The Effect of Mandatory Helmet Law on Traffic Fatalities in Vietnam

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1. Introduction

Road traffic accidents are considered to be among the leading global public health problems. The World Health Organization (WHO) estimates that 1.2 million people die in road accidents worldwide every year. Millions of others are injured and some of them suffer permanent disabilities. Most of the deaths and disabling injuries occur in developing countries and the fraction of youth traffic fatalities in low income countries is in much higher than in rich countries.

In Vietnam, on average 40 people die in traffic accidents every day and twice that number of people suffer debilitating head injuries (Asia Injury Prevention Foundation 2005). In 2007, nationwide there were 1,300 deaths and 600 serious injuries reported (website of GSO). Ninety-five percent of the 26 million vehicles are motorbikes and the number of vehicles, particularly motorcycles, has been increasing rapidly every year in Vietnam (Anh 2008). In 2007 alone the number of vehicles in Vietnam increased by 16 percent from the previous year (National Traffic Safety Committee 2008). At the same time, road deaths rose by 3.1 percent in Vietnam (website of GSO). The percentage of

road incidents involving motorized two-wheelers or motorized three wheelers out of a total number has reached to 95 nationwide. (World Health Organization, 2004). Traffic fatality risks are increased by not wearing helmets or using seatbelts. To reduce traffic fatalities, the government of Vietnam passed a law mandating that all people on motorbikes wear helmets starting December 15, 2007.

Experience elsewhere suggests that mandatory helmet laws do reduce traffic fatalities. This paper uses monthly data to investigate the effect of Vietnam's mandatory helmet law. It has been only one year since the helmet law was implemented in Vietnam, so the results will be tentative. Nevertheless, some understanding of whether the law is having an impact could help build public support for the law. Section 2 includes a review of related literature. Section 3 describes the data and methodology. Section 4 gives the results. Section 5 has conclusions.

2.Literature review

It is widely agreed that automobile safety regulations such as using seat belts, installing air bags or wearing helmets reduce fatalities among automobile occupants in the event of an accident. There have been a number of empirical studies attempting to examine the effects of automobile safety regulations on motor vehicle-related fatalities. Some argues that the overall effect on fatalities might be insignificant or even positive. Peltzman (1975) finds that auto safety regulation has not affected the highway death rate. Using time-series data for the United States, Peltzman emphasizes that drivers have offset safety regulation by taking greater accident risk which causes a shift of the burden of accidents from drivers to pedestrians. Peltzman concludes that although there has been a

long term decline in the highway death rate and a reduction in the probability of accident, there has not been a reduction in deaths per accident. Peltzman's findings support the concept of compensating behavior which implies that drivers with safety equipped motor vehicles drive more recklessly, and safety regulations such as seat belt and helmet use may also cause drivers to drive more recklessly.

A number of studies have examined the effect of helmet laws on motorcyclist fatalities. Early studies that were done soon after the motorcycle helmet laws began to be adopted in 1966 in the United States use simple before and after or cross-state comparisons and estimate that helmet laws reduce motorcyclist fatality rate by 24% to 50% (Sass and Leigh, 1991). From 1975-1978, twenty-four states repealed their helmet laws so researchers started examining the influence of the repeal of helmet use laws on motorcyclist fatalities. Watson, Zador and Wilks (1980) measured the effect of the repeal of helmet use laws on motorcyclist mortality in the United States between 1975 and 1978. Using statistical methods, Watson, Zador and Wilks (1980) matched the states that repealed or weakened their helmet laws with one or more states from the same geographic region that either did not have helmet laws or did not change such existing laws. Watson, Zador and Wilks find that the repeals or weakening the helmet law increased the number of motorcyclist deaths and the number of fatally injured motorcyclists.

Sass and Zimmerman (2000) employ data over a 22-year period to study the impact of helmet laws on motorcyclist fatalities and they consistently find that quantitatively large increase in fatalities are associated with repeal of helmet laws. Adoption of helmet laws and reinstatement of previously repealed helmet laws

significantly reduced the motorcyclist fatalities by 29-33%. Sass and Zimmerman (2000) regressed the number of motorcyclist fatalities per capita on whether the state has a helmet law and other variables such as local temperature, registered motorcycles per capita, alcohol consumption per capita, maximum speed limit and other variables with year and state fixed effects. According to Sass and Zimmerman (2000), the efficacy varies directly with the warmth of a state climate since voluntary helmet wearing rates are higher in harsher climates.

Sass and Leigh (1991) examine the impact of having helmet laws on fatality rate and find that fatality rates states with helmet laws would on average be less than 1% lower than for states without laws. Sass and Leigh argue that existing econometric studies of the efficacy of motorcycle helmet laws assume that such laws are exogenously determined and may therefore yield biased results. To correct for possible selectivity bias, Sass and Leigh use a selectivity model in which the choice of having a helmet law is endogenous. Sass and Leigh conclude that the greater the reduction in fatality rates the more likely a state would have a helmet law. Modeling legislative change requires accounting for the preexisting legal environment. "In such a model with lagged values of the dependent variable it is difficult to distinguish between situations where the existence of a law has an impact on its retention (true "state dependence") and simple serial correlation." (Sass and Zimmerman, 2000)

Branas and Knudson (2000) investigate motorcyclist death rates between states with motorcyclist helmet laws and those without. Using a least squared regression model Branas and Knudsaon (2000) find that the existence of motorcyclist helmet law does

lower the motorcycle riders' death rates after controlling for other factors that affect motorcyclist fatalities (most notably population density and temperature).

Similar studies have been done in the United States examining the effect of seat belt laws on traffic fatalities. Garbacz (1992) estimates the effectiveness of seat belt laws on traffic fatalities using cross sectional data. Garbacz (1992) suggests that seat belt laws have no significant effect on total or occupant fatalities but it leads to increased non-occupant deaths possibly as a result of more dangerous driving.

Calkins and Zlatoper (2001) studied the presence of offsetting behavior and assert that when drivers feel safer, they compensate by driving less cautiously. Using two years (1988 and 1997) of state level data, Calkins and Zlatopers (2001) regressed total and nonoccupant motor vehicle deaths. The findings are consistent with the off-setting behavior hypothesis.

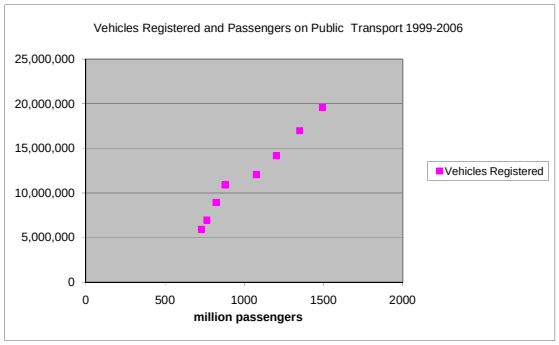
Using a panel data on the 50 U.S. states and the District of Columbia for the years 1983 to 1997, Cohen and Einav (2003) investigate the effectiveness of mandatory seat belt laws in reducing traffic fatalities. Cohen and Einav (2003) analyze how much laws, by influencing seat belt use, affect the incidence of traffic fatalities. The results suggest that the seat belt laws lower overall traffic fatalities by increasing seat belt usage. However, Cohen and Einav (2003) do not find significant support for the offsetting behavior hypothesis.

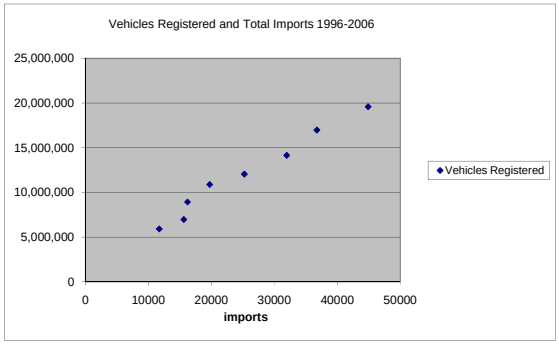
3. Data and Methodology

In order to examine the effect of the helmet law on traffic fatalities in Vietnam, I use time series monthly data on the number of traffic death, the number of traffic accidents, and other variables for the years 2005, 2006, 2007 and 2008 provided by the Government Statistical Office (GSO) of Vietnam. The data, pieced together from monthly data summaries on the GSO web site, include 46 observations which are 12 months data for each years from 2005 through 2007 and the first 10 months data for the year 2008. I use the number of deaths and accidents for the left hand variables and the helmet law and other variables on the right hand side. The helmet law variable equals one if a month is after December of 2007 and zero otherwise. The month of December 2007 has a value of 0.5, so the variable can be interpreted as the portion of the month during which there was a helmet law.

Most of the control variables used for studies in the US are not available for Vietnam, and the relatively small number of observations also make it difficult to include too many variables. However, it would be useful to control for the expanding number of motorbikes on the streets. Monthly data on the number of registered motorbikes is not available. However, two highly correlated variables are available. The number of passengers carried on public transportation (in millions) is available on a monthly basis. Based on annual data, the number of passengers carried has a correlation of 0.99 with the number of registered motorbikes. A second control variable is the total value of imports (billions USD). Since most motorbikes and gasoline are imported, and since higher income leads to higher imports and also to more motorbikes, total imports should be

related to number of motorbikes. Based on annual data, total imports has a correlation of 0.99 with the number of registered motorbikes.





I estimate two separate regression equations: for deaths and traffic accidents. Deaths is defined as the total number of traffic deaths in a month including nonoccupants (pedestrians, bicyclists and car drivers and passengers) and occupants (motorcyclists). Accidents are the number of reported traffic accidents. The data are collected at the scene of the accident by the traffic police. It should be noted that minor accidents are very frequent and usually go unreported. If wearing a helmet means that an accident is minor instead of major, then the helmet law would mean fewer reported accidents. My hypothesis therefore is that the helmet law decreased fatalities and accidents, and that the number of passengers carried and imports increased deaths and accidents.

4. Results

The results for the simple regressions with only helmet law on the right-hand side shows that helmet law is negatively correlated with both the number of deaths and accidents. The simple regressions suggest that there were 75 fewer deaths per month, and 165 fewer reported accidents per month, after the introduction of the helmet law.

The same regressions, but controlling for the import and passenger carriage, shows some surprising results. Although deaths are positively correlated with imports (but not significant), there is a negative correlation between passengers carried and both deaths and accidents. In the case of accidents, the relationship is statistically significant. Since passengers carried on public transportation is highly correlated with motorcycle registrations, this would seem to suggest that more motorcycle registrations are associated with fewer accidents.

However, this might be misleading. The number of registered motorcycles nearly quadrupled in less than a decade. Over the same period, the population only grew by about 10 percent. The growth in motorbikes may have been because people were switching from bicycles to motorbikes, or because more families had multiple motorbikes. Just because the number of motorcycles quadrupled, this doesn't mean the number of people on the road quadrupled. Perhaps the average motorbike is carrying fewer people. This suggests that while passengers carried may be a good proxy for registrations, registrations may not be the proper control variable.

Although the results for passengers carried are surprising, the results for the helmet law are as expected. The coefficient on the helmet law variable is significant at a low level, and negative suggesting that both deaths and accidents were lower after the introduction of the helmet law.

Regression Results					
Dependent variable	Passengers	Imports	Helmet Law	R-squared	N
Deaths			-74.6 (1.47)*	0.047	46
Deaths	-1.07 (1.22)	3.24 (0.21)		0.042	46
Deaths	-0.80 (0.90)	22.78 (1.06)	-113.7 (1.32)*	0.08	46
Accidents			-165.4 (2.71) ****	0.14	46
Accidents	-1.94 (1.93)**	20.6 (1.14)		0.21	46
Accidents	-1.81 (1.75)**	-11.6 (0.46)	-52.6 (0.52)	0.22	46
* 20% level of significance, ** 10% level of significance, *** 5% level of significance, **** 1% level of significance					

Since there was not good data available for control variables, regressions were also run using data for only 2007 to 2008 when long-term factors probably didn't change much. The results show that the helmet law had large and significant impact on both deaths and accidents, although it loses significance when control variables are included. However, as described above the control variables are not the best.

Regression Results, 2007-2008 only					
Dependent variable	Passengers	Imports	Helmet Law	R-squared	N
Deaths			-130.6 (1.94)**	0.16	22
Deaths	-4.42 (2.36)***	-0.96 (0.04)		0.30	22
Deaths	-4.66 (1.90)**	-3.90 (0.12)	-19.02 (0.16)	0.30	22
Accidents			-158.4 (3.24) ****	0.34	22
Accidents	-3.45 (2.47)***	-19.42 (1.00)		0.42	22
Accidents	-2.88 (1.58)*	-12.46 (0.52)	-44.97 (0.51)	0.43	22
* 20% level of significance, ** 10% level of significance, *** 5% level of significance, **** 1% level of significance					

5. Conclusion

The mandatory helmet law took effect in December 2007. Most of the results suggest that the new law reduced both deaths and accidents. The results that are significant show that deaths decline by between 74 and 130 per month, and reported accidents may have declined by 160 per month. There has only been a short period of time since the helmet law was implemented, and further research is needed to identify the full effects of the law. But these preliminary findings suggest that the law could have saved up to 1,500 lives in the first year alone.

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