

ECONOMIC AND NON-ECONOMIC INCENTIVES FOR MODAL SHIFT TO SUSTAINABLE MOBILITY SOLUTIONS: A REVIEW

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Overview

The advantages of road transport are numerous. They make it possible to move quickly to a given destination and to transport several people. Economically, road transport is an asset for the tourism sector and employment. However, it generates significant negative externalities, such as road accidents, congestion, CO2 emissions, premature deaths, etc. To reduce these negative externalities, it is necessary to reduce the use of energy-intensive vehicles and switch to more sustainable transport modes (collective transport, shared mobility, active modes). Thus, several economic or non-economic tools have already been put in place with the aim of changing mobility behavior. Examples include the Milan eco-toll, the differentiated traffic system introduced in 2019 in Paris, the ecological bonus-malus for cars in France, or the nudge concept applied in the United States as part of the reduction in electricity consumption in 2011. However, these instruments have limits despite their effectiveness. The aim of our study is to provide a literature review on economic (Arnott et al. 1985, Parumog and Acharya, 2007; Bulteau, 2012;) and non-economic (Steg, 2003; Cialdini, 2003; Donald et al., 2014) incentives for modal shift towards sustainable mobility solutions.

Methods

This study identifies the ranges of economic and non-economic incentives for modal shift, their potential effectiveness and their respective limitations. And then, the interest and gaps in our research topic are shown through a bibliometric analysis. A comparison of the two forms of incentives is made to identify the form that appears to be most effective based on a literature review of the literature. Finally, on the basis of the respective limitations identified, methods are proposed to optimise the effectiveness of these different incentives for a modal shift towards sustainable mobility. The study was carried out through a bibliometric analysis and bibliographic search of a literature review. Thus, we were able to highlight the interest and gaps in our topic. The method used by Bornmann and Mutz (2015) and Gandia et al. (2019) in their design of the methodological research on autonomous vehicles is used. It consists of 4 steps :

- The search of academic papers in Thomson Reuter's Web of Science (WoS) database,
- A descriptive analysis of the identified items.
- An in-depth analysis and discussion of the results.
- A discussion of observed results

Regarding the comparison in terms of effectiveness between economic and non-economic incentives, empirical work is identified with quantified results. For economic incentives, we consider effectiveness in terms of modal shift in percentage of modal shares, i.e., a decrease in the use of private cars towards an increase in more sustainable transport modes (public transport, shared mobility, active modes). The effectiveness of non-economic incentives is measured by the sign and degree of significance of the psychological factor on the decrease in the use of private cars and/or the increase in public transport. Then, for ease of reading, comparison and interpretation, these results have been set out in tables highlighting the author of the article, the type of incentive, the methodology used, the sample size, the estimation period, the geographical scope, the variables observed, and the results obtained from the author in terms of modal shift towards more sustainable transport modes.

Results

In order to reduce the negative externalities associated with road transport, we show that economic incentives can contribute to a modal shift towards more sustainable transport modes. These economic measures are classified according to two instruments: price regulations (fuel tax, road pricing through the implementation of congestion charges, parking fees, mileage allowances for bicycles, bonus-malus) and quantity regulations (tradable emission permits). However, these measures may also hamper efficiency in terms of modal shift. They pose a problem of social acceptability and uncertainty as to how the desired effects will be achieved (Schade and Schlag, 2003; Garling and Schuitema, 2007). These various limitations suggest that psychological factors should be taken into account in incentive policies towards more sustainable transport modes.

By analyzing and then discussing the work on non-economic incentives, we show that mode choice are guided by our attitudes, subjective norms, control of perceived behavior, habits and persuasive technologies. However, the literature shows that the effectiveness of these measures depends on the cultural context, public policies and the economic environment. In addition, there is the boomerang effect, which is also associated with the ineffectiveness of these measures. In the social psychology field, the boomerang effect is the opposite of the expected effect following an attempt at persuasion (Kiesler et al., 1971).

By comparing the two forms of incentives (economic and non-economic), we show that economic incentives are generally more effective than non-economic incentives to cut the modal share of private cars and/ or to increase modal shift. However the independent application of economic or non-economic incentives may be ineffective and may induce economic agents to behave in a way that is contrary to what is expected. For this purpose, a combination of both forms of incentives is needed to induce agents to adopt more sustainable transport modes (Hilton et al. 2014).

Conclusions

The independent application of these two types of measures has revealed their effectiveness, but also their limitations. Economic incentives are hardly acceptable to economic agents and limit the freedom to drive. Moreover, the effects of its measures on mobility behavior are uncertain. For non-economic incentives, the boomerang effect and inefficiency in certain cultural (stereotype) and economic contexts (public policies) are the main limitations. Thus, to maximise the effectiveness of these measures in terms of modal shift towards more sustainable transport modes, economic and non-economic incentives need to be combined.

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