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Economic development, mobility and traffic accidents in Algeria

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ABSTRACT

The aim of this contribution is to estimate the impact of road economic conditions and mobility on traffic accidents for the case of Algeria. Using the cointegration approach and vector error correction model (VECM), we will examine simultaneously short term and long-term impacts between the number of traffic accidents, fuel consumption and gross domestic product (GDP) per capital, over the period 1970–2013. The main results of the estimation show that the number of traffic accidents in Algeria is positively influenced by the GDP per capita in the short and long term. It implies that a higher economic development worsens the road safety situation. However, the new traffic rules adopted in 2009 have an impact on the forecast trend of traffic accidents, meaning efficient public policy could improve the situation. This result calls for a strong political commitment with effective countermeasures for avoiding the further deterioration of road safety record in Algeria.

1. Introduction

In Algeria, thousands of people are killed in traffic accidents every year. According to the National Center of Prevention and Road Safety (NCPRS), 42,846 traffic accidents involving a victim (traffic accidents thereafter) were recorded in 2013. They generated 4540 fatalities and 69,582 injured victims. The current total cost of road accidents is estimated at over 1 billion U.S $ per year (NCPRS, 2014).

More than 90% of traffic fatalities arise in low-income or intermediary countries, where only 48% of vehicles in the world are registered (WHO, 2009). For Algeria, this number arises to 11.7 traffic fatalities per 100,000 inhabitants in 2013, while high income countries (HIC) show a ratio less than 0.6. A similar divergence exists when the number of traffic fatalities per vehicles is compared. The high income countries (HIC) have less than one fatality per 100,000 vehicles, while this rate is 9.24 for Algeria. Algeria shows a poor traffic safety performance compared with the HICs.

Traffic accident is the outcome of different and intertwined factors, such as the application of new public policy interventions and the economic and social conditions of the country. Public authorities could intervene by implementing some regulations and countermeasures for reducing the adverse impacts associated with the so-called “three main killers”: alcohol, speed and the non-wearing of protecting devices. However, few studies are available about the impact of road safety public policy and knowledge is quite limited especially concerning the modeling of road safety in Algeria (Bencherif and Boubakour, 2013; Gaudry and Himouri, 2013).

Another important issue concerns the impact of economic conditions and its change on the traffic safety performance. Indeed, the evolution of the economic situation affects individual’s needs and the infrastructure provision for mobility, which in turn influences the number of traffic accidents. Several studies have shown that economic development is a key factor for explaining the level of traffic safety (Kopits and Cropper, 2005; Bishai et al., 2006; Paulozzi et al., 2007; Law et al., 2009; Iwata, 2010; Yannis et al., 2014). Indeed, some studies showed an inverted U shape relationship between per capita income and traffic fatalities. This effect is quite similar to the Kuznets curve (1955), which was used by economists for understanding the impacts associated with different stages of the economic development. Applied to the traffic safety issues, it can help in determining the influence of the economic development upon the traffic safety progress. This approach suggests that there is a traffic safety threshold associated with the economic development (Kopits and Cropper 2005; Iwata 2010; Law et al., 2011). In other words, two main trends can be distinguished: one associates a negative impact with the economic development upon traffic safety at large (a higher economic development is associated with an increasing mobility and traffic accidents), another one is linked with a positive effect for traffic safety (a richer society is a safer one by investing some resources for protecting population and securing mobility). Then it means there is a turning point, that some explains

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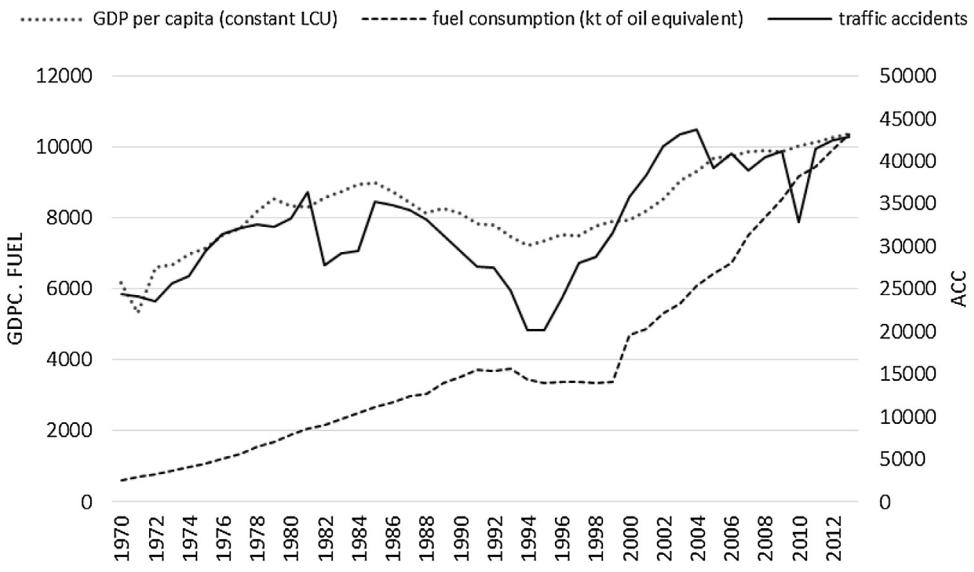

Fig. 1. Number of traffic accidents, GDP per capita and consumption of fuel in Algeria (1970–2013).

essentially by the adaptation of countermeasures (Brüde and Elvik, 2015). Such an approach could explain why some low and middle income countries (LIC and MIC) experience deterioration while facing improved economic conditions and why some HICs benefits from progress with better economic conditions.

From the methodological standpoint, some studies model the relationship between traffic safety performance and the economic conditions by developing a quadratic relationship (Kopits and Cropper, 2005; Bishai et al., 2006; Iwata, 2010; Law et al., 2011; Yannis et al., 2014; Brüde and Elvik, 2015). Other contributions use the theory of cycles or ARMA type models (Auto Regressive Moving Average) to analyze short-term effects between economic growth and the evolution of the traffic safety (Wagenaar, 1984; Van den Bossche et al., 2004; García-ferrer et al., 2007). Using an ARIMA model estimated with monthly data from 1972 to 1982, Wagenaar (1984) find an inverse and significant relationship between the unemployment rate and the number of traffic accidents in the United States. García-ferrer et al. (2007) propose an analysis of economic cycles to examine the short-term causality between the industry activity and traffic safety. The authors have shown that the number of accidents and traffic accident victims share a common cycle with the index of industrial production in Spain for the 1975–2005 period. The scientific literature shows also a positive link between economic growth and some traffic safety indicators (Joksch, 1984; Wagenaar, 1984; Garg and Hyder, 2006; García-ferrer et al., 2007; Yannis et al., 2014). Economic growth is associated with more traffic injuries, while economic recession improves the traffic safety situation. However, Bishai et al. (2006) find an ambivalent effect of economic growth for LICs and HICs. Economic growth is associated with adverse effects for LICs, while it generates positive effects for HIC because of a higher-level economic development. A better road and medical infrastructure could explain this latter result. A recent report published by OECD (2015) shows a positive impact of economic slowdown for HICs and a common impact associated with short-term economic dynamic for LICs and HICs.

Consequently, economic slowdown contributes to the traffic safety improvement, while a dynamic economic growth influences negatively traffic safety figures. This short-term impact seems to be common to the most part of countries. It has to be completed with the long-term impact associated with the economic development stage. It means there are two simultaneous economic effects upon traffic safety. It suggests also that the econometric strategy has to take into account these both dimensions to be able to identify correctly the short and long-term economic impacts.

Although both business cycle and Kuznets curve deal with the relationship between economic growth and traffic safety, they refer to two different time dynamics effects. Indeed, the business cycle approach suggests a short run effect, while the Kuznets curve approach sustains a long run relationship.[1] This distinction is not clearly stated in the literature. Distinguishing short and long run effects makes possible to go further into the understanding of the effect of economic growth on the traffic safety situation. Indeed, it is then possible to conceive opposed effect (a deviation between short and long-term effects) or reinforcing effects (a same direction

Table 1
The augmented Dickey Fuller (ADF) test results.

Variables		(No intercept no trend)	(Intercept)	(Intercept and trend)
At level	ACC	0.58	−1.47	−2.01
	FUEL	0.65	3.48	7.19
	GDPC	−2.15	−2.24	2.35
At first difference	D(ACC)	−6.85[a]	−6.91[a]	−6.82[a]
	D(FUEL)	−5.68[a]	−2.49	−1.41
	D(GDPC)	−7.55[a]	−7.54[a]	−6.57[a]

Notes: Lag lengths are selected automatically according to Akaike Info Criterion.
[a] Test statistics are significant at 1% level of significance.

Table 2
Lag order selection criterion.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	−1066.95	NA	3.44e+19	53.50	53.62	53.54
1	−914.745	273.96	2.68e+16	46.34	46.84[a]	46.52
2	−902.73	19.82[a]	2.32e+16[a]	46.19[a]	47.07	46.1[a]
3	−897.98	7.12	2.94e+16	46.40	47.67	46.86
4	−893.56	5.97	3.84e+16	46.63	48.27	47.22

[a] Indicates lag order selected by the criterion.

[1] It is interesting to note that the last OECD report does not define short run and long-term effects. Generally, a short term could be appraised through few years depending on the reactivity of the economic activity. It is associated with a quite short time scale, that is to say boom and bust periods. Research investigating such effect uses generally a 10 year period study. The long term effect concerns at least a 10–20 year period. Again, it depends on the evolution of society at large. Research interesting in such an effect spread over a 30–40 year period.