REPORT OF RESEARCH RESULTS

A. Title：

Adverse Selection in Automobile Insurance Market: Evidence from the Taxi

Driver Insurance in Taiwan

B. Researchers

Primary Researcher: Wen-Yen Hsu.

Affiliation: Professor, Department of Risk Management and Insurance, Feng Chia

University, Taiwan.

Email: wyhsu@fcu.edu.tw

Co-researcher: Yen-Chih Chen.

Affiliation: Associate professor, The Bachelor's Degree Program in Financial

Engineering and Actuarial Science, Feng Chia University, Taiwan

Email: ychihchen@fcu.edu.tw

C. Summary:

It's well known that theoretical equilibrium result in insurance market is that high-risk agents acquire more insurance than low-risk agents (Rothschild and Stiglitz, 1976). Under adverse selection theory, riskier policyholders with private information tend to purchase more insurance coverage (Akerlof 1970). The basic concept of adverse selection theory concerns the coverage–risk correlation between insurance coverage and risk. However, previous research in automobile insurance markets seems to indicate the absence of positive correlation between risk and coverage (Cohen and Siegelman, 2010).

The taxi insurance market in Taiwan allows us to analyze asymmetric information with respect to the different kinds of risk that are usually covered by automobile insurance. There are specific advantages to be gained by using the Survey of Taxi

Operating Conditions Database; firstly, this database involves detailed descriptions of taxi drivers' information valuable private information of driving behaviors and insurance purchase decision. The potential benefits of using survey data instead of claims data to control for the different dimensions of private information when testing for evidence of asymmetric information have been explored in the insurance literature (Rowell et al. 2017).

Secondly, given prevention of insurance companies from denying coverage of the taxi drivers and specialized products in Taiwan, the taxi insurance market in Taiwan provide an ideal setting for an investigation into this important research issue. Thirdly, it's hard to measure the risk of drivers to investigate the correlation between risk and coverage. However, one thing everyone can agree upon though is longer driving time increase the driving risk and probability of accident. The operating data of taxi drivers provide suitable proxies to measure the driver's risk.

We find evidence of adverse selection effects in taxi driver insurance market. Several variables related to driver's risk are statistically significant correlation between coverage, indicating the presence of adverse selection. Therefore, these low risk drivers are usually treated unfairly with the same premium or rejected in the current insurance market. On the contrary, high risk drivers have more incentive to purchase insurance and increase the adverse selection cost for insurance company. In addition, the correlation between purchase decision and driving risk exists in additional damage insurance and passenger liability insurance, but it does not exist in theft insurance. While collision damage is related to driving behavior, theft risk is not.

Our results reveal the adverse selection problem in taxi driver using different risk related factors, which can be measured by IoT devices. Applying IoT technology to measure these risk variables to design usage-based insurance for taxi drivers can offer a better solution for the current taxi drivers insurance market. Our results also show that new usage-based insurance can build a more efficient market and increase social welfare, which can create an improvement effect for whole society. Besides, it's important for the government that they can improve taxi market system and provide adequate consumer protection via insurance product design.

D. Aim of Research:

The primary aim of our empirical analysis is to investigate adverse selection in automobile insurance market. We make several contributions to the extant literature. Firstly, by using actual survey data on Taiwan, our results provide more precise evidence in support of adverse selection in the automobile insurance markets. Secondly, due to data limitations on risk and coverage, the prior studies have been unable to examine whether adverse selection exist in automobile insurance market. The homogeneous in taxi drivers and corresponding insurance products therefore allow us to provide new evidence on the ways in which asymmetric information affect automobile insurance market. This study fills the gap in the literature on the evidence of adverse selection in automobile insurance market.

E. Method of Research & Progression:

In this study, we focus on a relatively homogeneous group, which is composed of experienced taxi drivers. The construction of the sample for analysis in the present study was based upon data collected from Survey of Taxi Operating Conditions (STOC) database. The STOC database were conducted by Ministry of Transportation and Communications in Taiwan in 2007, 2009, 2011, 2013, 2015, 2017 and 2019[1]. The STOC database provides comprehensively detailed information on the operating of taxi drivers, including the private information of driver, driving habits, revenue, expenditure, insurance usage and insurance premium. Such detailed information enables us to carry out an in-depth investigation into this topic and compare the effects of adverse selection in automobile insurance.

In order to thoroughly examine the potential relationship between insurance purchase and driver's risk, we identify the different relevant risk factors using taxi driver's survey. The basic regression model can be expressed as follows:

$$Ins_i = \beta_0 + \alpha_i + \beta_1 Risk_i + \gamma X_i + \varepsilon_i \tag{1}$$

where Ins_i is a proxy measuring the insurance usage of an individual, which includes total premium and purchase decision; and $Risk$ refers to the measure of the extent of driving risk of an individual, which includes operating kilometers, fuel uses, operating

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[1] The STOC database can be obtained from Survey Research Data Archive of Academia Sinica in Taiwan.

time and taxi drivers' service revenue; ε is the error term; α are the individual specific effects; and X is a vector of the other control variables for the individual i.

These additional insurance purchase decision variables include physical damage insurance, third party liability insurance and passenger accident insurance. These variables of additional insurance purchase decision indicate whether or not the drivers purchase additional automobile insurance; this dummy variable takes the value of 1 for purchase additional automobile insurance, otherwise 0.

F. Results of Research:

Based upon actual data on taxi drivers' operation and insurance premium, we find that taxi drivers with longer operation times or higher driving kilometers per day purchase more automobile insurance. Overall, we find these high risk drivers are more apt to purchase additional physical damage insurance and passenger accident insurance. Our results also reveal that insurance with unlimited-mileage coverage may attract high risk drivers buy more insurance. The results in this study may provide new evidence on the relationship between insurance demand and driving time and driving kilometers.

G. Future Areas to Take Note of, and Going Forward:

In this study, we show the adverse selection problem in taxi driver. We further provide the suggestion on product design on UBI product design. For the data limitation, we can only use STOC database to carry out analysis. The insurers and government may also need more information on the clauses design of insurance policy. Thus, it is also worth collecting more data, and conducting further examination on the actual loss amount. Therefore, subsequent studies can collect more data with insurance company for further analysis.

H. Means of Official Announcement of Research Results:

We reported the results of this project to the Taiwan Risk Insurance Association Annual Meeting in 2021 December. We then will submit the revised to international academic journal.