Is the effect of quantified road safety targets sustainable?

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ABSTRACT

Recent studies have shown that the setting of road safety targets is associated with a substantial reduction in road fatalities in the short-term. Although such targets may not themselves be responsible for the reduction in fatalities, they serve as a useful measure of the intention and commitment of road authorities to formulate timely road safety measures that lead to the achievement of the target. A quantified target is regarded as one of the key components of a road safety strategy. However, few studies have examined the degree of commitment and attention of road authorities to such targets in the long-term. In this study, we revisit the effectiveness of the quantified road safety targets set by the Organisation for Economic Co-operation and Development (OECD) countries, but with a different method, time scale, and group of comparison countries. We not only evaluate the associations between quantified targets and road fatality levels, but also measure the changes in the time-series trends in road fatalities over the long-term. The results indicate that all seven treatment countries analyzed experienced desirable changes in the time-series trend in road fatalities during the period under study, which implies an increase in road safety improvement over time.

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1. Introduction

Quantified road safety targets have been established by many Organisation for Economic Co-operation and Development (OECD) countries to motivate and monitor actions to reduce road accidents, injuries, and fatalities (OECD Scientific Expert Group, 1994, 2008). Comprehensive road safety strategy frameworks have been formulated to stimulate the development of objective-related, cost-effective, and practical measures that contribute to target achievement (Elvik, 1993; Allsop, 2000, 2009; ETSC, 2001, 2003a).

However, a road safety target needs to be both achievable and challenging. Targets that are too ambitious can de-motivate, whereas those that can be achieved without a high level of implementation of all of the relevant measures can induce complacency. Establishing an appropriate target that strikes a balance among ambition, capability, and social acceptability relies on the efficient assessment of traffic exposure and risk levels and the contribution of each road safety measure (ETSC, 2003b).

To measure the degree to which a quantified road safety target has been realized is challenging, and only a few studies have estimated the effectiveness of national road safety targets in a rigorous manner (Elvik, 2001; Elvik and Vaa, 2004; Wong et al., 2006). Elvik (2001) deployed a treatment-comparison group approach to evaluate the effectiveness of setting regional and national road safety targets in which the effects of confounding factors were controlled. The choice of appropriate comparison countries determines the reliability of an analysis. Elvik's (2001) study relied on the researcher's expertise and knowledge to select a single comparison country. Wong et al. (2006) proposed a systematic approach to the selection of a group of comparison countries based primarily on historical road fatality trends. Their study suggested that the creation of quantified road safety targets in 14 OECD countries during the 1981–1999 period was associated with significant fatality reductions over a 3-year period, with an overall fatality reduction of 17.4%.

However, whether the association between quantified road safety targets and fatality reduction persists in the long-term is unknown. This motivates us to revisit the subject using a different method, time scale, and group of comparison countries. All OECD member countries are anticipated to be candidates for comparison groups for the evaluation of the effectiveness of targets set in seven OECD countries, and a regression approach is used for the qualification testing and association measurement. We measure the changes in both the average fatality levels and the time-series trends in road fatalities in the long-term.

2. Data

This study investigates the sustainability of the effects of national quantified road safety targets – identified through a

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number of deliverables and research reports – set in all OECD countries during the period 1970–2000 (Elvik, 2001; Elvik and Vaa, 2004; OECD Scientific Expert Group, 2008). Table 1 presents the years in which quantified road safety targets were set (and the corresponding target year) by the national governments of OECD countries. Fourteen OECD countries first established quantified road safety targets during the 1973–1997 period, whereas 16 OECD countries (Austria, Belgium, Canada, Czech Republic, Germany, Greece, Ireland, Italy, Japan, Korea, Luxemburg, Mexico, Portugal, Slovak Republic, Switzerland, and Turkey) did not set a target or set only one target after 2000.

The fatality data used in this study are taken from World Road Statistics (WRS) and the International Road Traffic and Accident Database (IRTAD) for the period 1963–2006 (IRF, 2008; IRTAD, 2008). It should be noted that not all OECD countries have adopted the standard definition of road fatalities given by the United Nations (as shown in Appendix I), and thus a correction factor has been applied to adapt these data to a 30-day definition for reliable comparisons across countries and periods (IRTAD, 1998). Iceland

and Luxemburg have rather low annual fatality numbers, and are thus removed from subsequent analyses because of the possible bias associated with the instability of low fatality rates (Elvik, 2001).

As certain initiatives are usually put in place when a quantified safety target is first announced by a national government, the road safety performance in the year in which a target is set is subject to that target. Thus, the year preceding the implementation of the quantified safety target is set as the reference year. We employ the treatment-comparison group approach for the effectiveness evaluation (Hauer, 1997; Wong et al., 2005, 2006), using all OECD member countries (listed in Table 1) as the comparison group. Although certain countries (e.g., Belgium and Germany) did not establish quantified safety targets in the study period, the OECD countries share similar characteristics in terms of level of economic development, commitment to road safety achievement, development of a road management system, and establishment of a robust strategy framework. This provides a reliable base for the comparison group.

To ensure that the measures are independent, for each treatment country that set a target in a particular year, countries that did not set a target until the end of the corresponding after-period are selected as candidates for the comparison group. The target year is taken as the final year of the after-period. However, when a new target is set before the expiration of the existing target, the year preceding the setting of the new target is selected as the final year instead.

For example, Norway set a road safety target for 1993 in 1987, and thus the reference year is set at 1986 and the after-period is 1987–1993. Hence, countries with no target set or that set a target after 1993 are selected as potential candidates for the comparison group for Norway. Denmark set a road safety target for 2000 in 1988, and so the reference year is set as 1987. However, a new target was set in 1998. The after-period for the target set in 1988 in Denmark would thus be 1988–1997. Hence, countries with no target or that set a target after 1997 are selected for analysis (as shown in Table 2). Because the timing of the target setting by the 16 OECD countries that set targets after 2000 is unclear, the treatment countries with an after-period up to 2000 and beyond (e.g., Hungary, 2000; Poland, 2001; United States, 2008; and France, 2002) may have no suitable comparison group for analysis. Consequently, only eight OECD countries with quantified road safety targets set during the 1973–1993 period are assessed. Table 2 presents the details of these countries.

3. Qualification test for the comparison groups

We formulate the comparison groups using a rigorous qualification test to compare the historical fatality figures between a treatment country and a corresponding group of comparison countries.

Let the number of fatalities in year y in the treatment country t be n_{ty} (with $y = -k, -k+1, -k+2, \ldots, -1, 0, 1, 2, \ldots, m$, where k

Table 1
Setting of national road safety targets in all OECD member countries (in chronological order).

Country	Notation	Target set	Target year	Subsequent target set
Finland	FI	1973	1979	1977
Netherlands	NL	1985	2000	1986
United Kingdom	GB	1986	2000	1999
Norway	NO	1987	1993	
Denmark	DK	1988	2000	1998
Sweden	SE	1989	2000	1996
New Zealand	NZ	1990	2001	1999
Spain	ES	1992	1999	
Australia	AU	1993	2001	1997
Hungary	HU	1993	2000	
Poland	PL	1996	2001	
United States	US	1996	2008	
France	FR	1997	2002	
Iceland	IS	1997	2000	
Austria	AT	No target set until 2001		
Canada	CA			
Czech Republic	CZ			
Greece	GR			
Ireland	IE			
Italy	IT			
Luxemburg	LU			
Portugal	PT			
Slovak Republic	SK			
Switzerland	CH			
Belgium	BE			
Germany	DE			
Japan	JP			
Korea	KR			
Mexico	MX			
Turkey	TR			

Table 2
Observation periods and groups of comparison countries for each of the eight treatment countries that set a target during the period 1973–1993.

Treatment country	Reference year	Before-period	After-period	Potential comparison countries
FI	1972	1963–1971	1973–1976	NL, GB, NO, DK, SE, NZ, ES, AU, HU, US, FR, $\hat{C}$
GB	1985	1975–1984	1986–1998	$\hat{C}$
NO	1986	1976–1985	1987–1993	PL, US, FR, $\hat{C}$
DK	1987	1977–1986	1988–1997	$\hat{C}$
SE	1988	1978–1987	1989–1995	FR, $\hat{C}$
NZ	1989	1979–1988	1990–1998	$\hat{C}$
ES	1991	1981–1990	1992–1999	$\hat{C}$
AU	1992	1982–1991	1993–1996	$\hat{C}$

$\hat{C}$ = AT, CA, CZ, GR, IE, IT, PT, SK, CH, BE, DE, JP, KR, MX, and TR.