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主 論 文 の 要 旨

論文題目 **An Empirical Investigation of Harmfulness, Pattern and Influential Factor Associated with Fatigue-related Crash**

(疲労による交通事故の損傷度，発生傾向と影響要因に関する実証分析)

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論 文 内 容 の 要 旨

Road traffic deaths and injuries have already become a major cause of concern and aroused great attention all around the world. According to Global Status Report on Road Safety 2015 by World Health Organization, more than 1.2 million people die each year, with millions more sustaining serious injuries and living with long-term adverse health consequences. In low- and middle-income countries, traffic injuries have become one of the leading causes of death and cost approximately 3% of their GDP as a result of traffic crashes. Fatigue driving was identified as one of the four most risky driving-related behaviors, especially in fatal traffic crashes and represented a significant social and economic cost to the community. Despite extensive body of research addressing the harmfulness of driver fatigue on road safety, it has not attracted enough attention. Drivers are less concerned about driver fatigued than other traffic safety issues. Besides drivers, public are also not fully aware of the potential risk of driver fatigue because it is difficult to evaluate its effect accurately.

The focus of this dissertation is to examine possible reasons for disregarding the harmfulness of fatigue-related crash, and identify factors contributing to the occurrence of fatigue-related crash as well as severe outcome in the crash. The first problem addressed in the dissertation is the misclassification problem of fatigue-related crash. Reliable and accurate records are essential for assessing the scope of fatigue-related

crash problems, monitoring, and evaluating the effectiveness of intervention measures. An analysis framework is developed to identify factors that cause police officers misclassify fatigue-related crashes and examine the interactive effects of those factors. It can be inferred that the stereotype of certain groups of drivers, crash types, and roadway conditions affects police officers' judgment on fatigue-related crashes.

Another possible reason for impeding understanding the harmfulness of fatigue-related crash is examined. Fatigue driving and injury severity in the crash may share some common influential factors. Ignoring the impact of these common factors will lead to endogeneity problem and result in biased parameter estimation. Therefore, a bivariate endogenous binary-ordered probit model is developed to examine the relationship between fatigue driving and injury severity considering endogeneity. Regarding the potential systematic differences between commercial and non-commercial vehicle drivers, the difference of influential factors between commercial and non-commercial vehicle drivers is also discussed. The results show that the influence of fatigue driving on injury severity is significantly underestimated if ignoring the endogeneity.

Lastly, the dissertation investigates the fatigue-related crash from macro-level. A spatial filtering technique is applied to capture the unobserved spatial correlation of fatigue-related crash frequency. With the filtered spatial components, a semi-parametric Poisson model can be developed to explore the impacts of both road and macroscopic variables on the occurrence of fatigue-related crashes. Also, the effects of omitted spatial components and macroscopic variables can also be calculated. The calculation results indicate that the filtered spatial components and macroscopic variables explain more than half of the unobserved variation in the error term.