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The cell phone effect on truck accidents: A specification error approach

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ABSTRACT

This paper examines the impact of cell phone usage on truck accident rates in the United States using econometric models and specification error tests. The models focus on the potential nonlinear effect of cell phones on these accidents. The results indicate that increases in cell phone usage increase truck accident rates, but at a declining rate.

1. Introduction

Over the last decade, motor vehicle accidents continued to claim over 41,000 lives a year and were responsible for approximately two million injuries per year in the United States.[1] A significant number of these accidents involve trucks. For example, in 2005, there were approximately 4.6 million truck accidents. These resulted in over 13,000 fatalities, considering accidents involving both light and heavy trucks.[2] In addition, the trend in fatalities associated with both light and heavy trucks has been increasing since 1992.[3] As such, these accidents are of interest to economists, public health officials, safety experts, and public policy makers who often attempt to examine the determinants of such accidents with econometric models. These studies have investigated the effect of alcohol, speed, speed variance, income, types of roads, inspection criteria, miles driven, experience of drivers, unemployment rates, the deregulatory climate, among other factors. Many of the results of the above effects are reported in Loeb et al. (1994).[4]

Only recently has the impact of cell phones aroused the interest of researchers when addressing the determinants of motor vehicle accidents as portrayed in Redelmeier and Tibshirani (1997), Loeb and Clarke (2009), Loeb et al. (2009), Fowles

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[1] See Loeb et al. (1994) for a review of the causes and deterrents of transportation accidents.

[2] Trucks are defined by the National Safety Council (1997, p. 6) to include single-unit trucks and truck combinations. They are, "designed primarily for carrying property." A single-unit truck is defined by the National Safety Council (1997, p.7) as, "a truck consisting primarily of a single motorized device. When connected to a trailer, such a device may be part of a truck combination." A truck combination is defined by the National Safety Council (1997, p. 7) as, "consisting of primarily of a transport device which is a single-unit truck or truck tractor together with one or more attached trailers." Truck accidents cover all truck related road accidents, i.e., those involving injuries, fatalities, and property damage only. See Loeb et al. (1994) for further discussion.

[3] Between 1992 and 2005, occupant fatalities in large and light trucks rose from 8683 to 13,841 or 59.4%. See U.S. Department of Transportation (2009).

[4] Of particular interest has been the effect of deregulation of the trucking industry by the Motor Carrier Act of 1980.The impact of the Motor Carrier Act of 1980 is difficult to measure with precision given that the Staggers Act, which deregulated the railroad industry, was initiated the same year. Trucks and railroads may serve as substitutes for one-another, at least in the transporting of certain classes of freight and deregulation of the trucking industry may transfer shipping from the relatively safer mode of transportation, i.e., railroads, to the less safe mode of transportation (trucks). See Loeb and Clarke (2007).

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et al. (2010), among others. The studies referred to centered on the impact in particular of cell phones on passenger cars or pedestrians.[5] No investigations have been conducted regarding the effect of cell phones on truck accidents to date. It has been argued that cell phones have a distracting influence on drivers, reduce attention spans, and impact disadvantageously on reaction times. Yet, only ten states (California, Connecticut, Delaware, Maryland, Nevada, New Jersey, New York, Oregon, Washington, and West Virginia) along with Washington, D.C. ban the use of hand-held cell phones as of 2012.[6] As mentioned above, the attention to cell phone effects on accidents is relatively recent, given that there were only 340,000 cell phone subscribers in the US in 1985. Today, there are over 330 million subscriber connections.[7] Not only has the sheer number of cell phones increased over time, but the percent of drivers using hand-held devices is estimated at 5% in daylight hours.[8] As such, we would expect, a priori, that increases in cell phone usage would be associated with increases in accidents.

In spite of the conventional wisdom regarding the effect of cell phones on motor vehicle accident and fatality rates in general and on automobile accident and fatality rates in particular, the statistical results regarding the effect of cell phones have not been uniform among the studies. Some have shown the expected positive effect, while others have failed to show a statistically significant effect and yet others have suggested that cell phones may reduce fatalities. Still others have argued that the effect of cell phones is determined by the number of subscribers. For example, Redelmeier and Tibshirani (1997) have found a four-fold increase in accidents when cell phones were in use, suggesting a life-taking effect of cell phones, while Chapman and Schofield (1998) credit cell phones with saving lives based on the "golden hour rule."[9] Loeb and Clarke (2009) and Loeb et al. (2009) have attempted to address these fragile results using specification error analysis and a non-linear model and found that the effect of cell phones depended on the number of subscribers in the general public.

This study extends the model developed by Loeb et al. (2009) to truck accidents. This is of particular interest since truck accidents are affected not only by truck drivers using cell phones, but by the volume of cell phones used by other motorists and by the general public. It is hypothesized that cell phones have an accident causing effect, given their distracting effect on drivers as well as an accident mitigating effect should there be a sufficient number of cell phones in the driving community and general public to report on poor driving conditions or accidents on roadways. It is argued that a sufficient number of cell phones need to be in existence to make the potential for the accident avoidance effect to be meaningful. The question then becomes whether this general effect noted among automobile fatality rates is also significant with regard to truck accidents.[10]

The current study is conducted using time series data on truck accident rates and factors which contributed to them for the period 1970–2007 (depending on data availability by variable) using econometric models which, in turn are subjected to stringent specification error tests to assure that the results are statistically viable.

2. Background

Since 1970, truck accidents have trended upward with the exception of a significant downturn between 1990 and 1996.[11] Many of the determinants of these accidents have been outlined in Loeb et al. (1994) and Loeb and Clarke (2007). They include, among other factors, real GDP, unemployment rates, alcohol consumption, population characteristics, roadway characteristics such as speed and speed variance along with miles traveled, the impact of the recent deregulatory climate in transportation, the age of the truck fleet, the real price of fuel, freight miles carried by railroads (a substitute for the movement of freight by trucks), among others. In addition various "companion variables," and or a time trend have been incorporated in the models to adjust for, among other things, omitted variable effects, permanent income, and technology improvements.

Both real GDP and unemployment rates address the impact of economic activity on truck accidents. We might anticipate that real GDP would be positively associated with truck accidents in that when economic activity is strong (and unemployment rates are low) there is a good deal of truck traffic as suppliers of raw materials ship to manufacturers who then ship to wholesalers and retailers. An increase in truck activity is anticipated to increase the likelihood of an accident, all else equal. However, one can also anticipate an inverse relationship between real GDP and truck accidents, given that the demand for safety and driving intensity should both increase with income, but will have offsetting effects on one-another. Generally, studies have found a positive influence of income on motor vehicle accidents when using time-series data (short-run effects) but a negative effect when using cross-sectional data (long-run effects).[12]

[5] See, for example, Loeb and Clarke (2009) and Loeb et al. (2009).

[6] See Insurance Institute for Highway Safety (2012).

[7] See Cellular Telecommunications and Internet Association (CTIA), (2011).

[8] See Glassbrenner and Ye (2007).

[9] The golden hour rule makes reference to the importance of providing care to severely injured patients within the first hour of an accident so as to increase the probability of survival. See Chapman and Schofield (1998) and The Trauma Center Association of America at: http://www.traumafoundation.org (accessed on July 10, 2012).

[10] See Loeb and Clarke (2007) for a further review of the literature on truck accidents along with Loeb et al. (1994).

[11] This downturn may be associated with a rise in unemployment rates. High unemployment rates may be associated with a decline in economic activity and thus a reduction in the need for truck transportation of goods. In addition, high unemployment rates may be associated with the discouraged worker effect, reducing the need for motor vehicle transportation leading to a reduction in motor vehicle related accidents. Unemployment rates remained above 5.3% from 1990 to 1996 and fell below 5% in 1997. See Appendix A for a graph of truck accidents over time.

[12] See Loeb et al. (1994). With regard to the impact of unemployment rates on motor vehicle accidents in general, see Evans and Graham (1988) and Fowles and Loeb (1995).