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How did the economic recession (2008–2010) influence traffic fatalities in OECD-countries?

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ABSTRACT

This paper presents analyses of how the economic recession that started in 2008 has influenced the number of traffic fatalities in OECD countries. Previous studies of the relationship between economic recessions and changes in the number of traffic fatalities are reviewed. Based on these studies, a causal diagram of the relationship between changes of the business cycle and changes in the number of traffic fatalities is proposed. This causal model is tested empirically by means of multivariate analyses and analyses of accident statistics for Great Britain and Sweden. Economic recession, as indicated both by slower growth of, or decline of gross national product, and by increased unemployment is associated with an accelerated decline in the number of traffic fatalities, i.e. a larger decline than the long-term trend that is normal in OECD countries. The principal mechanisms bringing this about are a disproportionate reduction of driving among high-risk drivers, in particular young drivers and a reduction of fatality rate per kilometre of travel, probably attributable to changes in road user behaviour that are only partly observable. The total number of vehicle kilometres of travel did not change very much as a result of the recession. The paper is based on an ITF-report that presents the analyses in greater detail.

1. Background and research problem

The observation that the number of traffic fatalities tends to decline during an economic recession was first made many years ago, see, for example Wagenaar (1984) for an early analysis. By now, several studies, reviewed in the next section of the paper, have reported an association between fluctuations of the business cycle and fluctuations in the number of traffic fatalities. Most studies have found that during an economic recession, the number of traffic fatalities is reduced, or a long-term decline is reinforced. The main objectives of this paper are: (1) to assess the robustness of the statistical relationship between economic recession and the number of traffic fatalities, and (2) to identify mechanisms producing this relationship. The paper is based on an ITF-report (ITF/IRTAD, 2015) consisting of six independent studies of the relationship between economic recession and changes in the number of traffic fatalities together with an overview (Allsop, 2015). The OECD defines a recession as at least two successive quarters during which there is a decline in gross domestic product. In this paper, the term recession will also refer to periods during which unemployment increases.

One of these studies (Wijnen and Rietveld, 2015) is a review of previous studies. One study is a combination of a review of previous studies and statistical analyses of data for 14 OECD-countries (Elvik, 2015). The third (Antoniou et al., 2015) and fourth (Bergel-Hayat et al., 2015) are econometric analyses of the relationship between recessions and traffic fatalities. The fifth (Forsman et al., 2015) and sixth (Noble et al., 2015) studies examine accident statistics for Sweden and Great Britain in order to identify mechanisms that underlie the relationship between economic recession and change in the number of traffic fatalities. The overview (Allsop, 2015) draws together a number of the findings. All studies were completed during 2014. The studies were conducted independently of each other.

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Table 1
Studies included in literature review.

Study (Publication year)	Country or region	Period covered by data
Peltzman (1975)	United States	1947–1972
Eshler (1977)	United States	1949–1976
Hoxie et al. (1984)	United States	1975–1982
Joksch (1984)	United States	1930–1982
Partyka (1984)	United States	1960–1984
Wagenaar (1984)[a]	United States (Michigan)	1972–1983
Zlatoper (1984)	United States	1947–1980
Hoxie and Skinner (1985)	United States	1975–1983
Mercer (1987)[a]	Canada (British Columbia)	1978–1984
Evans and Graham (1988)[a]	United States	1946–1985, 1975–1984
Saffer and Chaloupka (1989)	United States	1980–1985
Wagenaar and Streff (1989)	United States	1976–1985
McCarthy and Ziliak (1990)	United States (Californian cities)	1982–1985
Wagenaar et al. (1990)	United States	1978–1988
Zlatoper (1991)	United States	1987
Reinfurt et al. (1991)[a]	United States	1960–1986
Leigh and Waldon (1991)[a]	United States (District of Columbia)	1976–1980
Partyka (1991)[a]	United States	1960–1989
Pettitt et al. (1992)	Australia (Victoria)	1981–1991
McCarthy (1993)	United States (Indiana counties)	1981–1989
Haque (1993)[a]	Australia (Victoria)	1966–1990, 1985–1990
Keeler (1994)	United States	1970, 1980
McCarthy (1994)	United States (Californian counties)	1981–1989
Ruhm (1995)	United States	1975–1988
Loeb (1995)	United States (Texas)	1982–1987
Ruhm (1996)	United States	1982–1988
Johansson (1996)	Sweden (7 counties)	1982–1991
Robertson (1996)	United States	1975–1991
Wilde and Simonet (1996)[a]	Switzerland	1963–1993
Farmer (1997)[a]	United States	1975–1995
Newstead et al. (1998)[a]	Australia (Victoria)	1983–1996
Fridstrøm (1999)[a]	Norway	1973–1994
Ruhm (2000)[a]	United States	1972–1991
Scuffham (2003)[a]	New Zealand	1970–1994
Tay (2003)[a]	Australia (Victoria)	1983–1992
Neumayer (2004)[a]	Germany	1990–2000
Van den Bossche et al. (2005)[a]	Belgium	1990–2001
Hermans et al. (2006)[a]	Belgium	1974–1999
Garcia-Ferrer et al. (2007)[a]	Spain	1975–2003
Hu et al. (2008)	China	1985–2005
Wiklund et al. (2011)[a]	Sweden	1981–2008

[a] The study was included in the review of Elvik (2015), which in addition included the studies of Scuffham and Langley (2002), Kweon (2011) and Yannis et al. (2014).

They differ in several aspects of methodology and may therefore be used as a basis for assessing the robustness of the relationship between economic recessions and changes in the number of traffic fatalities. If the results of the studies are similar, that indicates a more robust relationship than if the findings are inconsistent.

2. Review of previous studies

Wijnen and Rietveld (2015) identified 41 studies that were included in their review. The studies are listed in Table 1. Some of the studies contained more than one estimate of the relationship between recessions and road safety; hence the total number of estimates extracted from the studies was 49. Summarising the findings of all studies by means of meta-analysis was not feasible, because the studies were too heterogeneous and did not consistently report the information needed for inclusion in a meta-analysis. Elvik (2015), see below, performed a meta-analysis of a subset of studies. The studies reviewed by Elvik are marked by an asterisk in Table 1.

A majority of the studies were made in the United States. There are also several studies from Australia. The data used in the studies span from 1947 to 2008. None of the studies include the great financial crisis and recession that started in 2008. There are 49 estimates of the relationship between economic changes and changes in the number of casualties (fatalities or injuries). 34 of the 49 estimates indicate a statistically significant positive relationship between the economic variables and the number of casualties. This means that when there is growth in gross domestic product (GDP) per capita, or growth in employment (i.e. decline in unemployment), there is also growth in the number of traffic casualties. 10 of the 49 estimates indicate a statistically significant negative relationship the economic variables and the number of traffic casualties, and 5 estimates indicate no statistically significant relationship.

There were 19 estimates using accident rate (number of accidents per vehicle kilometre of travel) as dependent variable. A positive relationship (growing income and growing employment is associated with an increase in accident rate) was found in 58% of the cases, a negative relationship in 37% of the cases and no clear relationship in 6% of the cases.

By far the two most common indicators of economic changes used in the studies are unemployment and GDP per capita. There is a recession when unemployment increases or when there are at least two consecutive quarters (periods of three months) without real growth in GDP per capita. When unemployment increases, the number of traffic casualties declines in 79% of the cases (N = 28), and accident rate declines in 78% of the cases (N = 9). Changes in GDP per capita have a less clear relationship with road safety. There is positive relationship (both variables increase) with the number of casualties in 53% of the cases (N = 15), and with accident rate in 50% of the cases (N = 6).

Change in unemployment thus seems to be the stronger predictor of change in the number of traffic casualties: When unemployment goes up, there will in most cases be a decline in traffic casualties. Is it, on the basis of the studies reviewed, possible to say anything about the strength of the relationship? Elvik (2015) extracted 21 estimates of the elasticity of the number of traffic casualties (mostly fatalities) with respect to unemployment and summarised these by means of an inverse-variance meta-analysis (i.e. each estimate of elasticity was weighted by $1/SE^2$; SE = standard error of estimate). The summary estimate of the elasticity was between −0.024 and −0.060, depending on the model of analysis. This means that if unemployment increases by 1%, one may expect a reduction of the number of traffic casualties of between 0.024 and 0.060% (given that the size of the labour force is constant).

This may seem like a minor effect. However, in the 14 OECD-countries included in the statistical analyses reported by Elvik (2015) (see next section of the paper for further details), mean unemployment rate increased from 5.2% in 2008–7.3% in 2010. This is an increase of 40%, but only of 2.1% points. Based on studies made before the financial crisis, one would expect such an increase in unemployment to be associated with a reduction in traffic casualties of between 1 and 2.4%.

In their review, Wijnen and Rietveld (2015) included a discussion of mechanisms that may generate the relationship between changes in the business cycle and changes in road safety. Based on that discussion, they proposed the model shown in Fig. 1.

Economic changes primarily take the form of changes in GDP per capita and changes in unemployment. These changes may influence road safety through a number of pathways. In a recession, vehicle kilometres of travel may be reduced or grow more slowly than