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Economic and statistical perspectives on traffic safety in Louisiana, 2005–2015

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ABSTRACT

This study examines and applies recent empirical evidence from Mississippi and Alabama on fatal crashes and its relationship with gasoline prices and alcohol consumption using the Louisiana Crash Data Reports between January 2005 and December 2015. Results suggest that higher gasoline prices reduce fatalities among young drivers. A fewer number of young drivers on the roads are believed to reduce the likelihood of fatal crashes. Alcohol consumption is strongly associated with all types of fatal crashes. Underage drinking is still prominent in Louisiana. Extreme temperatures are positively associated with youth and other types of fatal crashes.

1. Introduction

The study provides for the first time both an economic and a statistical analysis of the Louisiana Crash Data Reports maintained and made publicly available by the Louisiana Department of Transportation and Development. The economic analysis focuses on the costs of fatal crashes to society and the statistical analysis aims to apply and evaluate recent empirical evidence on the effects of gasoline prices and the alcohol consumption on the fatal crashes. This study contributes to the awareness of the drunk-driving and young driver's deaths, which take a huge toll on society in terms of social and economic costs, wealth destruction, and unfulfilled potential of the deceased or incapacitated. The estimated social costs are staggering. Although the over impact of fatal crashes among young drivers on the economic growth and development is still unknown, it may be substantial due to premature deaths (15–24 years) and unfulfilled youth drivers' lifetime potential. Ideas, new discoveries, innovations, inventions, entrepreneurial spirit, and social cooperation are one of the fundamentals of the economic development, which are made possible by the greatest asset above all—people, such as Thomas Edison, Blaise Pascal, Philo Farnsworth, Steve Jobs, Bill Gates, Benjamin Franklin, Alexander Graham Bell, Sandford Fleming, Marie Curie, Galileo Galilei, and Mark Zuckerberg. Premature deaths, as a result of fatal crashes, deprive the humanity of the benefits from the gifts and potentials of young drivers and others prematurely killed in motor vehicle accidents in the country where the life expectancy at birth is about 78.8 years, as documented by the Centers for Disease Control and Prevention (2016). Motor vehicle fatalities remain the leading cause of premature deaths among young drivers (Hoyert & Jiaquan, 2012).

According to the 2010 U.S. Department of Transportation, the National Highway Traffic Safety Administration (NHTSA) estimates, the harm of traffic crashes to society is evaluated at $836 billion, drunk driving crashes cost about $52.5 billion, and crashes resulting from speeding or driving too fast than the legal speed limits cost $52 billion, and crashes resulting from the lack of seat belts usage cost $10.43 billion to the United States (Blincoe, Miller, Ziloshnja, & Lawrence, 2015). The death toll is high, tapping 32,999 people killed based on the NHTSA estimates. The data from the Louisiana Department of Transportation (2005-2015) suggest the annual average total cost of crashes of about $6.76 billion and the average annual cost of crashes per licensed driver of $2336.91. The reduction in youth alcoholic beverage consumption should remain a public policy priority according to the 2013 Louisiana epidemiological profile because Louisiana's children get more familiarized with alcoholic beverage since their high school senior year and drink more in college. According to the same report, Louisiana middle and high school students (8–12th grade) are 11% more likely to drink alcoholic beverage within the last 30 days compared with their peers nationwide. In Louisiana, alcohol-attributable crashes represent 43.14% of the overall fatal crashes whereas youth fatal crashes represent 34.07%

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annually. Among young licensed drivers about 7.07% are arrested for driving while intoxicated. The lack of driving experience coupled with alcoholic beverage consumption undermines, in part, young drivers' capacity to evaluate accident risks and corrupt their perception of control (Leigh & Wilkinson, 1991). The data also reveal that 60.52% of drivers were killed for not wearing the safety seat belt. These risky behaviors have been characterized in the psychological and legal studies literature as a poor assessment of accident risk (De Joy, 1989; Fishhoff, Furby, & Gregory, 1987; Groeger & Brown, 1989; Lave, 1987) subsequent to varying degrees of enforcement of minimum legal driving and drinking age and drunk driving laws (Cook & Tauchen, 1984). To some economists, another explanation is that licensed drivers do not bear the burden of the true social costs of accidents. Researchers believe that more enforcement of existing laws and imposition of higher gasoline or beer taxes may alter these behaviors (Dee, 1999; Grabowski & Morrisey, 2006, 2011; Kenkel, 1993). Nevertheless, there is a belief that well designed and targeted driving education programs may perhaps have a transformational power toward more safer or sober driving. It is our contention that the involvement of teenagers or young drivers in shaping solutions to drunk-driving and to fatal, injury, and property damage only crashes may be instrumental. This study is the first step toward that direction by providing empirical evidence on the effects of drunk-driving and the increase in the gasoline prices on the fatal crashes. The next study, which consists of laboratory experiments, will evaluate the effectiveness of new driving education programs compared with tax policy proposals on gasoline and beer to change young drivers' behaviors in a participatory approach.

This paper is organized as follows. Section 2 briefly presents previous research related to fatal crashes and their relationships to gasoline prices or drunk-driving. Section 3 presents the methods, that is, the data source, the definition of variables, the summary statistics and the modeling strategy. Section 4 presents the results. Section 5 discusses the results and challenges that researchers continue to face in the empirical settings and provides the conclusion and the direction for future research.

2. Previous research

This study is built upon the empirical evidence of recent studies in the states of Mississippi and Alabama and evaluates these findings using the Louisiana Crash Data Reports. The task is to empirically estimate the effects of both alcoholic beverage consumption and gasoline prices on the youth, drunk-driving, and overall fatal crashes. In a burgeoning empirical literature, gasoline prices and alcohol consumption have often been cited as the major determinants of the motor vehicle fatal crashes in the state of Mississippi (Chi, Cosby, Quddus, Gilbert, & Levinson, 2010; Chi, Zhou, McClure, Gilbert, & Cosby, 2011) and Alabama (Chi, McClure, & Brown, 2012). In the same fashion, Hyatt, Griffin, RuelII, and McGrwin (2009) investigate the relationship between the motorcycle related fatalities and crashes for the entire United States.

The very large amount of research activity on the determinants of the motor vehicle fatal crashes has often focused on the gasoline price or the alcohol consumption along with a set of controls related to the economic conditions, measured by the state employment rate, the weather conditions, measured by the average air temperature and the rainfall, the drivers' demographic characteristics, measured by age, gender, and ethnicity, the observance of safety measures, measured by the seat belt usage by the drivers or passengers during the fatal, injury or property damage-only crashes (Chi et al., 2010, 2011, 2012; Hyatt et al., 2009; Kenkel, 1993; Leigh & Wilkinson, 1991; McGwin & Brown, 1999; Noland, 2005). The results of the burgeoning empirical literature are inconclusive on the expected signs. In this study, the gasoline price and the alcoholic beverage consumption per capita are the explanatory variables along with a host of controls (see Chi et al., 2012).

Two major trends have emerged in the empirical literature. The first trend postulates a positive association between the gasoline prices and the number of fatal crashes (Chi et al., 2011; Dee, 1999, 2001; WHO, 2014). That is, an increase in gasoline prices reduces the purchasing power of some drivers and is expected to trigger the stress levels of individuals who face hardship. The hardship hypothesis suggests that binge drinking increases during higher unemployment rates (Dee, 2001). The hardship coupled with the increase in the gasoline price levels may induce some individuals to consume more alcoholic beverages and drive while intoxicated or under the influence of alcohol. This likely leads to more alcohol involved motor vehicle crashes (De Joy, 1989; Groeger & Brown, 1989; Leigh & Wilkinson, 1991). The hardship hypothesis is tested in this study using the Louisiana crash data reports. The second trend of hardship hypothesis holds the view that bad economic conditions alter drivers' behavior and make them more rational and conservative spenders (Grabowski & Morrisey, 2004, 2006; Leigh & Wilkinson, 1991, 2008). Thus, drivers optimize their trip frequency, minimize their travel time and their travel costs through a careful rationalization of their trip for business, family, or vacation purposes (see Chi et al., 2010; Grabowski & Morrisey, 2004, 2006; Leigh & Wilkinson, 1991, 2008; Wilson, Stimpson, & Hilsenrath, 2009 for more details).

Despite the fact that the increase in gasoline prices more likely decreases the exposure to the fatal crashes, the magnitude of its effects measured by the elasticity is small (Chi et al., 2011). The reason is that there are a fewer fatal accidents compared with the number of injuries and property damage only crashes (Kenkel, 1993; McGwin & Brown, 1999). These authors find that the increasing gasoline prices have a stronger effect on the injury and property damage only crashes. The gasoline price increase is understandably stronger on the young drivers and affects male and female drivers similarly (Chi et al., 2012; Kenkel, 1993; McGwin & Brown, 1999). Alcohol consumption has been cited as the leading cause of fatal, injury and property damage only crashes compared to other causes of death (Leigh & Wilkinson, 1991; Noland, 2005) because it slows reaction times, impairs judgment, corrupts perception of accident risk, and induces drunk drivers to overestimate their perception of control over the vehicle and their self-control (De Joy, 1989; Groeger & Brown, 1989; Leigh & Wilkinson, 1991).

3. Data and methods

3.1. Data sources, variables and descriptive statistics

Five datasets are used in this study and run from January 2005 to December 2015. The first dataset is composed of the regular unleaded gasoline prices gathered from the U.S. Department of Energy, the Energy Information Administration. The second dataset consists of the state shipment of alcohol measured in gallons collected from the Beer Institute. The third dataset includes the Louisiana population estimates gathered from the U.S. Census Bureau. The fourth dataset is composed of the weather condition indicators including the average air temperature, the maximum and minimum temperatures, extreme temperatures maximum and minimum were obtained from the data maintained by the Louisiana State University, Department of Geography and Anthropology. The last dataset is the Louisiana Crash Data reports made publicly available by the Louisiana Department of Transportation Traffic Safety Office and the Louisiana State University Highway Safety Research Group.

The literature review suggests a comprehensive list of motor vehicle fatal crash covariates including the average gasoline prices, alcohol consumption, seat belt usage, road conditions, average air temperature and precipitation, and state unemployment and other drivers' demographic characteristics such as age, gender, and ethnicity/race; however, the publicly available data sets maintained by the Louisiana Department of Transportation and Development, Traffic Safety Office and the Louisiana State University Safety Research Group do not have the drivers' demographic characteristics (gender, age group, and ethnicity/race)

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