excess claims, in which the mean for the severity of opportunistic fraud is 0.4409 and the median is 0.3546.

Table 2. Summary statistics for dependent and independent variables based on 96 excess claim samples.

Variable name	Mean	Median	Std. dev.	Min	Max
Severity of opportunistic fraud	0.4409	0.3546	0.3572	0.0003	1.0000
Claim ratio	0.6371	0.7947	0.3570	0.0242	1.0000
CFemale	0.3125	0.0000	0.4659	0.0000	1.0000
CElderly	0.0625	0.0000	0.2433	0.0000	1.0000
CMarried	0.8750	0.0000	0.3325	0.0000	1.0000
Provincial city	0.8438	0.0000	0.3650	0.0000	1.0000
After new insurance law	0.1354	0.0000	0.3439	0.0000	1.0000
Third-party payment	0.1250	0.0000	0.3325	0.0000	1.0000
Lawyer	0.5312	0.0000	0.5016	0.0000	1.0000
Disability	0.5000	0.5000	0.5026	0.0000	1.0000
Death	0.2500	0.0000	0.4352	0.0000	1.0000
Daily injury	0.4167	0.0000	0.4956	0.0000	1.0000

Empirical Result

We perform an ordinary least squares (OLS) regression for model (4) based on the 96 buildup claim samples, and Table 3 presents results of the OLS estimation.

As we know, normality assumption is important for the residuals from a linear regression model. If they are not normally distributed, the residuals should not be used in Z tests or in any other tests derived from the normal distribution, such as t tests, F tests and chi-squared tests. Thus, before we demonstrate the OLS results in Table 3, we first check the normality assumption for the residuals from model (4). First, we show the visual inspection of the distribution of standardized residuals of OLS regression in Figure 1 via scatter plot and normal Q–Q (quantile–quantile) plot. From the scatter plot of the standardized residual in Figure 1a, which is randomly distributed in the band from −2 to +2, and its normal Q–Q plot in Figure 1b is distributed around a straight line, both of which imply that the normality assumption holds for model (4). Although Figure 1 shows

Table 3. OLS regression of dependent and independent variables for 96 excess claim samples.

Variable	Estimate	Standard error	T statistic	Prob.
Interpret	0.2529	0.0879	2.8770	0.0051***
Claim ratio	0.5761	0.0689	8.3563	0.0000***
CFemale	0.0503	0.0491	1.0229	0.3093
CElderly	–0.0536	0.0767	–0.6989	0.4866
CMarried	–0.0987	0.0617	–1.5998	0.1134
Provincial city	–0.1123	0.0541	–2.0764	0.0409**
After new insurance law	–0.2628	0.0594	–4.4220	0.0000***
Third-party payment	–0.2120	0.0578	–3.6698	0.0004***
Lawyer	–0.0657	0.0427	–1.5384	0.1277
Disability	–0.0526	0.0406	–1.2931	0.1995
Death	0.3187	0.0683	4.6652	0.0000***
Daily injury	0.0956	0.0492	1.9422	0.0555*
R-squared: 0.8051			Adjusted R-squared: 0.7796	
F-statistic: 31.54 on 11 and 84 DF			p-value: <2.2e-16	

***Significant at 0.01; **significant at 0.05; *significant at 0.1.

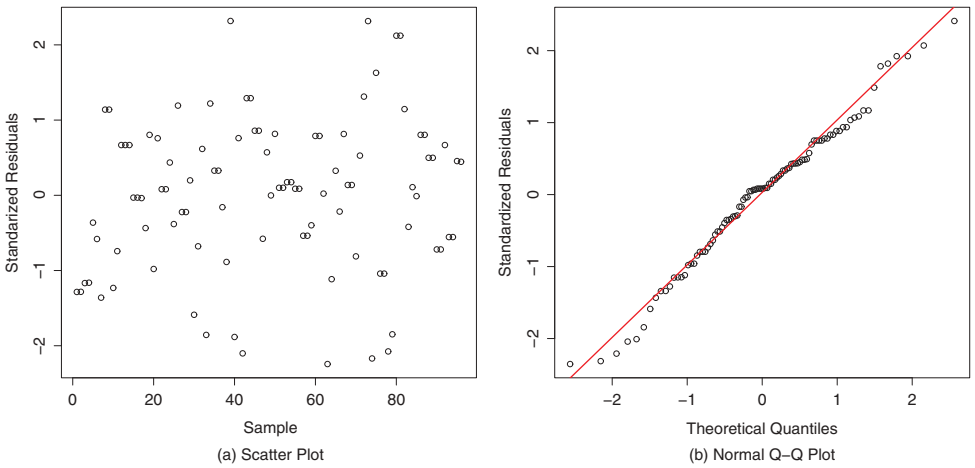

Figure 1. (a) Scatter plot and (b) normal Q–Q plot for standardized residual of OLS regression for Model (4).

the normality assumption, a visual method may seem unreliable. As a supplement to the graphical assessment of normality, we perform 10 popular normality tests described in Ghasemi and Zahediasl (2012): the Kolmogorov–Smirnov (KS) test, Jarque–Bera test, Shapiro–Wilk's test, D'Agostino Omnibus test, D'Agostino Skewness test, D'Agostino Kurtosis test, Cramer–von Mises test, Pearson Chi-Square test, Shapiro–Francia test, and Energy test; see the test results in Table 4. All tests have a *p*-value greater than 0.05 (in fact, they are greater than 0.20), which indicates a normal distribution of data.

Table 3 presents the result of the OLS estimation for the severity of soft fraud, and the adjusted R^2 is 0.7796. After examination, this model has no heteroskedasticity or multicollinearity and passed the *F* test. None of the claimant demographics is statistically significant, but all the statistically significant factors are related to other claim characteristics, such as whether the claim was in a provincial city, after the New Insurance Law, involved third-party payment, ended in death, or resulted from daily activity.

The coefficient estimate for the provincial city is negative and statistically significant at the 0.05 level, and it implies that the severity of opportunistic fraud is lower in a provincial city than in a small or midsize city, which is contrary to our hypothesis. With rapid urbanization in China, more and more migrant workers from across the country are flowing into cities, including provincial, small, and midsize cities. There exists more population mobility in provincial cities, leading to less familiarity and weaker moral constraint among people, so there is a higher likelihood of excess claim there than in small or midsize cities. For example, victims of accidental injury in a provincial city, after being hospitalized, ask the insurer to cover the cost of medical treatments and pharmaceuticals, including some that are unnecessary and are excluded in the personal injury insurance policy. But, this kind of higher probability of excess claim does not always imply a greater severity of opportunistic fraud, and this is the important finding of our article.

The coefficient estimate for claims after the passage of the New Insurance Law is negative and statistically significant at the 0.01 level, meaning that the severity of soft fraud is lower after the passage of the New Insurance law than before it, which is consistent with our hypothesis. The New Insurance Law emphasizes protecting the interests of consumers so some claims that, before the New Insurance Law, were supported by the court less or not at all are now supported or more supported. Accordingly, the court awards a higher amount for the same or similar injury after the passage of the New Insurance Law, weakening the severity of soft fraud by being more accurate than higher settlement amounts, and reducing the likelihood that a claim is underpaid (Asmat and Tennyson 2014; Tennyson and Warfel 2010). But, the excessive protection from the New Insurance Law is likely to induce moral risk in inflating claims made by consumers, so we will continue to track the excess claim effects of the New Insurance Law in the future.

Table 4. Normality test results for standardized residual of OLS regression for model (4).

Normality test	Test statistic	*p*-value
Kolmogorov–Smirnov Test	0.0892	0.4290
Jarque–Bera Test	0.6771	0.7128
Shapiro–Wilk's Test	0.9839	0.2907
D'Agostino Test–Omnibus	0.6244	0.7318
D'Agostino Test–Skewness	–0.7846	0.4327
D'Agostino Test–Kurtosis	–0.0937	0.9253
Cramer–von Mises Test	0.0727	0.2552
Pearson Chi-Square Test	9.8958	0.4497
Shapiro–Francia Test	0.9866	0.3733
Energy Test	0.5148	0.2412

The coefficient estimate for third-party payment is negative and statistically significant at the 0.01 level, suggesting that the severity of soft fraud is lower with third-party payment than without it, consistent with our hypothesis. Third-party payment largely relieves the claimant of economic pressure, leading to a lower claim amount than without third-party payment, and a lower possibility of excess claim and the less inflated claim severity are consistent.

The coefficient estimate for death is positive and statistically significant at the 0.01 level, but the coefficient estimate for disability is not statistically significant, suggesting that the severity of soft fraud is larger for death than for disability and nondisability, which is also contrary to our hypothesis. When the insured is dead, the claimant is the heir of the insured, claiming death damage and relevant medical expenses from the insurer. Under this condition, the insured's death is an objective fact with documentation offered by the traffic officer or the hospital, with a lower likelihood of fraud (Doerpinghaus, Schmit, and Yeh 2003). The insured's death is the most severe bodily injury extent and creates more convincing and reasonable motivations to exaggerate the claim amount; however, some insured's death occur for reasons specifically excluded in personal injury insurance policies, such as chronic illness, sudden acute disease, or suicide. In short, death claims have a lower probability of fraud but, at the same time, a larger severity of excess claims, another important finding of this article.

The coefficient estimate for injuries from daily activities is positive and statistically significant at the 0.10 level, suggesting that the severity of soft fraud is larger for these injuries than for injuries resulting from both work and traffic accidents, consistent with our hypothesis. Such injuries consist of bodily injury other than those suffered at work and in traffic accidents, including sudden falls at home or in the park, falling from a height, taking poison, and drowning. This kind of injury is similar to a soft-tissue injury (Derrig, Weisberg, and Chen 1994; Tennyson and Salsas-Forn 2002), in that the claimant is unlikely to offer authoritative documentation. For example, if someone insured suddenly falls at home or in the park because of a chronic illness that is not covered by personal injury insurance, the claimant will ask the insurer to cover not only the medical expense of bodily injury but also those for the chronic illness, so a larger potential exists for opportunistic claims than is the case for injuries at work or in traffic accidents.

Conclusion and Further Research

We propose using our empirical model (4) to analyze the severity of opportunistic fraud and conduct an OLS regression based on our survey of 96 excess claim lawsuits involving personal injury insurance from more than ten courts in China in 2000–2012. The results of our study suggest that the opportunistic fraud occurs across extent and types of bodily injury. Contrary to the traditional wisdom, the severity of soft fraud resulting in death is greater than that leading to disability and nondisability, contributing to the current literature on bodily injury extent claim including disability and nondisability. We extend soft-tissue injury to injury suffered in the course of daily activity and find that the severity of soft fraud in injuries from daily activity is greater than that for injuries from work and traffic accidents, enriching the present claim literature on bodily injury type, including mainly injuries at work and in traffic accidents.

However, our results should be interpreted with caution, as our empirical analysis based on a relatively small sample in China and may not reflect results worldwide. As one reviewer has pointed out, the geographical location may be important, and different results may be found in the different areas. The available data, however, prevent us from engaging in a wider analysis, so we encourage other researchers to use similar data from different areas, in Asia, Europe, or North America. If data could be collected that can be viewed as cluster data, maybe a mixture model will be appropriate, and this deserves our further study. In addition, excess claims also exist in other types of insurance. In the future, we will continue to survey data on lawsuits involving personal injury insurance and extend our evaluation of the severity of opportunistic fraud to other types of insurance, such as health or automobile insurance.

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