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Effects of a penalty point system on traffic violations

Fridulv Sagberg*, Rikke Ingebrigtsen

Institute of Transport Economics, Gaustadalléen 21, 0349 Oslo, Norway

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ABSTRACT

We analysed data from the Norwegian driver's licence penalty point register over a three-year period, in order to investigate whether the number of incurred penalty points in a given time period can predict the probability of incurring additional points in the subsequent period. Data for all category B drivers without penalty points at the start of the study period were included in the analyses. Norway's penalty point system implies that speeding and various other traffic violations result in two or three penalty points for full-license drivers and four or six points for probationary-license drivers. Eight points within a three-year period results in a six-month disqualification. Two hypotheses were formulated: 1) A "driving style effect" implying that drivers with previous penalty points have a higher probability of incurring new points than drivers without previous points; and 2) a "deterrence effect" implying that drivers with more than four points have a reduced probability of incurring new points, due to impending risk of license revocation. Results showed an inverted U-shaped relationship between number of penalty points incurred during a one-year period and the number of additional penalty points incurred in the subsequent year, with the highest number for drivers with four previous points. Thus, both hypotheses were clearly supported, and it is concluded that the penalty point system has a significant deterring effect for drivers who are at high risk of losing their license at the next infraction.

1. Introduction

Penalty – or demerit – point systems (PS) are used extensively for deterring drivers from committing traffic violations. Several countries all over the world have adopted such systems. According to Castillo-Manzano and Castro-Nuno (2012), some type of licence point system exists in 44 countries, the earliest examples being the state of Connecticut (PS introduced in 1957), New Zealand (1967), Japan (1968), and Victoria, Australia (1970). The earliest example from Europe is Germany (1974), whereas most countries have introduced PS after year 2000. For an overview of systems in Europe, see for example Van Schagen and Machata (2012). Typically, points are given for infractions that singly are not sufficiently serious to imply licence withdrawal; drivers who exceed a certain limit on the acceptable number of points lose their licence for a specified period of time. Systems vary a lot across jurisdictions regarding type of violations included, number of points, length of licence revocation, whether points are detracted from a fixed starting number of points or added from zero up, and other aspects.

Speeding is probably the most common criterion for incurring points, and PS is a measure often mentioned in discussions of speed management approaches (for example, ETSC, 2008; Global Road Safety Partnership, 2008). Other examples of violations included in point systems are red-light running, priority infractions, short headways, or non-use of seatbelts. More serious infractions, such as drink driving, are generally not part of point systems, since these violations result in immediate licence withdrawal in many jurisdictions. For an overview of different types of systems, see for example Castillo-Manzano and Castro-Nuno (2012).

Basili and Nicita (2005) have described four different mechanisms by which PS may result in improved road safety: 1) *Deterrence*, that is, drivers refraining from committing traffic violations due to fear of losing their licence; 2) *Selection*, that is, removing repeat offenders from the driver population for some time; 3) *Correction* (or incentive) to change unsafe behaviours; and 4) *Education,* that is, informing drivers about which types of traffic violations are considered most dangerous (and therefore result in penalty points), and in some jurisdiction also mandatory courses for repeat offenders.

The widespread use of point systems is based on an assumption that this measure is effective in preventing drivers from committing traffic violations, by one or more of the mentioned mechanisms.

In a *meta*-analysis study of the effects of implementing new point systems, Castillo-Manzano and Castro-Nuno (2012) found 13 studies where crashes or injuries were used as effect indicators, and eight studies using violations or other risk-related behaviours. In addition, they included five studies using healthcare data. They concluded that there were statistically significant positive effects on all three groups of

* Corresponding author.
E-mail addresses: fs@toi.no (F. Sagberg), rii@toi.no (R. Ingebrigtsen).

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indicators, which means that implementing a PS seems to result in improved safety. However, they also concluded that the effects seemed to be rather short-lived; an analysis of a subset of the studies with duration data showed that the effects of introducing a new PS only lasted for about 16 months on the average.

Several studies included data on violations or accidents before and after introduction of a PS. However, in some of these cases, introduction of PS was combined with intensified police enforcement or higher fines, so that it is not possible to disentangle any effect of PS from the effect of the other measures (for example, Ferguson et al., 1999; Izquierdo et al., 2011; Mikulik, 2007; Montag, 2014; Sze et al., 2011).

In some studies, possibly confounding factors have been controlled for in regression models. For example, in Italy, where PS was introduced in 2003, Zambon et al. (2008) obtained adjusted prevalence ratios by using Poisson regression and found a significant increase in safety belt use among male drivers. Furthermore, a regression analysis of traffic fatalities and driving offenses over the period 2001–2005 (De Paola et al., 2013) indicated a 9% decrease in road accidents and a 30% decrease in road fatalities ascribable to introduction of the PS. Also in Spain, which adopted a PS in 2006, a regression analysis with pre- vs. post-intervention comparison indicated a decreased crash risk (Novoa et al., 2010).

In another study from Italy, Benedettini and Nicita (2009) found clear evidence of a *selection effect* on number of crashes; i.e., an effect of removing offenders from traffic. However, they found only a transient *deterrence* effect, probably associated with announcement of the PS introduction. They explain the failure to observe a more lasting deterrence to some weaknesses with the Italian PS. First, licences are not withdrawn if the driver takes a test and completes a course within 30 days after losing all points, and second, drivers receive bonus points for each year of driving without violations, a system which gives little incentive for safe driving. It should be noted that the Italian PS implies that drivers are initially assigned a credit of 20 points, from which a certain number of points are detracted for each infraction.

A subsequent study (Benedettini and Nicita, 2012) found that the Italian PS resulted in increased use of seatbelts and a decrease in car occupant fatalities. However, there was an increase in car driver involvement in fatal crashes involving other road users than car occupants, which they ascribe to driver behaviour adaptation to using seatbelts.

Even though lasting effects may be difficult to observe in aggregated data, there may be significant deterrence effects on the individual level, for drivers who approach the point limit for losing their licence. Individual deterrence effects are interesting to demonstrate even though the aggregated effects may be too small to be detectable on a population level.

Some studies show decreases in self-reported traffic violations as a consequence of PS introduction (for example, Gonzalez et al., 2008; Gras et al., 2014). However, self-report data may be subject to social desirability effects, and do not necessarily reflect actual behaviour change.

Individual deterrence as indicated by register data has been investigated in Australia by Haque (1990), who found that the mean inter-offense time interval was longer between 2nd and 3rd offenses than between 1st and 2nd offenses. This indicates that the likelihood of a new violation was reduced as a consequence of incurred penalty points.

In Great Britain, Broughton (2008); see also Corbett et al., 2008) compared reconviction rates for speeding offenses in one-year periods (1996–2004) between drivers with different number of convictions in the two preceding years. He found that among drivers with two (or more) convictions, who would be disqualified from driving after one more conviction (due to reaching the penalty point limit), there was a significantly lower proportion of reconvictions compared to drivers with no or one previous conviction, indicating a change in driving behaviour.

A more recent evaluation of Italy's PS (Basili et al., 2015), consisting of a multivariate analysis of register data from a representative sample of 50 000 drivers over six years, showed that the probability of infractions was positively and significantly correlated with the number of residual points, indicating an individual deterrence effect. At the same time, they also found a positive relationship between the number of previous infractions and the probability of new infractions, that is, a recidivism effect. This finding may seem at variance with the previously mentioned evaluations of Italy's PS, which showed only a transient effect on an aggregated level. However, the individual deterrence effect of approaching the point limit of licence withdrawal possibly affects relatively few drivers, so that it may be difficult to observe an effect at the population level.

The purpose of the present study is to investigate the individual deterrence effect of Norway's penalty point system. This system implies licence withdrawal for six months after incurring a predefined amount of penalty points within a three-year period, and the aim of our study is to analyse whether the number of penalty points incurred during a given time period influences the probability of future infractions, measured in terms of additional penalty points incurred in the subsequent period.

A basic assumption underlying our study is that the risk of incurring penalty points is determined by two different and opposing behavioural mechanisms. First, we assume that there are individual differences in driving style resulting in different propensities to commit traffic infractions, which means that drivers with a history of incurring penalty points are more likely to incur additional points in the future. Second, fear of licence withdrawal will imply that the probability of additional infractions (and points) will decrease when the number of points approach the limit for licence withdrawal. Our study differs from most previous research on PS in addressing those two underlying behavioural mechanisms. Further knowledge about the effects of those mechanisms will probably be useful for optimising future point system schemes.

2. Norway's penalty point system

Norway's penalty point system was introduced January 1, 2004 (Norwegian Ministry of Transport and Communications, 2003). The purpose of the system is to contribute to increased road user safety and fewer road traffic fatalities and severe injuries, by means of licence revocation after repeated violations that singly do not qualify for revocation.

The penalty point system is supposed to present predictable reactions to traffic offenders who put themselves and other road users in danger. The system also intends to simplify the task of the police to revoke the licence.

After an evaluation based on experiences from 2004 to 2007 (Stene et al., 2008) the system was extended and strengthened from July 1, 2011, by inclusion of additional offenses and the introduction of double penalty points for novice drivers. Originally, penalty points were applied for speeding, priority violations, driving against red traffic light, and illegal overtaking. The car-driver violations added in 2011 included too short headways, driving on painted median barriers, and failure to secure child occupants (below the age of 15) by adequate child restraint system or seatbelt.

In general, a violation entails three penalty points (with the exception of minor speeding violations resulting in two points) for full-licence drivers and six points (or four for minor speeding) for probationary-licence drivers. Drivers with eight or more points in a three-year period get their licence revoked for six months (and all previous points are deleted).

After four penalty points the driver receives a warning letter with information about the consequences of further penalty points. Four points means that for full-licence drivers, the licence will be revoked after two more violations before the current points expire, and probationary-licence drivers will lose their licence after only one more