

THE ECONOMIC ATTRACTIVENESS OF ELECTRIC VEHICLES IN BRAZIL: THE IMPORTANCE OF INCENTIVE POLICIES

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Overview

The concern about the climate effects of CO₂ emissions, which comes largely from the transport sector, has motivated the search for less polluting alternatives in this sector. The introduction of electric vehicles is one of the vectors promoting the decarbonization of the energy matrix. In addition to the climatic aspects, the diffusion of electric vehicles could help to achieve other objectives, such the reduction of oil dependence in importing countries, the reduction of noise in urban areas, as these vehicles have quiet operation, and improved air quality. Thus, this paper will evaluate the attractiveness of electric and hybrid vehicles compared to internal combustion engine vehicles, the possibilities of reducing CO₂ emissions and highlight the importance of policies to encourage adoption of electric vehicles in Brazil, considering the different profiles of potential adopters of this technology.

Brazil has specific characteristics that could influence the way in which electric vehicles will be introduced. The high share of biofuels makes the issue of emissions less relevant. The high cost of batteries makes it difficult to adopt these vehicles in developing countries. Brazil has a concentration of the fleet in low acquisition value cars, segment in which vehicles have less competitiveness. The lack of recharging infrastructure is also a challenge in a country with continental dimensions. Thus, public policies play an important role in promoting the adoption of electric vehicles.

Methods

In order to evaluate the attractiveness of the acquisition of an electric vehicle in Brazil, we will make an economic feasibility study comparing the acquisition of electric, hybrid and flex fuel vehicles. We consider that a person wants to buy a internal combustion engine, hybrid or electric vehicle and intends to resell it after four years. We present a cash flow, considering the acquisition value, refuelling or recharge price and its resale value. The result of this cash flow can be interpreted as the amount of subsidy needed to enable the diffusion of electric cars or hybrids. The possible reduction in greenhouse gas emissions resulting from the diffusion of electric cars in Brazil will also be quantified, considering the scenarios of penetration of electric vehicles.

Based on the results of this cash flow and international experiences of policies to promote the diffusion of electric vehicles that have had good results, we will create a framework with profiles of potential adopters of electric vehicles. We will identify which profiles are most likely to be consumers of these cars and which policies could be applied.

Results

The high acquisition value of electric and hybrid vehicles makes them unattractive compared to the internal combustion engine cars, even though the electric models provide great savings in fuel costs. On the other hand, these vehicles make it possible to reduce greenhouse gas emissions.

For the diffusion of electric and hybrid vehicles to happen, it is necessary to adopt incentive policies. Consumers with higher incomes and who have a need to travel long distances tend to have more incentive to adopt electric cars.

Conclusions

The specific characteristics of the Brazilian market will make the diffusion trajectory in this country distinct from the others. The current Brazilian scenario is not attractive for the acquisition of electric and hybrid vehicles. The feasibility analysis shows that significant incentives are needed to allow the diffusion of these vehicles. As the biofuels sector is well developed and vehicles with low acquisition value are the majority of sales in the country, the adoption of electric vehicles tends to be slower and limited in Brazil. However, the Brazilian market may experience

particular solutions such as hybrid or electric vehicles that have recalibrated auxiliary combustion engines for the use of ethanol. Such vehicles may have niche markets in certain areas that have a greater incentive to adopt them, such as urban centers with poor air quality. Thus, we expect a late diffusion of electric vehicles and the coexistence of different automotive technologies in the coming years.

References

- ANFAVEA – Associação Nacional dos Fabricantes de Veículos Automotores. Anuário Estatístico 2018. Disponível em: <<http://www.anfavea.com.br/anoario.html>>. Acesso em: 10/10/2018.
- BARAN, R., 2012. A introdução de veículos elétricos no Brasil: Avaliação do Impacto no Consumo de Gasolina e Eletricidade. Tese de Doutorado, PPE/COPPE/UFRJ, Rio de Janeiro, RJ, Brasil.
- BONGES, H. A.; LUSK, A. C. Addressing electric vehicle (EV) sales and range anxiety through parking layout, policy and regulation. *Transportation Research Part A: Policy and Practice*, v. 83, p. 63–73, 2016.
- CONSONI, F. L. et al. Estudo de Governança e Políticas Públicas para Veículos Elétricos. Universidade de Campinas. Campinas, 2018.
- DELGADO, F. et al. Carros Elétricos. *FGV ENERGIA*, v. 4, n. 7, p. 112, 2017.
- EGBUE, O.; LONG, S. Barriers to widespread adoption of electric vehicles: An analysis of consumer attitudes and perceptions. *Energy Policy*, v. 48, p. 717–729, 2012.
- FENABRAVE. Anuário 2017: O Desempenho da distribuição Automotiva no Brasil, 2017.
- FERRERO, E. et al. Impact of the electric vehicles on the air pollution from a highway. *Applied Energy*, v. 169, p.450-459, 2016.
- FONTAÍNHAS, J.; CUNHA, J.; FERREIRA, P. Is investing in an electric car worthwhile from a consumers' perspective? *Energy*, v. 115, p. 1459–1477, 2016.
- INTERNATIONAL ENERGY AGENCY. Tracking Progress: Transport, 2017. Disponível em: <<https://www.iea.org/etp/tracking2017/transport/>>. Acesso em: 07/02/2018.
- KLEPPER, S. Entry, Exit, Growth, and Innovation Over the Product Life Cycle. *The American Economic Review*, v. 86, n. 3, p. 562–583, 1996.
- LI, S. et al. The Market for Electric Vehicles : Indirect Network Effects and Policy Design. *The Association of Environmental and Resource Economists*. v. 4, n. 1, 2017.
- PEREZ, Y.; KEMPTON, W.; PETIT, M. Public Policy for Electric Vehicles and for Vehicle To Gridpower. *Revue d'économie industrielle*, v. 148, n. 4e trimestre 2014, p. 263–290, 2014.
- SISTEMA DE ACOMPANHAMENTO DO INOVAR-AUTO. Available in: <<http://inovarauto.mdic.gov.br/InovarAuto/>>.
- YURONG, C.; PEREZ, Y. Business Model Design: Lessons Learned from Tesla Motors. *Sustainable Economy: Paradoxes and Trends*, 2017. Available in: <https://www.researchgate.net/publication/321666239_Business_Model_Design_Lessons_Learned_from_Tesla_Motors>.