



Research article

Comparative study on foreign drivers' characteristics using traffic violation and accident statistics in Japan

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ABSTRACT

Recently the number of foreign drivers has been rapidly increasing. Hence, the driving safety measures for foreign drivers have become more essential. This study aims to identify the characteristics of foreign drivers through analyzing traffic violation and traffic accident data in Japan. Chi-square test of independence and specialization coefficient were applied, in order to understand the specific violations and accidents with high tendency with respect to the region the foreign driver hails from. Also, multi-regression analysis was utilized to reveal the relationships between traffic violations and accidents. As a result, it was revealed that sense of priority, speed, and comprehension of rules affect traffic violations. Asian drivers tend to violate the rules related to priority in the road space, while North and South Americans violate rules related to speed, and South East Asian drivers violate rules related to priority and comprehension of traffic rules and road signs. Asian drivers tend to cause crossing collision while on the other hand North and South Americans are prone to head-on collision and rear-end collision. It was concluded that driving safety measures based on drivers' characteristics with respect to region were effective. This study seeks to contribute to the improvement of traffic safety for foreigners in Japan.

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1. Introduction

Currently in the midst of an inbound tourism boom, Japan welcomed a record breaking 20 million foreign tourists in 2015, nearly four times as many as when the "Visit Japan" campaign was launched in 2003. The lowered currency rate, more low-cost flight offerings and eased visa regulations, along with an increase in individual disposable incomes in emerging economies around Asia have all contributed to this stunning development. Today, over 50% of foreign visitors to Japan are "repeaters visitors", while one quarter of the visitors have been to Japan four or more times. These "repeaters visitors" have a higher tendency to drive cars by themselves and explore more destinations than they did before. In 2015, the number of cars rented out to foreigners in Hokkaido and Okinawa increased by about 1.7 times as compared to that in 2014. It is also speculated that other famous sightseeing areas had a similar increase, although there is no numerical data. Basing on this information, we speculate that the rise in the number of foreigners visiting Japan increases the probability of them getting involved in traffic accidents. In addition, according to driver's license statistics by

NPA, the number of foreigners holding Japanese driver's licenses in 2015 was approximately 800,000. This figure is 1.2 times that recorded in 2006 and also accounts for 1% of all Japanese driver's license holders. It is therefore becoming more essential for Japan to devise measures for the safety of foreign drivers as more are expected to visit the country.

1.1. License issues

With respect to driving licenses, temporary visitors need an international driver's license conforming to the Geneva Convention. But as of 2016, foreigners with driving licenses from Switzerland, Germany, France, Belgium, Slovenia, Monaco and Taiwan are allowed to drive in Japan. On the other hand, long term visitors and residents need a Japanese driver's license. There are two ways to obtain it, one is to take the standard Japanese driving exam, and the other is to switch a driver's license issued by a foreign administrative authority to a Japanese one. The former is similar to how Japanese ordinarily obtain driving licenses. In the latter, foreigners' knowledge of traffic rules and driving skills are checked.

As stated above, foreign drivers in Japan, except for the ones with a Japanese driver's license obtained through typical exams can drive without any prior instructions about Japanese traffic rules. That means driving behaviors of foreign drivers in Japan strongly depends on traffic culture such as the driver's license acquisition system, traffic rules, and habitual driving behavior in their countries. For example, people require

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13-hour instructions in total to get a driver's license in South Korea. The time required in South Korea is approximately a quarter of that in Japan. The time in Taiwan, on the other hand, is almost the same as that in Japan. However, some residents in Taiwan told the authors that driving schools in Taiwan seldom provide all the lectures and instructions, and the quality of the education is insufficient. This implies that traffic education standards can cause differences in the understanding of safe driving.

Various sectors related to traffic and safety are working towards ensuring the safety of foreign drivers in Japan. For example, in order for foreigners to obtain a Japanese driver's license, some local police stations provide the written test in foreign languages. Some driving schools have also started offering driving instructions in English. Rent-a-car associations and companies also provide information about driving safely in Japan to foreigners that they rent cars. MLIT has also standardized road signs to meet international specifications so that foreigners can easily understand them. Many more countermeasures have already been implemented, but most tend to focus mainly on language rather than the drivers' characteristics. Aspects like differences in driving habits, traffic regulations, attitude, etc. should also be considered if safety for foreign drivers is to be wholly achieved.

1.2. Literature review

The effects of social and cultural aspects on road safety parameters are widely examined via macroscopic cross-national analysis. Kopits et al. [1] examined the relationship between traffic fatality risk and per capita income, and used it to forecast traffic fatalities by geographic region. Paulozzi et al. [2] also analyzed the relationships between a country's stage of economic development and its motor vehicle crash fatality rate. These studies reveal that traffic safety depends on a country's economic situation. Moreover, Gaygisiz [3] investigated the relationship between governance quality, cultural dimensions and road traffic fatality rates with a sample space of 46 countries and concluded that both governance quality and cultural dimensions have an impact on traffic fatalities. Melinder [4] compared two periods (1989–1991 and 1997–1999) in order to understand the relationship between different socio-cultural factors, regulations related to traffic safety, and fatal traffic deaths. This study concluded that the type of religion and wealth of the country seem to be the most important factors affecting traffic accident forms and occurrence. These studies indicate that traffic safety varies from country to country because of differences in the social and cultural environment.

Recent studies show that drivers' characteristics are influenced by their respective societies and attitudes. Fruhen et al. [5] found that attitude and perception of the social norm impacted the drivers' aggressive behavior towards cyclists. Chung et al. [6] identified that the drivers' socio-demographic factors, e.g., gender, marital status, age, etc. also have an influence on the habitual driving style. Stanojevic et al. [7] discussed that the lack of enforcement encourages illegal driving behavior such as poor attitude towards speeding, wearing seat belts and drunk driving that breed riskier situations. Lheureux et al. [8] concluded that intention and habit are distinct and direct determinants of offenses, e.g., speeding and drunk driving. Yoshida et al. [9] reviewed the transition of the traffic safety situation in Japan and found that there is a relationship between the characteristics of traffic accidents involving young people and their perception of safety and travel mode. These studies demonstrate that drivers' characteristics, traffic accident occurrence and tendency to violate traffic regulations are influenced not only by an individual's cognition but also by the social and cultural environment.

Bone and Mowen [10] identified a set of personality traits predictive of aggressive and distracted driving propensity as a hierarchical model framework. This study revealed four hierarchies i.e. elemental, compound, situational, and surface traits affecting driving propensity. Elemental traits arise from genetics and early learning history while

compound traits result from culture, sub-culture, the learning history of the individual. Cestec et al. [11] examined the social influence of cultural values and random breath tests on drunk driving in 15 countries. The results confirmed the social influence of drunk driving and how it strongly differs from country to country. All these studies show the influence of social and cultural factors on driving behavior and habits.

Few studies focused on road safety issues of foreign and native drivers in the same country. Yannis et al. [12] investigated the relative accident fault risk distribution among different driver nationality categories in Greece. As a result, they revealed that the most significant effect on accident risk arises from the presence of foreign drivers at junctions. It was also found that immigrants and permanent residents appear to have a lower risk compared to tourists, regardless of the road environment.

1.3. The objectives

For this study, Fig. 1 shows the viewpoint from where the foreign drivers' characteristics are perceived. Doi et al. [13] classified the state of safety into two categories: functionally safe and inherently safe. Functionally safe is the state in which either the probability of accident occurrence or the magnitude of harm/damage is reduced through Enforcement and Engineering of the traditional 3 E's. While inherently safe corresponds to the state in which hazards are removed at the source, e.g., respecting priority leads to little or no chance of collision. Another explanation is that the driver can be helped to restrain or control hazardous energy/speed, e.g., maintain driving at an appropriate speed. Education, sophistication and promotion are crucial because inherent safety is realized by drivers' behaviors. However, both priority and speed are habitual factors formed in the respective drivers' country because of the differences in the driver's license systems, traffic rules, etc. In addition to these two factors, the correct comprehension of traffic rules and road signs is the key factor to reduce traffic accidents, particularly for foreign drivers. Thus, the PSC (Priority, Speed and Comprehension) concept is used as a basis to understand the differences of foreign drivers' characteristics in this study.

This study aims to find the characteristics of foreign drivers using the information available, albeit minimum. Thus, this study's importance is to find the facts related to the characteristics of foreign drivers. Takubo [14] stated that the analysis using traffic accident statistics data may help to understand the actual situation although this can't reveal the detailed causal relations. Therefore, this study is a baseline to suggest countermeasures for the safety of foreign drivers and perhaps more specialized studies related to foreign drivers.

2. Methods

2.1. Summary of the data used in this study

Recently the National Police Agency (NPA) in Japan has taken interest in the safety of foreign drivers, and thus started to include the information of drivers' nationality to statistics of traffic violations and accidents. The data used in this study is the number of the traffic violations and accidents reported by the local police agency in Japan. This data includes nationality but not gender, age, license type and so on. Furthermore, the comparison of the risk by nationality is difficult because of the limited data. For example, finding the exact number of foreigners may not be possible because international driver's licenses are issued in their home countries. This explains why this study centers on the analysis of the characteristics of traffic violations and accidents caused by foreign drivers in Japan.

The information availed by NPA is of the following countries: Korea (KOR), China (CHN), Taiwan (TPE), Philippines (PHI), Vietnam (VIE), Thailand (THA), Brazil (BRA), Peru (PER), United States (USA), Japan (JPN) and the other nationalities (Others). It should be noted that the data with reference to Taiwan is separate from that of China, but that

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