



Long-term effects of alternative deterrence policies: Panel data evidence from traffic punishments in Denmark

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ABSTRACT

This paper aims to quantify the long-term effects of alternative traffic punishments, ranging from demerit point assignment to conditional suspension of driving privileges. We employ unique longitudinal traffic offense data and exploit the introduction of a point-recording scheme in Denmark. We find that drivers who are assigned one or more demerit points reduce their frequency of traffic offenses and that these effects increase with the number of demerit points accumulated. However, these effects are short-lived, lasting only for the first two years post-reform and fading thereafter. In contrast, a stricter traffic punishment that conditionally suspends the driving license seems to have significant short-run and long-run effects. Our investigation into the types of offenses suggests that the deterrence effects are specific to the offense type for which they are imposed rather than generic improvements in driving behavior. These results imply that the effects of some of the existing traffic punishments are not only short-lived but also provide “specific deterrence”.

1. Introduction

Road traffic crashes involve substantial social and economic costs. For instance, the overall costs of road crashes for the US amounts to 433 billion US dollars each year, accounting for about 4.3% of the GDP (Parry et al., 2007). Aggressive driving behavior is believed to be a key factor in amplifying these externalities. Not surprisingly, this has attracted the attention of public road safety policy makers and led to the introduction of various monetary and non-monetary instruments to influence driving behavior. The demerit point system (DPS) is one of such instruments, which assigns a demerit point (DMP) for each traffic violation committed; accumulating demerit points above a specific threshold leads to license revocation. The point-recording system induces substantial costs for traffic offenders, which, among other things, include forgone income associated with the loss of driving privileges, indirect costs of insurance premiums and costs associated with license redemption. Beyond inducing these costs and hence its incentive effect, the DPS also serves as an important instrument in incapacitating reckless drivers (Bourgeon and Picard, 2007).

Economic models of crime predict that harsher punishments can deter criminal activity by increasing the expected cost of criminal offenses (e.g., Becker, 1968; Polinsky and Shavell, 1979; Lee and McCrary, 2009). Accordingly, some empirical studies find that criminal activities are responsive to the severity of punishments (Helland and Tabarrok, 2007; Drago et al., 2009; Abrams, 2012; Hansen, 2015). In road policing setting, Bates et al. (2012) review studies on the effectiveness of various traffic law enforcement

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strategies and conclude that enforcement operations should be tailored to the specific context and driving environment.¹

More specifically, recent theoretical and empirical studies show that the DPS could be an effective instrument in curbing traffic offenses (Bourgeon and Picard, 2007; Dionne et al., 2011; Abay, 2017).² However, despite the substantial evidence on the response of crimes and criminals to alternative deterrence policies, little is known about the nature and the mechanisms through which these deterrence effects work (Nagin, 2013; Chalfin and McCrary, 2016). More specifically, there is limited evidence on the nature of these responses, specifically whether they are *short-lived* adjustments or *long-lasting* behavioral responses. Investigating the long-run implications of alternative deterrence policies is crucial to designing cost-effective and high-deterrence policies. This is particularly appealing because many deterrence and public road safety policies are proven to produce only short-term effects (Abouk and Adams, 2013; Bhargava and Pathania, 2013; Cheng, 2015; Abay, 2017, 2018). Furthermore, there is limited evidence on whether these alternative deterrence policies (traffic punishments) can improve overall (driving) behavior and hence provide “generic deterrence” or “specific deterrence” related to the specific offenses.

The objective and contribution of this paper is twofold. First, while previous studies (including Abay, 2017) focus on quantifying short-term effects, we aim to investigate the long-run effects of alternative traffic punishments. Second, we aim to explore whether the deterrence effects associated with these traffic punishments are generic improvements in driving behavior or specific to the offenses for which they are assigned. We employ unique longitudinal traffic offense data and exploit the introduction of a point-recording scheme in Denmark. These data enable us to follow individuals’ driving behavior for over a decade, both before and after the introduction of the DPS in Denmark. We employ differences-in-differences approaches to compare the driving behavior of individuals who are assigned one or more demerit points (treatment group) with those who are not affected by the reform (control group), before and after the reform. Despite our focus on new research questions, the data and methods used in this study are similar to those in Abay (2017).

We find that drivers who are assigned one or more demerit points reduce their frequency of committing traffic offenses. We also find that the deterrence effect increases with the number of demerit points accumulated. However, these effects are short-lived and do not last after the validity of the accumulated demerit points has expired. We believe that this empirical regularity is likely to be driven by the institutional settings of the DPS in Denmark and many other countries, a structure that stipulates that consecutive “terms” are independent and hence demerit points from a previous term expire once this term has elapsed. On the other hand, our results show that conditional suspension of drivers’ license is effective in both the short-term and the long-term. These results confirm that stricter traffic punishments with immediate consequences are effective and hence can be considered if deemed appropriate. Although we are not able to observe the exact channel through which the conditional suspension of the driving license affects driving behavior (incapacitation or behavioral response), our empirical exercises suggest that the main channel is deterrence (behavioral response). Examining drivers’ response, our results show that demerit points assigned for speed-related offenses are only effective in deterring speed-related offenses and do not affect overall driving behavior. These results imply that some of the existing traffic punishments are only effective in providing “specific deterrence” rather than general improvements in driving behavior. Finally, we find heterogeneous effects across some groups of car users. Car users who commute a longer distance to their workplace and those with a higher income are more responsive to the assignment of demerit points. We probe the robustness of our results and identification strategy using alternative placebo exercises. We particularly show that treatment and control group drivers share statistically identical pre-reform time trends in driving behavior. We also estimate our differences-in-differences equations on a conservatively matched sample of drivers.

Our paper contributes to the deterrence literature in general and the evolving literature on the efficacy of non-monetary instruments in particular. This paper complements previous studies that only focus on the short-run effects of alternative public road safety policies (Bourgeon and Picard, 2007; Dionne et al., 2011; Abay, 2017). Along this line, our results provide new insights into the effectiveness of the DPS and related stricter traffic punishments in the long-run. While recent studies on the effectiveness of non-monetary traffic penalties, particularly the DPS, argue that it can be a powerful instrument to deter reckless driving, our findings show that the effects are short-lived and do not lead to long-lasting behavioral responses. In view of public road safety policy making, these results implicitly corroborate some existing studies that compare alternative policy instruments to reduce road traffic crashes (e.g., Parry, 2004).

The rest of the paper is organized as follows. Section 2 describes the institutional context, data and sampling design associated with alternative traffic punishments in Denmark. Section 3 presents the empirical model and identification strategies, while Section 4 discusses the empirical results. Section 5 provides some concluding remarks.

2. Institutional context, data and sampling design

2.1. Institutional context

In this section we briefly discuss how traffic enforcement and speed regulation work in Denmark.³ The police enforce speed limit

¹ Similarly, Davey and Freeman (2011) review studies on the application of deterrence theory to road safety. The authors conclude that deterrence-based methods alone may not achieve desired results.

² Bourgeon and Picard (2007) and Dionne et al. (2011) provide theoretical models that demonstrate the effectiveness of the point-recording scheme. Abay (2017) provides empirical evidence on the effectiveness of the DPS in the short-run. More recently, Abay (2018) evaluates the relative efficacy of two common deterrence policies, short-spell incarcerations and monetary punishments, to improve public road safety.

³ Speeding is a major cause of road traffic crashes and related material damage (NHTSA, 2007). In Denmark speeding is a contributory factor in up to 50% of all road

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