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Do people drive safer when accidents are more expensive: Testing for moral hazard in experience rating schemes ☆

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ABSTRACT

Using individual policies and claims data from the Croatian mandatory motor insurance we test the theoretical proposition that under moral hazard, experience rated pricing scheme should generate the negative state dependence in claims, i.e. that drivers should drive more safely after they had an accident. The empirical challenge in these tests is to disentangle the state dependence from unobserved heterogeneity. We propose a simple approach based on the explicit reliance on the cost of future accidents function which is used to filter out the pure incentives effect, whereas the bonus-malus scale is used to control for pure heterogeneity. Our results confirm the existence of negative dependence in claims indicating the presence of significant moral hazard effect. Increasing a 3-year cost of having an accident by approximately US$20 decreases the probability of having an accident by 6.5%.

1. Introduction

Transportation safety is of great interest and importance in modern societies. Analyzing the safety of various transportation modes Savage (2013) shows that in the United States 43,000 people die each year in transportation related accidents. Despite the widespread press coverage of dramatic train collisions and airplane crashes, 95% of these transportation fatalities occur on the roads. Historically, the changes in road safety have occurred with various degree of success through three channels. First, changes over the years came about via improvements in vehicle safety equipment and highway design (e.g., Cohen and Einav, 2003; Noland and Oh, 2004; Carpenter and Stehr, 2008). Secondly, the attempts to improve driver behavior and road safety by ensuring that drivers internalize the consequences of their behavior via incentives provided by tort liability and the design and pricing of insurance policies have been quite successful (e.g. Boyer and Dionne, 1989; Sloan et al., 1995; Lindberg, 2001). Finally, the strict enforcement and policing of traffic laws (such as alcohol consumption and speed limits) also had measurable effects on the reduction of crash rates and fatalities (e.g., Homel, 1994; Chen et al., 2002; Tay, 2005).

The main research interest in this paper is to investigate whether people can be incentivized to drive carefully by provisions of the automobile insurance policies. Road safety measures and insurance contracts often use dynamic incentives

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mechanisms based on traffic violations and accidents to encourage safe driving. These long-term incentives mechanisms are either monetary (fines, insurance premiums) or non-monetary (point-record driver's licenses). An important feature of multi-period insurance contracts such as those based on experience rating is that an individual's past experience is a good predictor of the probability of future accidents. Because the drivers have more information about their driving environment and safety behavior than insurers and regulators and the insurer cannot directly observe the self-protection effort of the insured (i.e., there is a problem of moral hazard), the trick is to use the individual's past driving record as a good proxy for the individual's risk.[1] Therefore, experience rating schemes enable the insurer to increase the incentives for the insured to exert better care since a good record in the past means a lower premium in the future.

To test whether people drive more carefully after their insurance premiums went up as a consequence of a previous accident and claim, we use a random sample of car insurance policies from all 14 insurance companies that sold mandatory motor third party liability insurance (MTPL) in Croatia in 2009. The Croatian system of mandatory motor insurance is based on the experience rating schemes, the so called bonus-malus system. From the policy perspective, the motivation for this paper comes from the necessity to understand the connection between the insurance industry practices and the road transportation safety regulation. There is ample anecdotal evidence that enforcement of laws against drunk-driving and speeding in Croatia and some other countries is rather lax and inefficient and consequently the number of accidents is still quite large. If the results show that drivers are sensitive to bonus-malus insurance schemes, then the road safety regulation should focus on market instruments that are easily implementable and non-arbitrary.

With 12.2 traffic fatalities per 100,000 inhabitants Croatia is comparable to some European countries such Austria (12.2) and Italy (12.2), compares poorly to countries like Sweden (6.7) or United Kingdom (6.1), but compares very favorably to countries like Slovenia (15.8), Poland (16.3) or Portugal (18.1). Croatia made tremendous improvements in terms of reducing the number of traffic related fatalities by more than a half from the peak years of 1979 and 1980 (1,605 and 1,603 respectively) to 548 fatalities in 2009. The number of traffic accidents also dropped precipitously from 92,102 accidents in 2003 and to 50,388 traffic accidents in 2009. This result is even more remarkable taking into consideration the rapid growth in the number of registered motor vehicles throughout the entire transition period. For example, the total number of registered motor vehicles at the end of 2005 was 841,000 whereas that number jumped to 1.4 million at the end of 2009.[2] Such remarkable results are directly related to the construction of the network of new highways that made the traveling in the entire country, but especially the communication between the coast and the hinterland, much more secure. But beside this most obvious explanation, we are also interested in finding out whether more competitive and market driven insurance industry practices in the post-transition period could have contributed to the reduction in traffic accidents.

The approach used in this paper relies on the idea that asymmetric information problems (moral hazard and adverse selection) can be distinguished by analyzing the dynamic aspects of the contractual relationships. The strategy we adopt is based on Abbring et al. (2003) and takes the existing (and possibly suboptimal) insurance contracts as given and contrasts the behavior implied by the theory to the observed behavior. Specifically, we exploit the fact that under moral hazard, experience rating has very interesting implications in that the occurrence of an accident affects the entire schedule of future premiums. This suggests that we can test for moral hazard by testing for such dynamics in the insured drivers' accident process. In addition to ACP (2003), a number of empirical studies analyzed the efficiency of dynamic incentives as mechanisms to reduce the asymmetric information problems in pricing of insurance contracts (e.g., Chiappori and Salanie, 2000; Israel, 2004; Chiappori et al., 2006; Dionne et al., 2013).

The main methodological feature of ACP (2003) is to highlight the distinction between pure heterogeneity and state dependence, the problem that originally appeared in economics in studies of unemployment and labor supply (see Heckman and Borjas (1980)). Testing for moral hazard in car insurance with experience rating is similar and boils down to designing a test capable of disentangling the true negative state dependence in accidents (claims) from the unobserved heterogeneity that generates the spurious positive dependence. Using the data from a French insurance company, APC (2003) observe the claim histories for all insurance contracts and are able to model the occurrence of accidents using event-history models. They developed general non-parametric tests which allowed for the non-stationary claim intensity and found no evidence of moral hazard. Their main problem comes from the fact that they observe multiple claims for very few of the many contracts they have in the data which translates into a fairly low precision of their empirical results.

Since the low occurrence of the multiple claims within a contract period (at the end of which the experience rating adjusts) is a common feature of this type of data, we propose a much simpler approach based on the explicit reliance on the cost of future accidents function which is then used to filter out the pure incentives effect, whereas the bonus-malus scale is used to control for unobserved heterogeneity. The fact that the individual's bonus-malus designation is the result of one's historical driving record, and as such endogenous, is dealt with by the use of instruments tied to the nontransparent characteristics of their insurance contracts. After controlling for positive dependence in claims based on unobserved driving ability (proneness to accidents), our results confirm the existence of negative dependence in claims indicating the presence of significant moral hazard effect. The answer to the question posed in the title of this paper is affirmative: yes indeed, people drive more carefully when the accidents are more expensive.

[1] The increasing adoption of in-vehicle data recorders for commercial purposes such as pay-as-you-drive insurance (see: Paefgen et al., 2014) is generating new opportunities for different pricing of insurance policies based on substantially reduced asymmetric information problem between drivers and insurers.

[2] The numbers are compiled from OECD (2010) and MUP (2009).