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Can fear of going to jail reduce the number of road fatalities? The Spanish experience

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ABSTRACT

The goal of this article is to evaluate the impact of the drastic Spanish Penal Code reform on the number of road deaths in Spain and the time that the effects might last. This is achieved by means of multivariate unobserved component models set up in a state space framework estimated using maximum likelihood. In short, with this reform Spain might be considered to be closing the final gap that kept it apart from other developed countries as far as the road accident rate is concerned. We have found two different types of effects on Spanish road traffic fatalities. Initially, a month before the reform was passed there was a 24.7 percent fall in Spanish road deaths. After the Bill had been passed and for the following thirteen months, the reduction stayed at a constant sixteen percent. This reform has reduced Spanish road fatalities by 534 in all between November 2007 and December 2008 and the effects will foreseeably continue during 2009.

1. Introduction

During the 1980s and 1990s, Spain was one of the countries in Europe with the highest risk indicators in road accidents (Page, 2001). In 1990, 9,302 persons died as a result of over 100,000 injury crashes on Spanish public roads, with mortality rates of 23.2 killed per 100,000 inhabitants and 5.8 deaths per 10,000 motor vehicles (OECD, 2009); these values were only lower than those for other Mediterranean countries such as Greece and Portugal. Conscious of the high economic and social costs caused by the externalities linked to traffic accidents (see Verhoef, 1994 for an analysis of externalities), the various administrative tiers in Spain have made great efforts to mitigate the problem.

Remarkable progress has been made in Spain: from 1990 to 2008, the risk has been reduced by around 70% (OECD, 2009, see Fig. 1).[1] The European Commission's target of a 50% reduction in traffic fatalities between 2000 and 2010 (European Commission, 2001) has been already achieved in Spain, with the number of road deaths reduced by 52.5% during the 2003–2009 period (Dirección General de Tráfico [DGT], 2010b).

The key to this great improvement has been a change in Spanish road user behavior and attitudes prompted by the huge changes seen in road safety policy. Traffic injury prevention has become a priority of government policies, turning Spain into a social laboratory where a raft of measures has been passed (Arranz & Gil, 2009; García-Ferrer, De Juan, & Poncela, 2007; and Gras et al., 2007) over the last 20 years to bring an end to the high road accident rate. With the dawning of the 21st century, the strategies of the Spanish General Directorate of Road Traffic (DGT) were not only ramped up but also became highly punitive in nature with a view to achieving fast, dramatic results.

With this objective in mind, progressively severer measures were implemented, of which the following can be highlighted:

- *use of safety features*: since 1992, seat belt use has been compulsory in front and rear seats (see García-Ferrer et al., 2007), even in urban areas (idem crash helmets for motorcyclists)
- *avoidance of distractions at the wheel:* speaking on cell phones, for example, except when done 'hands-free' and without the use of earphones, headphones or similar (see Gras et al., 2007)
- *drunk driving*: the legal allowed BAC (Blood Alcohol Concentrations) limit has been reduced from 0.8 g/l in 1992, to 0.5 g/l in 2003[2] (considered in Arranz & Gil, 2009)
- *speed monitoring*: with a significant increase in numbers of traffic patrol officers and the development of the fixed speed camera plan in 2005–2007 (studied by Novoa, Pérez, Santamariña-Rubio, Dell'Olmo, & Tobías, 2010) and a new Penalty Points driving license system (PPS), which came into effect in 2006 (see Montoro, Roca, & Tortosa, 2008).

There has also been a sharp increase in the crude reality of road safety campaigns during the 1990 s (especially since 1992) and the

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[1] According to The Spanish General Traffic Directorate (DGT, 2010b), the number of road deaths has fallen back to 1964 levels, despite the traffic scenario being different in the extreme with the number of vehicles having multiplied by seven.

[2] Despite the negative results achieved by similar measures in other countries (see Cox, 2006 for US).

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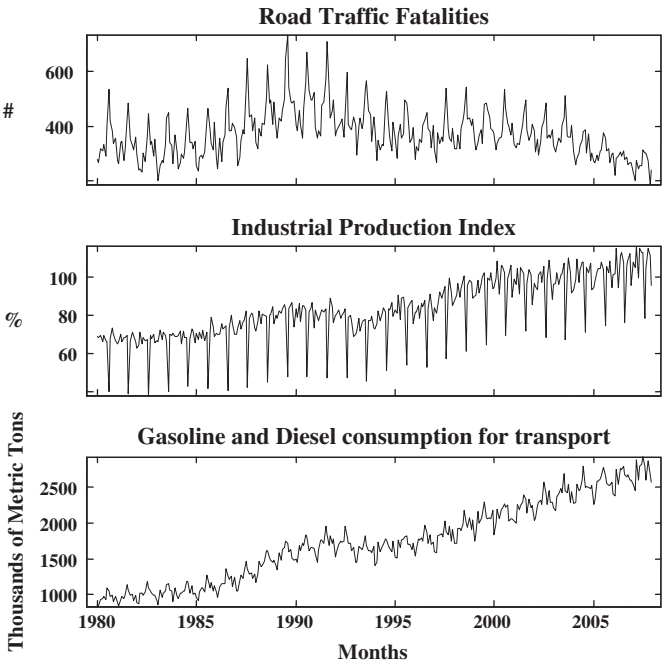

Fig. 1. Endogenous variables in the models.

first decade of this 21st century, including a move from the popular slogan *"don't drive drunk"* sung by Stevie Wonder, to bloody advertisements with brutal images of accidents and eyewitness accounts from real victims.

On top of all this, the most aggressive measure to date has been the reform of the Spanish Penal Code, which came into effect on December 2, 2007. This legal reform is a blow against the impunity of reckless drivers whom it classifies as delinquents at the wheel. Certain actions hitherto regarded as simple traffic violations were upgraded to the category of criminal offenses, including driving at a speed of 60 km/h over the legal speed limit in built-up areas and 80 km/h on highways; driving under the influence of drugs (DUI) or with a BAC of over 1.2 g/l; driving without a license either because of temporary disqualification or because all the points on the license have been lost; reckless driving with disregard for the lives of others; refusing to take a breathalyzer/drugs test; and blocking the traffic. All these offenses can be punished by jail sentences, hefty fines, and community service (generally in hospital A&E departments or attending to road accident victims), apart from disqualification from driving.

In short, Penal Code reform does not address what behavior at the wheel is permitted or not, but provides for significantly tougher penalties for conduct that is not permitted. Its main aim is to boost social willingness to comply with the law, which, according to Vereeck and Vrolix (2007), is the key factor in explaining differences in road safety from one country to another.

The appraisal of the impact of Penal Reform on Road Safety (DGT, 2010a) done at the end of April 2009 showed that the number of inmates imprisoned because of road safety crimes was 2,546. Over half were for DUI offenses or for refusing to undergo the pertinent tests.[3] The deterrence effect of legal measures like these on reckless drivers improves road safety and raises public revenue (Tay, 2010).

Considering monthly series of road accidents from the 1980s to the present day, the goal of this article is to evaluate the impact of this drastic legal reform on the number of road deaths in Spain and the duration the effects might last. For this the effect of other variables that might have influenced Spanish traffic accident rates in the time period analyzed have been isolated, including the level of economic activity, the rate of vehicle utilization, the implementation of other public policies of a legal or punitive nature, and other specific events, including general bad weather conditions. This is achieved by means of multivariate unobserved component models set up in a state space framework estimated using maximum likelihood.

The paper is organized as follows: a description of data and basic methodology appears in Section 2. Section 3 sets out the discussion of our findings and Section 4 summarizes the main conclusions. Finally, we include the references.

2. Description of data and methodology

The key endogenous variable in this study is the number of deaths in road traffic accidents per month from January 1980 to December 2008 (from Spanish Statistics Agency data series available on the agency's website, www.ine.es). Death was defined as occurring within 24 hours of the accident.

The relation of deaths in road accidents to other variables is considered in the context of a full multivariate model in which two additional endogenous variables are included. Firstly, the economic activity is represented by the Industrial Production Index (IPI) and the degree of vehicle utilization by the consumption of gasoline and diesel for transport (see García-Ferrer et al., 2007, about the need for these variables to be included). Time evolution of the three endogenous variables may be seen in Fig. 1.

A series of dummy variables is also included as exogenous to the models, specifically both to accommodate any outliers detected, generally resulting from poor weather conditions (for example JAN 84) or to correct a series of earlier measures and policies prior to the reform of the Spanish Penal Code at the end of 2007, to be specific, and according to findings from earlier studies, compulsory seat-belt use from 1992 (García-Ferrer et al., 2007), and the introduction of the Penalty Points driving license system in 2006 (Castillo-Manzano, Castro- Nuño, & Pedregal, 2010). A declining temporary effect has been considered for the latter, as suggested in the prior literature (see, e.g., Butler et al., 2006; Farchi et al., 2007 on the Irish and Italian cases, respectively).

In other respects, two additional exogenous variables have been included to accommodate the main events on the calendar that would affect the number of accidents: EASTER and TRADING. Whilst the first of these, EASTER, is used to correct the intense traffic in Spain that is the norm during Holy Week (i.e., between Palm Sunday weekend up to and including Easter Sunday weekend), the TRADING variable provides for the number of trading days in a month and, therefore, also reflects the number of weekend days when there is an especially high rate of accidents on highway. TRADING and EASTER were included also in the equations for gas consumption and the IPI. While TRADING proved significant in both cases (see Table 1 below), EASTER was also important for IPI.

Finally, a dummy variable has been included to estimate the effects of the 2007 Spanish Penal Code reform. To be more precise, two specifications have been tried out. Firstly, it was investigated whether the effects started to be felt with the Reform's coming into effect in December 2007 (DEC07 in Table 1 below), or, whether they in fact started to be felt earlier, in November 2007 (NOV07) as a result of the great anticipation that the passing of the Bill through Parliament aroused in public opinion due to the huge amount of attention paid to the legal reform in the media, which meant that the level of expectation was much higher than for other road safety measures. Secondly, the effects were examined to see if they remained constant 13 months after the reform came into effect, or whether, as with other legal reforms (such as the introduction of the PPS driver's license) they had quickly become diluted over time.

[3] This has meant a sharp rise in numbers of inmates in penitentiaries (61.3% more than in 2007). Seventy-five % of all sentences handed down for community service are related to road safety offenses. From December 2007 to April 2009 there were 52,513 convictions for road safety offenses practically bringing the law courts to a standstill.