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Fatal connections—socioeconomic determinants of road accident risk and drunk driving in Sweden

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ABSTRACT

Problem: In recent years a considerable number of papers have examined socioeconomic factors influencing the number and the outcome of traffic accidents. There is however more research needed to confirm the previous results in order to generalize them and a need to examine additional factors that might have an impact. *Method*: This paper uses both regional panel data and national time series data combined with filtering techniques to determine what factors influence the number of accidents, the accident outcome and detected drunk driving. *Results*: Using time series data, it is found that the number of traffic fatalities increases for both per capita and per person kilometer travelled during economic booms. This indicates that the death risk rises not only because of increased mileage or motorization during booms. Using panel data, it is found that traffic fatalities decrease with unemployment, whereas personal injuries increase on a per capita basis with youth and the number of cars. In contrast to property crimes and other types of crime, drunk driving in Sweden decreases during economic contractions. *Discussion*: The main policy conclusion from our results is that resources for safety measures should not be spend uniformly across time and space. Instead, safety measures should be concentrated to areas with a high share of young people and to periods with low unemployment. The results of the time series analysis suggest that factors other than increased mileage during booms contribute to the higher rate of fatalities during good times. Increased risk taking, such as drunk driving, might be an explanatory factor. *Impact on Industry*: The results might be interesting for safety-oriented car and truck producers as well for developers of traffic safety products, since the results indicate in what regional markets and under what market conditions their products are most needed.

1. Introduction

In recent years a considerable number of papers have examined factors influencing the number and the outcome of traffic accidents. Ruhm (2000) was the first investigating how unemployment and traffic fatalities are related. For US state-level data it is found that higher unemployment implies a lower rate of traffic fatalities. Among other examined factors in the research literature are medical treatment (Noland, 2003a), infrastructure (Noland, 2003b), economic growth (Kopits & Cropper, 2008; Koppits & Cropper, 2005), light trucks (Anderson, 2008) and alcohol (Levitt & Porter, 2001).

One important risk factor in road traffic is drunk driving. It might well be the case that not only the amount of traffic increases during booms Krüger, 2012, but that drinking and hence drunk driving also increase. In economic upturns alcohol consumption may rise due to increases in income and individuals using alcohol as self-medication to cope with job stress. However, alcohol consumption may also rise in economic downturns due to more leisure time and the decreasing opportunity cost of drinking. Since there are reasons for both a pro-cyclical and a counter-cyclical relationship, determining the aggregate effect of economic fluctuations on alcohol consumption is an empirical question. For Sweden, Krüger and Svensson (2010) find that alcohol sales (which are closely connected to alcohol consumption) increase as the economy expands.

A recent study (SIKA, 2008) using individual-level data has found that the group of people involved in road accidents differs in many respects from the average population even prior to the accidents. On an individual level the unemployed have a higher accident risk despite the fact that the employed travel more. Nonetheless, factors like alcohol consumption or health status cannot be controlled for with the data used. Hence, if these factors are correlated with both fatalities and unemployment, this might bias the estimate of the correlation between unemployment and traffic fatalities. It is therefore important to investigate whether macro-level data confirms these individual-level findings.

In 1997 the Swedish parliament voted for a declaration ('Nollvisionen') stating that the number of premature deaths as a result of road traffic accidents was unacceptable; thus, strong measures were

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advocated to reduce the number of traffic fatalities to about 270 per annum by 2007. Despite this declaration and efforts by the Swedish Road Administration, the target was not reached, since around 500 persons are still killed on Swedish roads every year.

This paper sets out to ascertain what factors determine the number and outcome of traffic accidents. The data and the methods used are described in Section 2. We examine the impact of fluctuations in GDP and mileage on the fatal accident risk in Section 3.1, and find that the number of traffic fatalities increases per person-kilometer travelled during economic booms. Hence, there seem to be effects of GDP-fluctuations in addition to their impact on mileage. Using panel data in Section 3.2, we find that unemployment decreases traffic fatalities and serious injuries. Section 3.3 presents evidence that not only traffic fatalities but also risky behavior in road traffic (in terms of drunk driving) increase as unemployment falls. A short discussion in Section 4 concludes the paper.

2. Data and method

2.1. Data

2.1.1. National time series data 1950–2005

Fig. 1 visually compares the development of GDP and person-kilometres travelled (PKM), ton kilometres (TKM), death rate and motorization (cars per capita).

It is obvious that traffic (in terms of cars per capita, PKM and TKM) has increased in line with the trend in GDP-growth. At first sight, the number of fatalities per capita is not closely connected to GDP-growth because of the decrease of deaths in road traffic accidents beginning in the late seventies, despite the fact that road traffic increased manifold at the same time. Table 1 shows that cars per capita have increased annually by nearly five percent, whereas GDP per capita has increased by only a little more than two percent annually. Also, person-kilometres travelled (PKM) and tonne kilometres transported (TKM) have increased substantially during the past five decades (4.3 percent and 4.9 percent annual growth). Part of this rapid growth is explained by the increase in population; on a per capita basis PKM-growth is 3.8 percent and TKM-growth is 4.4 percent. Deaths per capita have decreased by one percent annually over the whole period, but the decrease is more pronounced when the traffic growth is taken into consideration (deaths per million PKM have decreased on average by 4.8 percent).

Table 1
Descriptive statistics for annual changes in percent 1950–2005.

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP per capita	55	.0227	.0177	-.0230	.0626
Cars per capita	55	.0463	.0563	-.0138	.2116
PKM	55	.0425	.0530	-.0408	.1955
TKM	55	.0487	.0652	-.0938	.2926
PKM per capita	55	.0379	.0520	-.0447	.1874
TKM per capita	55	.0441	.0643	-.1005	.2859
Deaths per capita	55	-.0099	.0785	-.2044	.1996
Deaths per PKM	55	-.0478	.0661	-.2286	.1245

Data sources: Statistics Sweden; Swedish Institute for Transport and Communications Analysis.

2.1.2. Panel data for Swedish regions 1976–2007

Table 2 contains the descriptive statistics for different variables of interest for Swedish regions during the time period 1976–2007. A person in an accident is said to suffer serious injury if they have broken bones, a crush injury, laceration, severe cutting damage, concussion or internal injury. A serious injury also includes any damage that is expected to lead to hospitalization.

Looking at the regional development (Table 3), we see quite consistent decreases in the number of deaths and serious injuries per capita in Swedish regions. Some notable exceptions exist, for example *Västernorrland*, where we actually see an increase in serious injuries or the relatively minor decrease in traffic fatalities observed for *Blekinge*. In order to test the hypothesis of differing regional trends, we include regional time trends in the model specification for the panel data analysis in Section 3.2.

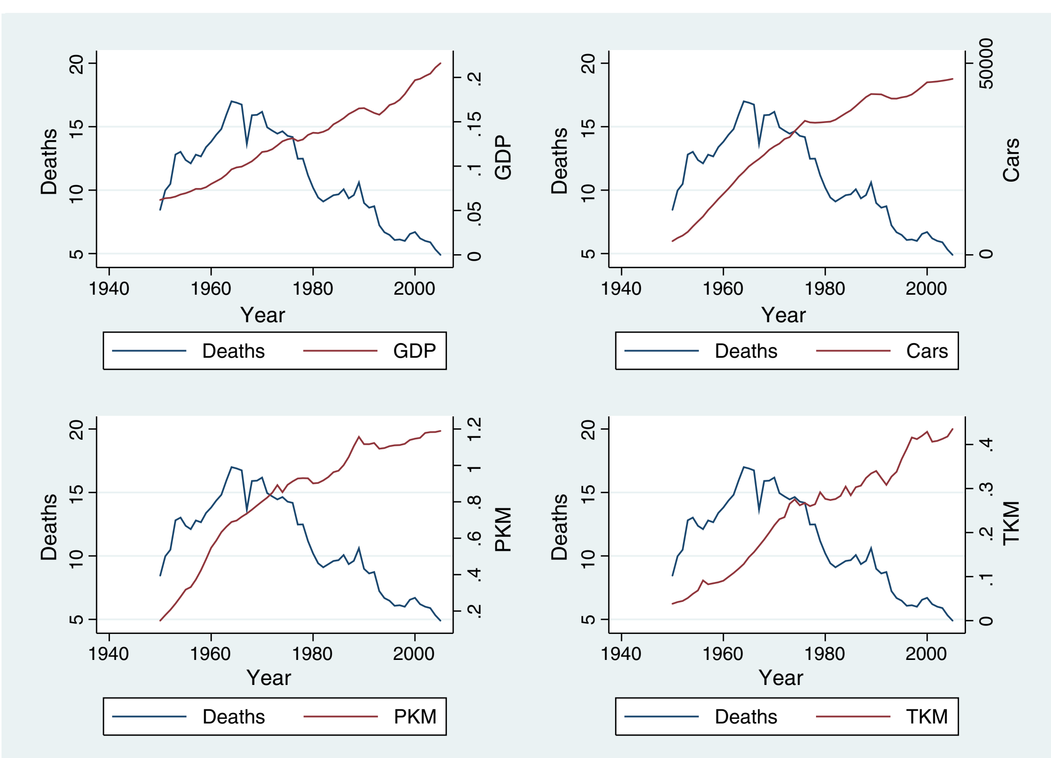

Fig. 1. Comparison of deaths per 100,000 inhabitants with GDP (in fixed prices), motorization (cars per 100,000 inhabitants), PKM (in 100 billion km) and TKM (in 100 billion km).