



Bundled automobile insurance coverage and accidents[☆]

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ARTICLE INFO

Article history:

Received 18 August 2011

Received in revised form 8 March 2012

Accepted 21 March 2012

Keywords:

Automobile accidents

Bundled coverage

Automobile insurance

ABSTRACT

This paper investigates the characteristics of automobile accidents by taking into account two types of automobile insurance coverage: comprehensive vehicle physical damage insurance and voluntary third-party liability insurance. By using a unique data set in the Taiwanese automobile insurance market, we explore the bundled automobile insurance coverage and the occurrence of claims. It is shown that vehicle physical damage insurance is the major automobile coverage and affects the decision to purchase voluntary liability insurance coverage as a complement. Moreover, policyholders with high vehicle physical damage insurance coverage have a significantly higher probability of filing vehicle damage claims, and if they additionally purchase low voluntary liability insurance coverage, their accident claims probability is higher than those who purchase high voluntary liability insurance coverage. Our empirical results reveal that additional automobile insurance coverage information can capture more driver characteristics and driving behaviors to provide useful information for insurers' underwriting policies and to help analyze the occurrence of automobile accidents.

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1. Introduction

The prevention of automobile accidents is a critical issue in modern society. Since automobile insurance is usually mandatory when driving a car, the relationship between automobile accidents and insurance might contain some important links. Recently, numerous studies, such as Puelz and Snow (1994), Dionne and Gagné (2002), and Cohen (2005), have been devoted to verify the positive relation between driving risk and insurance coverage based on asymmetric information theory. In particular, Blows et al. (2003) examine the relationship between vehicle insurance status and car crash injury and find that uninsured drivers are more likely to be injured in a crash. Cohen and Dehejia (2004) conclude that the purchase of automobile liability insurance can reduce the expected financial costs of accidents and then lead to an increase in traffic fatalities, indicating that the financial incentive from insurance coverage might influence driver behavior. Since having or not having insurance seems to affect driver behavior and in turn possibly cause accidents, analyzing the relations between insurance coverage and accidents might provide an alternative view on accident prevention.

[☆] Financial support from National Science Council, Taiwan, ROC (grant no. 98-2410-H-035-024-MY2) is gratefully acknowledged.

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The standard approach for testing the correlation between insurance coverage and accident occurrence uses the information from only one type of insurance, such as vehicle damage insurance (e.g., Dionne and Gagné, 2002; Li et al., 2007; Wang et al., 2008), or vehicle liability insurance (e.g., Chiappori and Salanie, 2000; Chiappori et al., 2006; Cohen, 2005; Dionne et al., 2001; Puelz and Snow, 1994). Alternatively, it is common for a car owner to have both vehicle damage insurance and voluntary third party liability insurance at the same time to cover the driving risk associated with the vehicle itself and the driver's legal responsibility in case of an accident. However, the role of insurance bundles on accident claims is completely overlooked in the current literature. To fill this gap, the purpose of this paper is to explore the relationship between insurance coverage and accidents, focusing on insurance bundles. Using a unique data set from the Taiwanese automobile insurance market, we consider the bundling of two types of automobile insurance coverage—vehicle damage insurance and voluntary liability insurance—to examine the coverage–risk correlation.

By using simultaneous models, we explore the customer's purchasing behavior of bundled insurance coverage, as the demand for the two types of automobile insurance might be mutually dependent. Subsequently, we examine the relationship between bundled insurance coverage and claim occurrence (accident).¹ The estimated results show that vehicle damage insurance is the major

¹ Many studies mention that not all policyholders with accidents file insurance claims. However, we do not distinguish the difference between accident and claim,

coverage and affects the purchasing decision of voluntary liability insurance. However, liability insurance has no effect on the purchase of vehicle damage insurance.

Additionally, policyholders with high vehicle damage coverage have a significantly higher probability of filing damage claims than those with low damage coverage, indicating that asymmetric information is present in the vehicle damage insurance market. Considering the extra information on liability insurance coverage, policyholders with a bundle of high vehicle damage insurance and low voluntary liability insurance are more likely to file damage claims. The choice of bundled insurance coverage provides an alternative view when analyzing vehicle claims.

This paper contributes to the literature in several ways. First, we provide a more realistic framework to analyze the relationship between insurance coverage and car accident risk by taking into account the demand for insurance bundles, which is seldom discussed in the previous literature. Second, we explicitly show that vehicle physical damage insurance is the major automobile coverage and affects the decision to purchase voluntary liability insurance coverage as a complement. Third, we demonstrate that given the same higher coverage in damage insurance, the amount of liability insurance purchased at the same time contains additional information on accident risk, highlighting the crucial role of the bundled insurance.

1.1. Theoretical background and related literature

Previous literature examines the correlation between insurance coverage and accidents in terms of the asymmetric information problem, which includes adverse selection and moral hazard. The adverse selection model by Rothschild and Stiglitz (1976) indicates that when insurers cannot fully identify types of risk from observable information, individuals with high risk will purchase more insurance to cover their losses than those with lower risk. Insurers cannot set a fair premium rate for high-risk and low-risk drivers because insurers do not have full information about expected claims. In addition, moral hazard may be caused by negligence in risk protection due to the assurance that if anything goes wrong, the loss will be covered (Shavell, 1979); some drivers even intentionally create damages in order to make claims (Arrow, 1963). Moral hazard depends on some unobservable action made by the insured. Higher coverage might lead to decreased prevention efforts or fraudulent claims and, therefore, a higher expected loss.

Regardless of adverse selection or moral hazard, with a driver's available information, the theory of information asymmetry predicts a positive correlation between coverage and risk.² With asymmetric information, policyholder purchasing decisions for automobile insurance can capture partial characteristics of the driver and driving behavior, helping the analysis of the occurrence of automobile accidents. Puelz and Snow (1994) find a positive coverage–risk correlation in that drivers with claims who might be high risk are more likely to select lower deductibles (higher insurance coverage). The analysis of Chiappori and Salanie (2000) focuses on beginning drivers and finds no coverage–risk correlation. As suggested by the above study, Cohen (2005) divides testing samples according to driver experience and finds a significantly positive correlation between insurance coverage and

accident risk for those drivers whose experience is in excess of three years. Dionne and Gagné (2002) use the time pattern of claims and the endorsement of replacement cost to separate moral hazard from adverse selection. Their evidence shows that cars covered by the additional endorsement are more likely to be stolen before expiration, indicating the presence of moral hazard. Li et al. (2007) investigate the dynamic patterns of claim occurrences before and after policyholders change deductibles, and they find that drivers who switch to a zero deductible tend to have higher claim occurrences than those who switch to an increasing per-claim deductible. Using an alternative to a dichotomous measurement approach, Kim et al. (2009) employ a multinomial measurement approach to test information asymmetry in both coverage area and coverage amount choices and present statistically positive coverage–risk correlations. On the whole, the null of zero correlation cannot be rejected in some of the empirical studies associated with automobile insurance.

Among all the previous studies, the relation between coverage and risk is investigated by using only one type of insurance, vehicle damage insurance, or liability insurance, not both. In other words, to our knowledge, there has been no research that considers the fact that people often buy insurance bundles, which include more than one type of insurance. Therefore, unlike previous studies, this paper considers a common insurance bundle of automobile insurance, vehicle damage insurance and voluntary liability insurance, to explore the relation between coverage and risk.

Examining the bundling of insurance may be insightful as policyholders often buy several types of insurance to cover the driving risk associated with the vehicle itself and the driver's legal responsibility in case of an accident. By determining the associated coverage of each type of insurance, policyholders make diverse decisions based on car value, driving habits, risk tolerance, and hedging liability risk. Consequently, the purchasing decision of bundled insurance coverage contains more information about the characteristics of drivers and their driving behavior.

1.2. Hypotheses testing

Based on the information above, we develop the following hypotheses to be tested in this paper.

Hypothesis 1. The amounts of vehicle damage insurance and voluntary liability insurance purchased are positively correlated, forming a complementary relationship.

Hypothesis 2. Policyholders with higher vehicle damage insurance or voluntary liability insurance are more likely to make damage claims.

Hypothesis 2.1. Policyholders with both higher vehicle damage insurance and voluntary liability insurance are more likely to make damage claims.

Hypothesis 3. Policyholders with higher vehicle damage insurance or voluntary liability insurance are more likely to make liability claims.

Hypothesis 3.1. Policyholders with both higher vehicle damage insurance and voluntary liability insurance are more likely to make liability claims.

1.3. The Taiwanese automobile insurance market

With the increase in car use, the number of traffic accidents in Taiwan (injuries and fatalities) is a rising trend, and the accident rate has gradually increased. For example, the number of automobile accidents increased from 21,414 cases in 2000 to 70,942 cases in 2010, corresponding to an accident rate of 38.24 (cases per 10,000

as it is not identifiable from our data. Consequently, the quantity of accidents might be underestimated in our study.

² Under adverse selection, the risk of the potential driver affects the choice of insurance contracts, whereas under moral hazard, the chosen insurance contract influences risk behavior. Both cases, therefore, reveal inverse causality. In the empirical research, it is difficult to separate moral hazard from adverse selection. Dionne and Gagné (2002) are the first to attempt this.

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