THE DETERMINANTS OF ROAD TRAFFIC FATALITIES ACROSS COUNTRIES

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Abstract

Concerning policy attention, Road Traffic Accident (RTA) is among the most overlooked causes of death worldwide. Unlike various other health and mortality indicators, road traffic fatality rates do not necessarily decline with economic growth. In recent decades, low-income countries have witnessed a rapid increase in the death rate associated with traffic accidents, whereas high-income countries have registered a decline. The observed pattern is in accordance with the hypothesised 'inverted U-shaped' relationship that road traffic fatality rate has with per capita income. This econometric study attempts to identify the core determinants responsible for the evolution of such mortality rates across countries. The associations were tested using cross-sectional data from 102 countries for the year 2016. The results reveal that a high rate of motorisation and greater per-person energy consumption for road transportation increase the fatality rate. Income inequality is also positively linked with traffic mortality; greater inequality increases the proportion of vulnerable road users and restricts access to emergency healthcare. Effective legislation and enforcement emerge as important mitigating factors. Finally, based on the results, key policy imperatives in the Indian context are identified.

JEL Classification: I14, I15, I18
Keywords: Road Traffic Fatality, Per Capita Income, Inequality

1. INTRODUCTION

Road traffic injury is unlike other causes of mortality in various respects. Firstly, most people do not view it as a major health crisis. In 2016, however, it ranked higher than HIV/AIDS, tuberculosis and diarrhoeal diseases in the list of causes of mortality for all age groups worldwide; more people aged 5-29 years died in a road accident than of any other cause (World Health Organisation 2018). The developing world accounts for a disproportionate share of such fatalities. In these countries, passengers of two-wheelers and three-wheelers along with pedestrians are at most risk.

Secondly, road traffic fatalities are caused due to a multiplicity of factors, making diagnosis and treatment highly context-specific. The underlying cause may be systemic (such as flawed road design) or concerned with the actions of an individual (such as driver negligence) or a combination of both. The option of rolling out a standard vaccine, medication or treatment plan is not available to policymakers when designing strategies to combat road traffic accidents. For illustration, penalties on violation of traffic laws should ideally be complemented with the construction of safe road infrastructure.

Thirdly and most interestingly, the road traffic fatality rate in a country does not simply reduce with economic progress. With increasing per capita income, it initially rises, peaks and falls gradually thereafter (Kopits and Cropper 2003). Economic progress generates counterforces that give rise to an inverted U-shaped curve. A rise in average income stimulates higher vehicle ownership and greater use of roadways. At the same time, it leads to an improvement in the standard of vehicles, roads and inpatient healthcare. In the beginning, the former is the dominant force. Eventually, the latter takes over and the situation reverses.

Roads are ubiquitous; every economy is reliant on road transportation. Even in the presence of alternative modes of transportation, last-mile travel is unfeasible without roadways. Certain factors, such as topography, may restrict countries from developing alternatives in the form of railroads and waterways. Thus, road safety is a matter of concern for every

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nation. This study aims to identify the determinants of road traffic fatalities by comparing countries. Apart from economic progress and its relationship with road safety, the major themes explored in this paper are the role of income inequality and the significance of legislation and enforcement. Sections 2 and 3 summarise the existing literature on the subject and establish the conceptual basis of the study. Sections 4 and 5 describe the design and results of the econometric exercise. Section 6 is a detailed discussion of the findings. The paper culminates in the identification of critical policy imperatives regarding India.

2. LITERATURE REVIEW

Previous cross-country studies found road traffic fatality rate to be an inverted U-shaped function of average income (van Beeck, Borsboom and Mackenbach 2000, Kopits and Cropper 2003, Bishai et al 2006). From figure 1, which plots the fatality rate against per capita income, it is observable that the pattern still holds in the year 2016. In the beginning, the fatality rate rises sharply with average income. Eventually, it attains a maximum; the highest values are recorded in the income range of Int'l $10,000-20,000 (international dollars 2017 PPP). Thereafter, it falls gradually and reaches a floor.

Kopits and Cropper (2003) explained the phenomenon by expressing the fatality rate as a product of fatalities per vehicle and motorisation rate (vehicles[1] per capita).

$$\frac{fatalities\ (F)}{population\ (P)} = \frac{fatalities\ (F)}{vehicles\ (V)} \times \frac{vehicles\ (V)}{population\ (P)} \quad (1)$$

As per capita income increases, fatalities per vehicle (F/V) fall whereas the motorisation rate (V/P) rises. From figures 2 and 3, it is evident that the relationships have remained steady over the years.

As household income rises, passengers switch from two-wheelers and three-wheelers to relatively safer vehicles such as cars while existing car owners upgrade to models equipped with better safety features. At the same time, expenditure on the construction of better-quality roads rises. Ambulance services and post-crash healthcare are more accessible in high-income countries. In low-income countries, the percentage of casualties who succumb to injuries before receiving attention in a hospital is more than twice that in high-income countries (WHO 2018). These factors are mitigating in nature and cause F/V to fall. V/P is positively correlated with average income. A rise in the number of vehicles per capita indicates greater use of road transportation. A higher volume of passengers and freight move through the system. These factors are aggravating in nature and increase the probability of road accidents.

The interplay between these two forces gives rise to the inverted U-shaped curve. In low-income countries, high growth in the rate of motorisation subdues the decline in fatalities per vehicle. The aggravating effect is dominant over the mitigating effect. As a consequence, the fatality rate rises. Beyond a point[2], the trend reverses. The mitigating forces take over the aggravating forces. With further economic progress, the road traffic fatality rate falls.

3. THEORETICAL FRAMEWORK

Based on the preceding discussion, it can be remarked that the hypothesised evolution of the road fatality rate with increasing per capita income is not automatic in nature. Suppose economic progress is not accompanied by a rise in the motorisation rate and leads to an improvement in the health and road infrastructure. In that case, the fatality rate is expected to fall. Thus, a simple log-linear[3] model of road traffic fatality rate can be structured as

$$\ln(Fatalityrate) = \alpha_0 + \alpha_1 \ln(GDPpercapita) + \alpha_2 \ln(Vehiclespercapita) + u \quad (2)$$

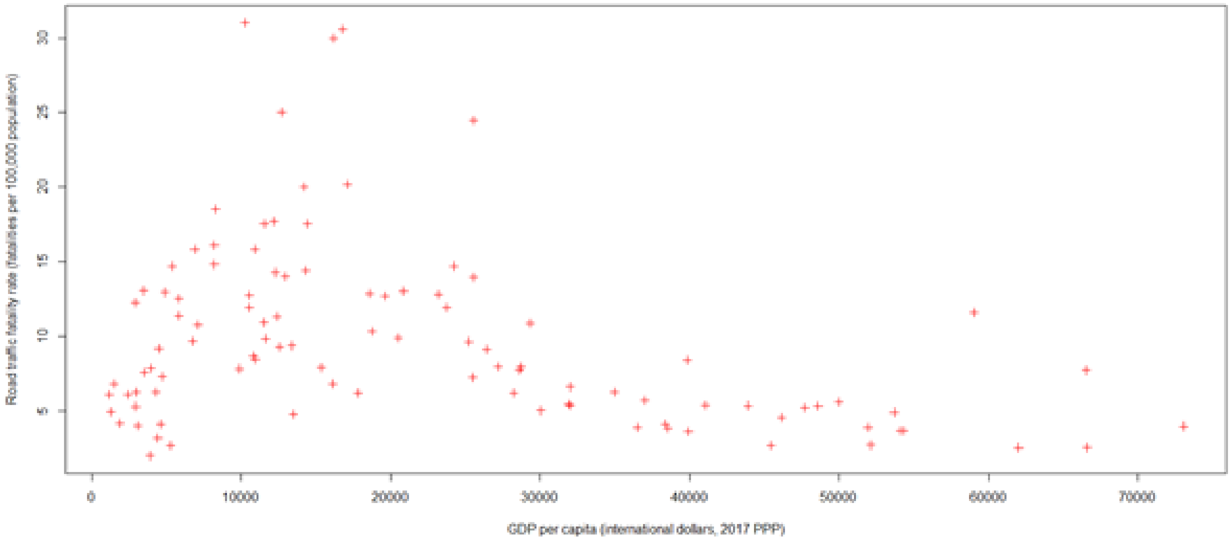
Keeping the motorisation rate fixed, an increase in GDP per capita is expected to generate only positive developments and reduce the fatality rate. GDP per capita, in this case, is effectively a proxy variable for the mitigating factors——quality of healthcare and road infrastructure. Hence, a priori, we expect the elasticity of fatality rate with respect to per capita income to be negative.

1 Throughout the text, the term 'vehicles' refers to all kinds of passenger and transport vehicles

2 Kopits and Cropper (2003) estimated the fatality rate to peak at approximately Int'l $8,600 (international dollars 1985 PPP)

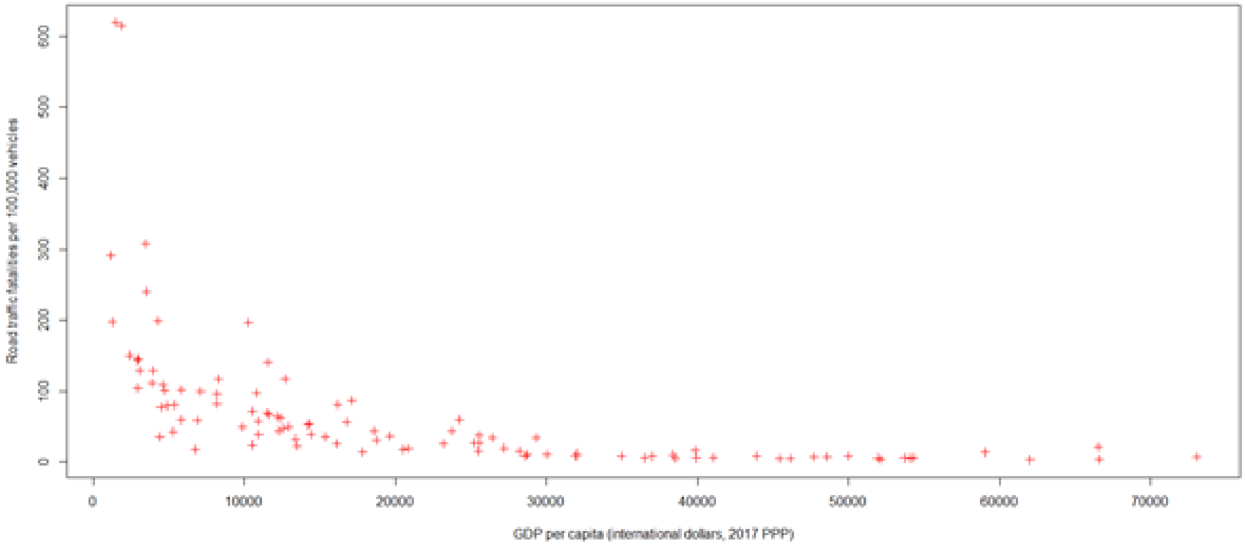
3 The model is broadly derived from equation 1. Fatalities per vehicle (F/V) is a function of income per capita (and possibly other variables). Logarithmic transformation has been used to simplify the multiplicative terms.

Figure 1: *Road traffic fatality rate versus GDP per capita, 2016 (102 countries in the compiled dataset)*



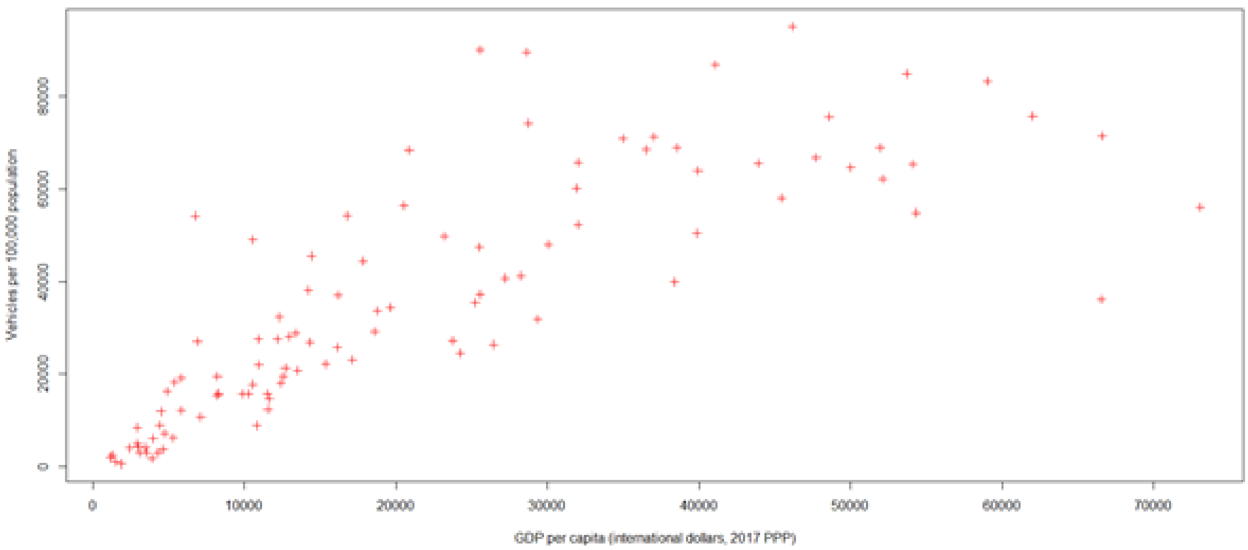
Source: GDP per capita: Human Development Data Center | Road traffic fatality rate: WHO, various national databases

Figure 2: *Road traffic fatalities per vehicle versus GDP per capita, 2016 (102 countries in the compiled dataset)*



Source: GDP per capita: Human Development Data Center | Road traffic fatalities and Vehicles: WHO, various national databases

Figure 3: *Vehicles per capita versus GDP per capita, 2016 (102 countries in the compiled dataset)*



Source: GDP per capita: Human Development Data Center | Vehicles: WHO, various national databases

The motorisation rate measures the reliance of a country on road transportation. Based on figure 3, it can be said that the variability in the motorisation rate is higher among middle and high-income countries. The motorisation rate of a country depends on various factors apart from its per capita income. The availability of alternative means of transportation is among them. A well-developed public transportation system can reduce the use of private vehicles in urban areas. Similarly, rail and waterways can effectively substitute for large-scale freight transportation through highway networks. From the former, we expect the elasticity of fatality rate with respect to vehicles per capita to be positive.

Although figure 1 supports the hypothesised inverted U-shaped pattern, it also reveals significant deviations from it. The deviations may be a result of various other factors not yet considered. Thus, a search for additional determinants is warranted.

Motorisation rate is not the sole indicator of an economy's dependence on roadways. Higher vehicle ownership may not necessarily lead to higher movement of vehicles. Wider distribution of population or higher freight movement may result in a greater number of trips through the system. Thus, apart from the density of vehicles, the dimension of the volume of vehicular movement should also be considered. Per capita consumption of energy in road transport is one such metric. Everything else constant, greater per-person energy consumption in road transportation is expected to increase the possibility of an accident and thereby the possibility of a fatality.

Distribution in income within a country affects road safety in multiple ways. Firstly, income inequality creates heterogeneity among road users in a country (Anbarci, Escaleras and Register 2009). High-income households can own vehicles that are relatively safer to drive, for example, cars. Low-income households[4] have to settle for bicycles, motorcycles or no vehicle at all. Thus, the proportion of vulnerable road users is greater in income-unequal societies. Secondly, income inequality translates into inequality in access to post-crash care. In the absence of adequate public healthcare, affordability of treatment becomes an issue of huge concern. Trauma centres are often located in urban settlements and there is limited availability of ambulance services in remote areas. The importance of legislation and enforcement cannot be overstated when it comes to road safety[5]. Irrespective of the economic setting, its role in ensuring safety on roads is indispensable. Law and vigilance have to complement each other. While regulations need to be dynamic and evidence-based, in the absence of effective enforcement any law will fail to achieve its purpose. This study is an attempt to find evidence in support of these propositions.

4. DATA AND METHODOLOGY

This is a cross-sectional study involving 102 countries with data for the year 2016. Countries were selected based on the availability of relevant data. A complete list of countries can be found in Appendix A.1. Across countries, different time-based definitions are used to classify deaths as road traffic fatalities. For example, certain countries declare the cause of death as road accident injury only if it occurs on-site. Other countries consider a death to be a traffic fatality even if it happens a few days post the accident in a medical centre. Thus, two countries with otherwise similar attributes but different definitions will record a significantly different number of fatalities. The country with the narrower definition is expected to under-report. The World Health Organisation (WHO) recommends a 30-day definition. However, 26 out of the 102 countries in this dataset do not follow this standard. Thus, to account for this heterogeneity, the data were adjusted using WHO's scheme. The adjustment scheme has been described in Table 1.

Table 1: *Adjustment factors for road traffic fatality rate*

Time period (post-accident) specified in road fatality definition	Adjustment factor
At the scene or within 24 hours	1.30
3 days	1.15
6 days	1.09
7 days	1.08
30 days	1.00
365 days and more	0.97
adjusted fatalities = reported fatalities × adjustment factor	

Source: Data Systems: A Road Safety Manual for Decision-Makers and Practitioners, World Health Organisation, 2010

[4] Passengers of two- and three-wheelers and pedestrians account for fifty-four per cent of road traffic deaths worldwide. Twenty-nine per cent of the fatalities are car users (WHO 2018).

[5] For example, correct helmet use can reduce the probability of sustaining injuries to the head by sixty-nine per cent. (WHO 2018)

Data sources and descriptions can be found in Table 2. Descriptive statistics of the variables can be found in Appendix A.2.

Table 2. Data Description

Variable	Description	Time period	Source
	Aggregates		
rtf	Reported number of fatalities attributable to road traffic accidents	2016	Global Status Report on Road Safety 2018, WHO Supplementary data from various national statistical databases. *See Appendix A.3 for the complete list*
veh	Number of registered vehicles	2016[a]	
renergy	Units of energy consumed in road transportation (in ktoe)	2016	World Energy Balances, International Energy Agency
pop	Total population count	2016	World Population Prospects 2019, United Nations
	Derived Ratios		
rtfrate	Reported road traffic fatality rate: road traffic fatalities per 100,000 population, adjusted for reporting definition		
vehpc	Motorisation rate: registered vehicles per 100,000 population		
renergypc	Energy consumption per capita: consumption of road transport energy (ktoe) per 100,000 population		
	Others		
gdppc	GDP per capita (in international dollars, 2017 PPP)	2016	Human Development Data Center, United Nations Development Programme
gini	Gini coefficient of income inequality Range: 0 (perfect equality) to 1 (perfect inequality)	2016 or latest available	
rulelaw[b]	'Rule of Law': one among the six indicators of governance quality developed by the World Bank *(official definition) reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.* Range: -2.5 (weakest) to 2.5 (strongest)	2016	Worldwide Governance Indicators, World Bank

Notes
[a]*Vehicle counts for France, Iraq, Kyrgyzstan and Senegal are for the year 2015*

[b]*In the absence of a composite index measuring the effectiveness of road safety legislation and enforcement, the 'rule of law' indicator from Worldwide Governance Indicators has been used as a proxy. Disregard for law, in general, is expected to translate into disregard for road safety regulations also.*

Using the method of Ordinary Least Squares (OLS), the parameters of the following equation were estimated.

$$\ln(rtfrate_i) = \beta_0 + \beta_1 \ln(gdppc_i) + \beta_2 \ln(vehpc_i) + \beta_3 \ln(renergypc_i) + \beta_4 gini_i + \beta_5 rulelaw_i + u_i \quad (3)$$

5. REGRESSION RESULTS

Results of the OLS regressions have been presented in Table 3. Supplementary information can be found in Appendices A.4 and A.5.

Table 3. OLS Regression Results | Dependent Variable: ln(*rtfrate*)

Independent Variables	Coefficients	
	(1)	(2)
Intercept	2.7227 (5.23)***	−0.5066 (−0.46)
ln(*gdppc*)	−0.6639 (−5.37)***	−0.3517 (−2.35)**
ln(*vehpc*)	0.5692 (5.01)***	0.3985 (4.49)***
ln(*renergypc*)	—	0.2467 (2.21)**
gini	—	3.2500 (5.85)***
rulelaw	—	−0.3756 (−5.33)***
R-squared *Adjusted R-squared*	0.22 0.21	0.58 0.56
F statistic	14.52***	27.41***
Akaike criterion *Schwarz criterion*	165.27 173.15	107.04 122.79
Number of Observations	102	102
t-ratios in parentheses		
Significance codes: 0.01 ***, 0.05 **, 0.10 *		
Source: Author's calculations		

6. DISCUSSION OF RESULTS

In the simpler Model 1, the signs of the coefficients are as expected. The elasticity of fatality rate with respect to per capita income (gdppc) is negative and the elasticity with respect to motorisation rate (vehpc) is positive. The coefficients are individually as well as jointly highly significant. Higher motorisation, indicative of greater reliance on road transportation, causes higher fatalities. Keeping the motorisation rate constant, an increase in average income brings the fatality rate down. This occurs primarily because of two reasons. Firstly, economic progress brings about a change in the composition of road users. Two- and three-wheelers are substituted with relatively safer four-wheelers. Secondly, post-crash healthcare becomes more accessible; the chances of surviving a severe accident increase when emergency treatment is delivered in time.

In Model 2, even as more variables are added, both per capita income and vehicles per capita retain their signs. They also remain statistically significant. However, the magnitude of the elasticities declines markedly. Based on the information criteria, it can be said that Model 2 is an improvement over Model 1. There is a substantial rise in the value of R-squared also. The R-squared value is considerably high for a cross-sectional study of this nature. The coefficients are jointly significant.

The coefficients of the remaining three variables bear the expected signs and are individually statistically significant. Road energy use per capita (renergypc) and motorisation rate are used to measure a country's dependence on road transportation. A higher volume of traffic increases the probability of accidents. The coefficient of income inequality, as measured by the Gini coefficient (gini), is positive. This supports the proposition that the income distribution within a country affects its health indicators, including the road traffic fatality rate. Higher inequality increases the percentage of vulnerable commuters (pedestrians, cyclists, motorcyclists) on the roads. At the same time, it deprives low-income households of quality hospital treatment. Inequality exposes more people to the risk of being involved in an accident and diminishes their chances of surviving such an accident. 'Rule of law' (rulelaw), used as a proxy to judge the effectiveness of road safety legislation and enforcement, carries a negative coefficient.

Greater compliance with traffic regulations reduces the number of mishaps and brings the fatality rate down. The analysis provides ample evidence to support the propositions put forward in the beginning.

Model 2 was put through diagnostic tests to check for multicollinearity, heteroskedasticity and model misspecification. Detailed results can be found in Appendix A.4. The Variance Inflation Factors (VIFs) indicate the presence of multicollinearity. The VIFs of gdppc and renergypc are in particular very high. A high pair-wise correlation exists between them and with the remaining variables (see Appendix A.5). Breusch-Pagan and White's tests refute the presence of heteroskedasticity even though it is a common occurrence in cross-sectional datasets. The result of Ramsey's RESET supports the claim that the model is not misspecified. Adequate specification may be a reason behind the absence of heteroskedasticity. A test to verify the normality of residuals was also conducted. Based on the results it can be concluded that the residuals are normally distributed.

7. CONCLUSION: POLICY IMPERATIVES

Given the complexity surrounding road traffic fatalities, individual country analysis becomes highly context-specific. In India, the road traffic fatality rate has risen from 7.9 per 100,000 persons in 2001 to 11.5 per 100,000 persons in 2019. The fatality rate rose consistently in the first decade of the new century and plateaued thereafter (MoRTH 2020). In 2019, passengers of two-wheelers accounted for the highest share in the fatality rate at thirty-seven per cent. In the same year, the number of registered vehicles stood at 297 million (22,600 vehicles per 100,000 persons), around sixty per cent of which were two-wheelers. In 2001, the vehicle fleet size was 54 million (5,600 vehicles per 100,000 persons) (ibid). Based on conservative estimates, the national vehicle fleet is projected to expand to the size of 507 million (33,700 vehicles per 100,000 persons) by the year 2040 (Arora, Vyas and Johnson 2011). Under these circumstances, curbing road traffic fatalities will continue to be a major challenge for the country in the years to come.

In light of the findings of this study, three key policy imperatives can be identified- (a) managing greater traffic volumes, (b) addressing the inequality in access to emergency healthcare and (c) adopting evidence-based legislation and ensuring greater compliance. Reducing private vehicle ownership is easier said than done; the convenience offered by road transportation is unparalleled. However, efficient public transport can reduce the burden on roads. By expanding the network of buses and metro systems, urban roads can be decongested. Urban planning is of great significance. Constructing transit systems that reduce travel time will help curb vehicular pollution and prevent accidents. In the meantime, existing networks can be improved by identifying and upgrading perilous road stretches. Healthcare in India is marked by grave inequalities. Access to healthcare is skewed, even more so in the case of emergency and trauma care. Therefore, increasing public expenditure in this sector is of utmost priority. Traffic regulations are undoubtedly the most cost-effective solution to minimising the number of road accidents. By making best practices as legal requirements, ensuring compliance and reducing corruption in law enforcement, the status of road safety can be improved. The issue of road safety deserves more attention from the public and government alike. Like in any other health crisis, reducing road traffic fatalities requires dedicated efforts from the side of the authorities and devoted participation of the masses.

APPENDIX

A.1 List of countries (102) in the dataset

Albania, Algeria, Argentina, Australia, Austria, Bangladesh, Belarus, Belgium, Benin, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Cameroon, Canada, Chile, China, Colombia, Costa Rica, Cote d'Ivoire, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Ethiopia, Finland, France, Georgia, Germany, Ghana, Greece, Guatemala, Honduras, Hungary, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Japan, Jordan, Kazakhstan, Kenya, Korea (Republic of), Kyrgyzstan, Laos, Latvia, Lithuania, Malaysia, Mexico, Moldova, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Netherlands, Nicaragua, Niger, Nigeria, North Macedonia, Norway, Pakistan, Panama, Paraguay, Peru, Poland, Portugal, Romania, Russian Federation, Senegal, Serbia, Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, Sudan, Sweden, Switzerland, Tajikistan, Tanzania, Thailand, Togo, Tunisia, Turkey, United Arab Emirates, United Kingdom, United States of America, Uruguay, Viet Nam, Zambia, Zimbabwe

A.2 Descriptive statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
rtfrate	9.76	6.11	2.02	31.00
gdppc	21865.00	17886.00	1150.00	73035.00
vehpc	36057.00	25739.00	683.00	94909.00
renergypc	37.39	30.07	1.71	163.50
gini	0.37	0.08	0.24	0.63
rulelaw	0.14	0.94	-1.63	2.04
Number of observations: 102				
Source: Author's calculations				

A.3 List of supplementary data sources

Algeria
National Office of Statistics. https://www.ons.dz/
Argentina
National Directorate of Road Observatory. https://www.argentina.gob.ar/seguridadvial/observatoriovialnacional
Bangladesh
Bangladesh Bureau of Statistics. http://www.bbs.gov.bd/
Benin
National Institute of Statistics and Economic Analysis. https://insae.bj/
Botswana
Statistics Botswana. https://www.statsbots.org.bw/
Brazil
National Observatory of Road Safety. https://www.onsv.org.br/19076-2/
Canada
Statistics Canada. https://www.statcan.gc.ca/eng/start
China
"Number of fatalities in traffic accidents in China from 2008 to 2018". Statista.
https://www.statista.com/statistics/276260/number-of-fatalities-in-traffic-accidents-in-china/
Colombia
Single National Registry of Traffic. https://www.runt.com
Costa Rica
Costa Rican Observatory of Road Safety. https://www.csv.go.cr/observatorio

Cyprus
Statistical Service of the Republic of Cyprus. https://www.mof.gov.cy/mof/cystat/statistics.nsf/index
Czech Republic
Czech Statistical Office. https://www.czso.cz/csu/czso/home
Ecuador
National Institute of Statistics and Census. https://www.ecuadorencifras.gob.ec/institucional/home/
India
Union Ministry of Road Transport and Highways. https://morth.nic.in
Ireland
Central Statistical Office. https://www.cso.ie/en/index.html
Italy
National Institute of Statistics. https://www.istat.it/en/
Lithuania
Statistics Lithuania- Official Statistics Portal. https://www.stat.gov.lt/en
Mexico
National Institute of Statistics and Geography. https://en.www.inegi.org.mx/
"Number of road traffic fatalities in Mexico from 2007 to 2018". Statista.
https://www.statista.com/statistics/957976/mexico-road-traffic-fatalities/
Myanmar
Central Statistical Organisation. https://www.csostat.gov.mm/
Netherlands
Statistics Netherlands - Central Bureau of Statistics. https://www.cbs.nl/en-gb
"Number of road traffic fatalities in the Netherlands from 2006 to 2019". Statista.
https://www.statista.com/statistics/437942/number-of-road-deaths-in-netherlands/
Nicaragua
Ministry of Transport and Infrastructure. https://biblioteca.mti.gob.ni/
North Macedonia
State Statistical Office. https://www.stat.gov.mk/Default_en.aspx
Pakistan
Pakistan Bureau of Statistics. https://www.pbs.gov.pk/
Poland
Statistics Poland- Central Statistical Office of Poland. https://stat.gov.pl/en/
Portugal
PORDATA- Contemporary Portugal Database. https://www.pordata.pt/en/Portugal
South Africa
National Traffic Information System. www.enatis.com/
Spain
Directorate-General for Traffic. https://www.dgt.es/es/
United Kingdom
Department for Transport. https://www.gov.uk/government/organisations/department-for-transport
United States of America
Bureau of Transportation Statistics. https://www.bts.gov/
Zambia
Road Transport and Safety Agency. https://www.rtsa.org.zm/

A.4. Diagnostic Tests: Model 2

Regression Diagnostic	**Test/Criterion**	**Result**	
Multicollinearity	Variance Inflation Factors	ln(*gdppc*)	14.27
		ln(*vehpc*)	5.92
		ln(*renergypc*)	8.60
		gini	1.26
		rulelaw	2.82
Heteroscedasticity	Breusch-Pagan Test	p-value = 0.340	
	White's Test (squares and cross products)	p-value = 0.477	
Model Specification	Ramsey's RESET (squares and cubes)	p-value = 0.574	
Normality of Residuals	Jarque-Bera Test	p-value = 0.114	
Source: Author's calculations			

A.5. Correlation matrix of the regressors

ln(*gdppc*)	ln(*vehpc*)	ln(*renergypc*)	*gini*	*rulelaw*	
1	0.90	0.93	-0.39	0.79	ln(*gdppc*)
	1	0.88	-0.33	0.66	ln(*vehpc*)
		1	-0.28	0.70	ln(*renergypc*)
			1	-0.35	*gini*
				1	*rulelaw*

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