

Summary:

Effects on accidents of reduced use of studded tyres in Norwegian cities

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Reduced use of studded tyres in five Norwegian cities from 2002 to 2009 has not had a major impact on the number of road accidents. The five cities are Oslo, Drammen, Stavanger, Bergen and Trondheim. Changes in the use of studded tyres and changes in the number of accidents have been studied in these five cities for the period from January 1, 2002 until August 31, 2009. The use of studded tyres was reduced in all cities except Stavanger. For all five cities as a group, the number of police reported injury accidents increased by 2 percent during the winter season as a result of reduced use of studded tyres. The number of insurance reported accidents (of which more than 90 percent are property damage only accidents) was almost unchanged. The results of the study are highly consistent with the results of a similar study reported by the Institute of Transport Economics in 2000.

Background and research problem

The background of this study is an ongoing discussion in Sweden regarding the impacts of studded tyres. Recently, attention has focused on the potential impacts of studded tyres on public health, arising from the spread of micro-particles that can be inhaled and may cause, or worsen, respiratory diseases. There is a political desire to reduce the use of studded tyres in major cities in Sweden. There is, however, concern that a reduced use of studded tyres may lead to an increase in the number of road accidents.

The Swedish Transport Administration (Trafikverket) therefore contacted the Institute of Transport Economics in order to commission an update of a study reported by the institute in 2000 (Fridstrøm 2000). That study included the cities of Oslo, Stavanger, Bergen and Trondheim. It covered the period from 1991 (1992 in Trondheim, 1993 in Oslo) to 2000. The study modelled changes in the use of studded tyres during this period and evaluated the effects on accidents of these changes by means of a negative binomial regression model. The use of studded tyres was reduced in all cities. The study estimated that reducing the use of studded tyres by 50 percent (e.g. from 70 percent to 35 percent) would lead to an increase of about 3 percent in the number of police reported injury accidents during the season when the use of studded tyres is permitted (from November 1 to the first Monday after Easter). For accidents reported to insurance companies (most of which are property-damage-only accidents), the effect of reduced use of

studded tyres was considerably smaller; an estimated increase of less than 0.5 percent.

The use of studded tyres has continued to decline in most major cities in Norway after the year 2000. Only in the city of Stavanger did the use of studded tyres remain virtually constant between 2002 and 2009. The question the Swedish Transport Administration wanted the Institute of Transport Economics to investigate was whether the reduced use of studded tyres was associated with an increase in the number of accidents. The objective was to replicate the study reported in 2000 as closely as possible.

Sources of data and methods

The study presented in this report is, as far as available data permit, a replication of the study reported in 2000. It employs the same sources of data and the same approach to data analysis as the former study. The study relies on a multivariate negative binomial regression analysis of a large number of factors that influence the number of accidents. Data were taken from multiple sources and were supplied by, among others, the Public Roads Administration, the Norwegian Meteorological Institute and the Norwegian Association of Finance.

The study includes the cities of Oslo, Drammen, Stavanger, Bergen and Trondheim. It covers the period from January 1, 2002 to August 31, 2009. The unit of observation is day per city. The complete data set includes 2,800 days in each city, for a total of 14,000 in the five cities. The effects on accidents of reduced use of studded tyres were estimated by means of a negative binomial regression model containing 23 independent variables. This approach was chosen because it controls statistically for a large number of factors that influence accidents in addition to the use of studded tyres.

In addition to studying the effects on accidents, road user behavioural adaptation in terms of changes in the mean speed of traffic was studied. This study was included in order to estimate how road users adapt speed to factors like traffic volume, the length of daylight and changes in the weather.

A third multivariate analysis was performed in order to determine the effects of factors influencing the use of studded tyres, including the introduction of a tax for using studded tyres.

Results

The use of studded tyres has been reduced in all cities, except in Stavanger. The use of studded tyres in the city of Stavanger was marginally lower in 2009 than in 2002, but fluctuated randomly in the years between, with no clear long-term trend. In Oslo, the use of studded tyres (in the season when it is permitted) was 32.0 % in 2002, declining to 16.5 % in 2009. The corresponding figures for Drammen were 40.1 % (2002) and 30.5 % (2009); for Bergen: 31.1 % (2002) and 14.0 % (2009); for Trondheim 44.5 % (2002) and 20.4 % (2009).

Model estimates show that the number of police reported injury accidents goes down when the use of studded tyres increases (as it did some years in Stavanger

and on a few occasions in the other cities), and increases when the use of studded tyres is reduced. The largest decline in the number of injury accidents observed was 1.3 %. The largest increase observed was 9.5 %. For all five cities as a group, the number of injury accidents increased by 2 %. Figure S.1 shows the relationship between percentage points of change in the use of studded tyres using 2002 as baseline and change in the number of police reported injury accidents.

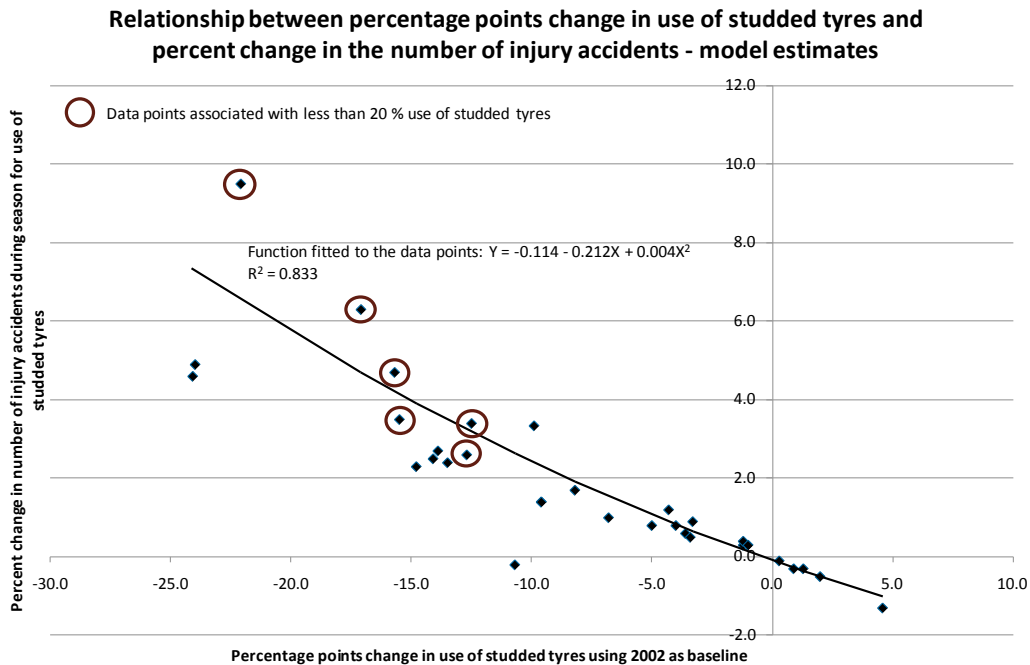


Figure S.1: Relationship between percentage points of change in use of studded tyres and percent change in the number of police reported injury accidents

There was no meaningful change in the number of insurance reported accidents (property damage accidents). The results are highly consistent with those reported in the study published in 2000.

Speed is reduced when traffic becomes denser. Speed is reduced considerably when snow is falling. If the ground is covered by snow, speed is reduced even in fine weather, although not as much as when snow is falling. Road user adaptation in terms of speed was not sufficient to fully offset the adverse effects of bad weather on the number of accidents.

Introducing a fee for the use of studded tyres was found to reduce the use of such tyres by four percentage points (e.g. from 26 to 22 percent).

Discussion and conclusions

The main source of uncertainty in a study of the kind reported here, is whether one has been able to successfully control for all potentially confounding variables, thus supporting a claim that the changes in the number of accidents were caused by changes in the use of studded tyres, and not something else. Unfortunately, there is a potentially important omitted variable in this study. That is changes in winter road maintenance. Data on winter road maintenance are not available in a form that permits inclusion of this variable in a multivariate analysis.

Aggregate data on municipal expenditures suggest that road maintenance has been increased from 2002 to 2009 in all cities except for the city of Trondheim. Expenditures on road maintenance have grown considerably more than wage expenditures for municipal employees. It is therefore possible that a higher standard of road maintenance may have prevented an increase in the number of accidents that would otherwise have happened. It is, however, not possible to estimate the effect on accidents of changes in road maintenance in a meaningful way.

Changes in road maintenance should, however, only be treated as an omitted variable if these changes did not occur in response to changes in the use of studded tyres. If winter maintenance of roads was changed in order to compensate for the effects of reduced use of studded tyres, it is an effect of reduced use of studded tyres that should not be controlled for in statistical analyses.

The fact that the results, at least for injury accidents, display a very clear dose-response pattern (see Figure S.1), and that they agree very well with the results of the previous study suggest as the most reasonable conclusion that reduced use of studded tyres is associated with a quite modest increase in the number of injury accidents. For insurance reported accidents (mostly property damage only accidents), no effects could be detected.