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Cell Phones and Motor Vehicle Fatalities

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Abstract

We examine real-world data on 6,700 motor vehicle crashes and data on cell phone usage in a mid-sized European country. In a non-experimental context, we document a positive correlation at the cell-tower level between call volumes and the likelihood of a nearby motor vehicle accident leading to a serious injury. We demonstrate that these correlations are robust to a series of controls. Scaling our estimates by the number of crashes in our data, we estimate that a 100% increase in call volumes is associated with a 15% to 43% increase in the likelihood of a serious crash.

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1. Introduction

Smart phones, cell phones and other mobile devices have dramatically changed many aspects of society. In March 2012, the Pew Internet and American Life Project (http://www.pewinternet.org/) surveyed American adults and found that over 88% of American adults surveyed owned a cell phone and more than half owned a smart phone. Relatively to the previous year, smart phone usage rose amongst all major demographic groups. Ownership of other mobile devices has increased substantially as well. 57% of those surveyed owned a laptop and 19% owned a tablet computer.

One particularly relevant policy question is how the use of mobile devices affects driver safety. Cell phone use while driving is thought to be extremely common. In "Distracted Driving: What Research Shows and What States Can Do," the Governors' Highway Safety Association (GHSA) estimates that 7-10% of drivers are using a cell phone at any point in time and that cell phone use is a significant contributor to automobile accidents (15-30% of vehicle crashes involve at least one distracted driver). In response to concerns about the safety of distracted drivers, forty-five states have laws regulating the use of cell-phones while driving.

Despite the substantial concern of policy makers, relatively little consensus has been reached on the impact of distracted driving on safety. Academic studies employ a variety of approaches, from driver simulations to econometric estimates exploiting cell phone plan contract structure and reach an equally wide range of results, from estimates that suggest driver distraction and cell phone use increase accidents substantially to estimates that suggest cell phone use

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has little impact. But, to our knowledge, none of the these studies directly observe primary data on cell phone use and match information with data on vehicle crashes or fatalities.

We bring direct evidence to bear on this important public health and safety question by examining the relationship between accidents and directly observed data on cell phone call volumes at the local level. For more than two thousand cell phone towers, we observe hourly call volumes as well as whether there nearby vehicle accident that led to a serious injury or fatality.

1.1. Previous Literature

Our research will make several contributions to the existing literature examining the relationship between mobile device use and driver safety.

First, our empirical approach (detailed below) will enable us to more cleanly estimate the causal relationship between device use and crashes. Although a number of papers have studied the effect of cell phones on driver safety, no approach to date cleanly estimates the causal impact of mobile device use on driver safety based on real-world driving behavior. The existing literature has produced a wide range of results - from estimates that suggest driver distraction and cell phone use greatly increase accidents substantially to estimates that suggest cell phone use has little impact.

Previous research on the topic has approached the question in one three ways. First, a number of studies compare fatalities before and after state enactment of legislation designed to limit drivers' use of cell phones. These studies tend to find modest effects of cell phone regulation - but cannot measure enforcement or actual cell phone use. If enforcement is imperfect, these studies may substantially understate the relationship between driver distraction and driver safety.

A second set of research attempts to overcome this shortcoming by surveying drivers to elicit information about distracted driving or using after-crash police observation. As examples, McEnvoy et. al. (2005) and Redelmeier and Ticshirani (1997) use cell phone records of a small sample of consenting drivers to see if these drivers had been on the phone immediately prior to a crash. If crash victims using cell phones are unwilling to admit cell phone use, both driver surveys and police observation likely understate the fraction of drivers who use cell phones. A handful of other papers find little causal evidence between distracted driving and driver safety. Violanti and Marshall (1996) , Laberge-Nadeau et. al. (2003) , and Hahn and Prieger (2007) find that drivers who use cell phones tend to be higher risk drivers. A final set of studies have tried to experimentally establish the relationship between driver distraction and safety. These studies have typically used driving simulators to measure reaction times and driver safety in a controlled laboratory environment. While informative, these are unlikely to measure the impact on real-world driving behavior.

Our approach improves on the existing literature in several ways. As we discuss in the methodology section below, our work will: (1) measure real-world crash outcomes, (2) use information on all police reported traffic accidents, and (3) use real-time detailed information on cell phone use to estimate the overall population risks imposed by cell phone use without relying on self-reporting or artificial lab conditions. This will allow us to more cleanly estimate the relationship between cell phone use and driving outcomes.

Our approach also allows us to better understand the risk that distracted driving poses for nearby drivers. Even if many drivers comply with a cell-phone ban, a small number of distracted drivers may still create large risks for non-distracted drivers. By capturing the effects on both the distracted driver and other drivers, the paper better captures the welfare-relevant consequences of cell phone use.

2. Data and Methodology

Our traffic accident data come from the national road safety authority of a mid-sized European country, and they include information on 3,548 accidents in 2006 and 3,155 in 2007. The data only record accidents involving serious injuries or deaths. The data include a detailed time stamp, a roadside location, and a description of the cause of the accident. We were able to successful geocode more than 70% of these accidents using Google's geocoding API.

We match this dataset to a proprietary dataset of a nationwide mobile phone carrier for that same country. The data are call data records that contain the call time, duration and tower locations and scrambled identifiers for each