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I. 中文摘要

　　保險市場是否存在著資訊不對稱的現象一直是保險研究文獻中一個重要的議題。雖然有許多學者提出不同的理論模型與實證結果來檢證這個問題，由於無法區分資訊不對稱之現象與所造的原因，因此始終沒有明確的定論。本篇論文蒐集台灣汽車車體損失險的資料，實證分析台灣汽車車體損失險是否存在有道德危險及逆選擇的問題，並進一步提出新的研究方法來分辨道德危險與逆選擇的現象。研究結果發現台灣汽車車體損失險市場的確存在有不對稱之現象，本文所提出的研究方法確實能夠辨別出道德危險與逆選擇，並發現道德危險現象在保單將要到期之最後幾個月較無嚴重。本研究之實證結果可提供學術界對保險市場的不對稱資訊研究有更完備與正確的了解。

關鍵詞 ：資訊不對稱、保險市場、汽車保險、道德危險、逆選擇

I. Abstract

　　The empirical evidences in the literature have not yet provided a determinant result on whether asymmetric information exists in insurance market. Using a unique data set of automobile comprehensive insurance in Taiwan, this paper re-exams whether asymmetric information problems exist in the insurance market. With information of the timing and number of the claims, we further propose two new methods to distinguish the effect between adverse selection and moral hazard. By examining the conditional relationship between the choice of insurance coverage and the occurrence of the claims, our empirical results provide new evidence to verify whether the asymmetric information problems may be jointly contributed by both adverse selection and moral hazard problems or mainly caused by moral hazard near the end of the policy.

Key Words: asymmetric information, adverse selection, automobile insurance, empirical evidences, moral hazard.

II. Introduction

Rothschild and Stiglitz (1976) and Shavell (1979) pioneered the studies on adverse selection and moral hazard for insurance, and inspired many researchers over the past two decades—e.g., Miyazaki, 1977; Wilson, 1977; Radner, 1981; Holmstrom, 1982; Dionne, 1983; Rubinstein and Yarri, 1983; Crocker and Snow, 1986; Cooper and Hayes, 1987; Arnott and Stiglitz, 1988; Hellwig, 1988; Hosios and Peters, 1989; Hoy, 1989; Mookerjee and Png, 1989; Abreu, Pearce, and Stacchetti, 1990.   The theoretical literature has identified many insightful mechanisms for understanding as well as controlling adverse selection and moral hazard in the insurance market. More recently, several papers (including Dahlby, 1983; Dionne and Doherty, 1994; Puelz and Snow, 1994; Chiappori and Salanie, 1997; Dionne, Gourieroux, and Vanasse, 1998; Cawley and Philipson, 1999; Chiappori and Salanie, 2000; Dionne and Gagne, 2002; and Finkelstein and Poterba, 2004) have used empirical data to investigate whether asymmetric information exists in insurance market.

The empirical evidences in the literature have not yet provided a determinant result on whether asymmetric information exists in insurance market.   Some papers, such as Puelz and Snow, 1994; Dionne and Gagne, 2002; and Finkelstein and Poterba, 2004, find some evidence to support the existence of asymmetric information in insurance market, whereas other papers, such as Dionne, Gourieroux, and Vanasse, 1998; Cawley and Philipson, 1999; and Chiappori and Salanie, 2000, find no evidence to support the existence of asymmetric information in insurance market.

Furthermore, Dionne and Gagne, 2002; and Finkelstein and Poterba, 2004 have extended this line of research to trace the source of the asymmetric information.   To exam whether asymmetric information problems haunted insurance markets, most papers, such as Chiappori and Salanie (2000), generally test the relationship between the choice of insurance coverage and the occurrence of the claims.   However, a positive relationship between the choice of insurance coverage and the occurrence of the claims could be induced either by adverse selection or moral hazard.   Because of adverse selection, high- risks insured could choose high coverage.   On the other hand, an insured with higher coverage could have less incentive to control risks. Dionne and Gagne (2002) find that a replacement cost endorsement in automobile insurance increases the probability of theft near the end of the protection.   They interpreted this result as ex post moral hazard or opportunistic fraud after ruling out ex ante moral hazard and adverse selection. Finkelstein and Poterba (2004) promote annuity data to distinguish moral hazard and adverse selection, since moral hazard unlikely plays an important role in annuity market.   Their empirical evidences support the presence of asymmetric information caused by adverse selection.

It is important to explore the existence of asymmetric information in insurance markets.   It is equally important to further distinguish the effects between adverse selection and moral hazard since literature has developed alternative mechanisms to solve adverse selection and moral hazard problems.   The major goal of this paper is to use a unique data set to re-examine whether asymmetric information exist in the automobile insurance market, and moreover investigate the source of the asymmetric information.

Chiappori and Salanie (2000) suggested that dynamic data may help to distinguish moral hazard and adverse selection.   However, it is very expensive to conduct an experiment and collect the dynamic data.   The market of Taiwan automobile comprehensive coverage insurance provides a natural experiment which can be used to examine this issue.

Specifically, we propose two new methods to trace whether moral hazard or adverse selection cause the asymmetric information in the market.   First, we use policy-month information to distinguish the adverse selection from moral hazard.   Instead of measuring the conditional relationship between the choice of insurance coverage and the occurrence of the claims by policy year, we estimate it by every policy month.   Adverse selection may influence the occurrence of the claims uniformly through each policy month, whereas moral hazard may induce different patterns in different policy month.   That is, if the market is driven only by adverse selection problem, the claims should be uniformly distributed in each policy month.   On the other hand, if the market is driven by moral hazard problem, the claims may exhibit certain patterns.   In the case of Taiwan automobile comprehensive coverage insurance, most policies have an increasing deductible provision.   If the market has a moral hazard problem and since insurers employ increasing deductible to control the moral hazard, the insured may have the incentive to report a claim until a couple of months before the policy expires in order to minimize his own costs.   This pattern may provide a tractable signature of moral hazard.   Thus, in every policy month, we measure the conditional relationship between the choice of insurance coverage and the occurrence of the claims.   If the conditional relationship is significantly high and uniformly distributed through every policy month, then it may support that the market exist only adverse selection problem.   On the other hand, if the conditional relationship is significantly high but with tailed-heavy pattern, then it supports that the market should exist moral hazard problem.

The second method in our paper focuses on whether the conditional relationship between the choice of insurance coverage and the occurrence of the claims decreases with respect to an increase in deductible within the policy year.   Previous research, such as Chiappori and Salanie (2000), also test whether the higher deductible makes lower probability of loss.   However, both moral hazard and adverse selection can interpret this result.   In the case of Taiwan automobile comprehensive coverage insurance, an increase of the deductible within the policy year may provide a natural control to separate moral hazard from adverse selection.   As mentioned above, most policies are under an increasing deductible provision.   Since the insured typically can not renew the policy after a claim, the choice of the policy does not change after a claim but the deductible of the policy is automatically increased.   If the source of asymmetric information is mainly from moral hazard, then we should observe that the conditional relationship between the choice of insurance coverage and the occurrence of the claims decreases with respect to the number of the claims (an increase in deductible).

In our paper, we start following the same method as Chiappori and Salanie (2000) as a benchmark.   Unlike Chiappori and Salanie (2000), we find evidences to support that there exist asymmetric information problems in Taiwan comprehensive automobile insurance market.   We further examine how the definition of the claim could influence the empirical evidences.   As

discussed by Chiappori and Salanie (2000), it is very important to control the definition of the claim since insurance companies can only observe claims but can not observe all accidents. To solve this issue, Chiappori and Salanie (2000) suggested using data with more than two cars involved. However, this method solves one problem but creates another one, because it may implicitly censor out the asymmetric information problems caused by the insured. Chiappori and Salanie (2000) found evidences to support that there is no asymmetric information problem in French automobile liability insurance market. But, Chiappori and Salanie's evidences can not rule out the possibility of asymmetric information problem, which may exist in accidents with only one car involved. By the same token, without reasonable control on the definition of the claim, empirical evidences supporting the existence of asymmetric information could not be reliable. Therefore, using alternative definition for claims could provide insightful information and to further exam the robustness of the empirical evidences.

To check the robustness of our empirical results, we further employ the claim amount to redefine the occurrence of a claim. Our hypotheses are: (1) insurance companies employ more stringent underwriting criteria for drivers who may create a claim with a greater amount; (2) insurance companies employ more stringent audit criteria for claims with greater amounts. To control adverse selection and moral hazard, insurance companies typically hire many professional employees in underwriting and claim audit, respectively. When dealing with underwriting, insurance companies not only concern on the occurrence of the claim but also the amount of the claim. It is reasonable to believe that insurance companies pay more attention on drivers who may potentially create a claim with a greater amount. On the other hand, insurance companies may pay less attention on claims with smaller amounts when auditing realized claims, since auditing is costly. Thus, in our paper, we intend to further exam whether insurance companies control asymmetric information problems better for larger claims. We use several claim amounts as thresholds to redefine the occurrence of the claim. We then exam the relationship between the choice of insurance coverage and the refined occurrence of the claims. If our hypotheses are correct, then we expect that asymmetric information problems diminish for larger claims. Moreover, we further employ the information on the timing and the number of the claims to investigate the source of the asymmetric information. By examining the conditional relationship between the choice of insurance coverage and the occurrence of the claims, our empirical results provide new evidence to verify whether the asymmetric information problems may be jointly contributed by both adverse selection and moral hazard problems or mainly caused by moral hazard near the end of the policy.

II. Model

To analyze the empirical evidence of the asymmetric information problems in Taiwan's automobile insurance market, we collect data of comprehensive automobile coverage from Fu-Bon Property and Casualty Insurance, the biggest property casualty insurance company which occupies about 40 percent market shares in Taiwan. To avoid the data inconsistent problem in the transaction period, we use the data of year 2000 since Type C coverage was first introduced to the market in 1999. As suggested by Chiappori and Salanie (2000), we only use data with more

than two cars involved and new cars within two years.   For each observation, we can recognize both the choice of coverage and whether the insured claimed any indemnity both in the year and in the month.   Furthermore, we also included many control variables for sex, age of driver, age of car, type of car, type of area, and distribution channel.

The empirical model in this paper follows the procedures suggested by Chiappori and Salanie (2000).   Let $i = 1,...,n$ denote individuals and X_{it} denote the set of exogenous variables for individual i in the year t.   Define individual $i's$ choice of coverage in the year t as y_{it}, where $y_{it} = 1$ if individual i chooses high coverage (Types A or B) in the year t, and $y_{it} = 0$ if individual i chooses low coverage (Type C) in the year t.   We further define $z_{it} = 1$ if individual i had at least one claims in the year t, otherwise $z_{it} = 0$.

We first perform Chiappori and Salanie's test by establishing two probit regression models:

$$y_{it} = 1(X_{it}\beta + \varepsilon_{it} > 0)$$

and

$$z_{it} = 1(X_{it}\gamma + \eta_{it} > 0).$$ (1)

We then test the correlation of the residuals as defined in Chiappori and Salanie (2000) between above two probit models.

$$W = \frac{(\sum_{i=1}^{n} w_i \varepsilon_i \eta_i)^2}{\sum_{i=1}^{n} w_i^2 \varepsilon_i^2 \eta_i^2}$$

where w_i is the weight of period before policy expire for each insurance.

Although using the same procedures as Chiappori and Salanie (2000), our study differs from theirs in two important aspects with regard to the definition of z_{it}.   First, based on the information about the timing of claims over the policy year we define z_{it} for each of the twelve months of the entire policy year.   Secondly, based on the information about the dollar amounts of claims we define z_{it} for various levels of claim amounts.   More precisely, for $m = 1,2,...,12$ and $w = 10000, 30000, 50000,$ and 100000, $z_{it}(m,w) = 1$, if i had at least one claims at month m with claim amounts greater than w. $z_{it}(m,w) = 0$, otherwise.

We classify the occurrence of the claim by month to distinguish the effects between adverse selection and moral hazard.   Typically, adverse selection may influence the occurrence of the claims uniformly through each policy month, whereas moral hazard may induce different patterns in different policy month.   Thus, by testing the conditional relationship between the choice of insurance coverage and the occurrence of the claims by every policy month, we could further trace the resource of the asymmetric information problems.

We further classify the occurrence of the claim by the dollar amounts of the claim to exam our hypotheses: to control asymmetric information problems, insurance companies usually pay more attention on drivers who may create a claim with a greater amount and more carefully review claims with greater amounts.   Thus, by observing the conditional relationship between the choice of insurance coverage and the occurrence of the claims by different level of claim

amounts, we could investigate whether or not asymmetric information problems diminish for larger claims.

III. Research Results and Conclusion

In this paper we propose improved methods and obtain new empirical results regarding asymmetric information in the auto insurance market.   The data collected from automobile comprehensive insurance coverage in Taiwan provide us a unique opportunity to examine our methodology.   The results of Chiappori and Salanié's test from our analysis show that there are highly significant conditional correlation between the choice of insurance coverage and the occurrence of the claims.   This result seems to support strongly that Taiwan's auto insurance market has severe asymmetric information problems. Our findings suggest that Taiwan's auto insurance market may indeed have both moral hazard and adverse selection problems.

Moreover, the conditional relationship between the choice of insurance coverage and the occurrenceof the claims exhibits a smirk pattern with respect to policy month.   This suggests that asymmetric information problems may be jointly contributed by adverse selection and moral hazard and mainly caused by moral hazard towards the end of the policy.   However, after controlling the claim amounts, asymmetric information problems disappear.   This suggests that insurance companies must have employed more a stringent underwriting policy for drivers who may potentially create expensive claims and applied more stringent audit criteria for realized claims with large amounts.

Chiappori and Salanié (2000) found no evidence in supporting the presence of asymmetric information in the insurance market.   Our results actually do not refute but rather supplement Chiappori and Salanié (2000) since we have utilized additional information from monthly data and claims amounts.   The previous literature has not yet reached a consensus about the existence of asymmetric information in insurance markets.   These contradictory findings suggest that differences in regulation, pricing mechanism, as well as deductible system may all induce different types of asymmetric information problems.   Further investigation of asymmetric information problems by comparing different insurance markets or data from different countries is definitely needed since sufficiently different insurance contracts may only exist in different countries.   For example, Dionne and Gagne (2002) employ the replacement cost endorsement in Canada automobile insurance market to separate moral hazard from adverse selection. Finkelstein and Poterba (2004) use the contract designs in the U. K. annuity market to track the existence of adverse selection.   In our paper, we use the increasing deductible provision in Taiwan automobile insurance to examine the moral hazard problems. Our paper demonstrates that the alternative insurance markets in different countries could serve as nature experiments and provide fruitful data for further research.

Finally, we have to point out that, due to data limitation, our empirical investigation suffers an important drawback.   We do not have enough sample observations for the insured without increasing deductibles to test the marginal effects of increasing deductibles on moral hazard behavior in a more controlled manner.   That is, just as Chiappori and Salanié (2000), Dionne and Gagne (2002), and many other previous works, we are unable to provide a direct proof for

the existence of asymmetric information. This deficiency calls for further researches in testing asymmetric information problems with alternative models and data.

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