THE FISCAL IMPLICATIONS OF ENERGY TRANSITION IN THE TRANSPORT SECTOR: A CASE STUDY OF THE BASQUE COUNTRY

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Overview

The transition to a zero-carbon economy is a key objective for the European Union and its regions (European Commission, 2019), including the Basque Country, which established a legal framework to meet the target of net-zero emissions by 2050 (Gobierno Vasco, 2022). The transport sector accounts for about 25% of global GHG emissions (Zhang and Fujimori, 2020) and 43% of final energy consumption in the Basque Country (EUSTAT, 2023). Within this sector, road transport is the largest emitter, contributing over 50% of the total emissions. As a result, several governments have established objectives for the substitution of diesel and gasoline engines by 2050, as electric vehicles (EVs) are viewed as a promising technology and an appealing solution for low-carbon private transportation (Weiss et al, 2012; Kihm and Trommer, 2014). However, the gradual elimination of fossil fuels presents fiscal challenges, as traditional revenue sources will be impacted. This research contributes by analyzing the fiscal implications of the energy transition in the Basque transport sector, focusing on the interactions between macroeconomic and energy models. Unlike existing studies that mainly explore the impact of fiscal policies on CO2 emissions, our research examines the reverse relationship, i.e., how decarbonization measures affect fiscal dynamics. Using a dynamic input-output model, we explore variables like trade balances, energy costs and consumption, filling a significant gap in the literature. The methodology can be adapted for other regions, offering a versatile tool for evaluating decarbonization policies. The integration of local data provides valuable insights for governments aiming to implement effective energy transition strategies and simulate climate policy scenarios.

Methods

The DERIO model is a macroeconomic framework that employs a dynamic econometric New Keynesian Input-Output approach, integrating elements from both econometric input-output models and computable general equilibrium (CGE) models. It draws inspiration from the FIDELIO model developed by the European Commission, which has been utilized for various economic evaluations, including the Clean Air Package and the analysis of protectionist policies in the U.S. (Kratena et al., 2013, 2017). A similar model (DENIO) has been employed to assess the economic impact of various plans and strategies developed by the Spanish Government, including the National Integrated Energy and Climate Plan, PNIEC 2021-2030 (González-Eguino et al., 2020), the Long-term Decarbonization Strategy, ELP 2050 (MITECO, 2020), and the Long-term Strategy for Energy Rehabilitation in the Building Sector in Spain, ERESEE 2050 (Arto et al., 2019). DERIO is specifically designed to evaluate the economic implications of energy and climate change policies in the Basque Country. It analyzes the effects of these policies on a range of socio-economic variables, including employment, GDP, trade balance, and household income and wealth distribution. The model outputs include detailed assessments of government revenues, household consumption patterns, and various economic indicators across different income quintiles. The model operates on an annual basis, covering data from the base year (2018) to a simulation horizon set at 2030 or 2050. It is programmed in GAMS and solved as a system of non-linear constrained equations. DERIO can function independently or in conjunction with bottom-up energy models, allowing for a comprehensive analysis of fiscal policies and investments. In terms of structure, DERIO encompasses several modules representing key economic agents: firms, households, government, and energy and emissions. It includes 104 sectors (15 energy-related), 126 products (27 energy-related), and a diverse array of household types and consumption categories. The model parameters are estimated using official data from various statistical institutes.

Two scenarios are implemented: (i) *baseline scenario* (no decarbonization policies) and (ii) *electrification scenario* (gasoline and diesel fuels replaced by electricity, i.e., liters are substituted with kilowatt-hours). In this electrification scenario, only private vehicles are affected, and the number of private vehicle users remains constant between scenarios. It is assumed that by 2050, household consumption of fossil fuels will be virtually eliminated for private vehicles, assuming that climate policies continue on the current trajectory. This is aligned with the European regulation prohibiting the sale of new combustion-engine cars and vans by 2035. Considering the typical lifespan of cars (10 to 15 years), most combustion-engine vehicles sold up until 2034 will reach the end of their lifecycle by 2050, further supporting the shift towards full electrification of private transport.

Results

The variations in macroeconomic variables resulting from the electrification of road transport by 2050 indicate an economic transformation, highlighting both challenges and opportunities for the Basque Country. GDP and household consumption experience robust increase, largely fueled by the widespread adoption of EVs, which not only reduces operating costs for consumers but also stimulates spending in other sectors, thereby enhancing overall economic activity. As a result of these trends, the overall unemployment rate is expected to decrease by -2.95%, which is a positive indicator of the labor market's health. However, the refining sector's decline and the associated job losses highlight the need for targeted workforce development and retraining programs to support work ers transitioning from fossil fuel-related jobs to those in the growing green economy. The transition to a climate-neutral economy implies a reduction in the consumption of fossil fuels, which has been the main source of energy used in transportation for decades and has generated significant tax revenues for the Basque government through fossil fuel taxes. While there is an increase in taxes on income, wealth, profits, and social security contributions due to positive economic impacts from the transition, this is outweighed by the significant loss in fossil fuel tax revenues, leading to a net decrease in total government revenue.

Conclusions

The transition to a climate-neutral economy, which involves the gradual phase-out of fossil fuels, poses a significant challenge to the Basque government's revenue collection. This transition may negatively impact total tax revenue, creating a dilemma for the government: balancing the need to reduce greenhouse gas emissions and meet climate targets, while ensuring the sustainability of public finances and fiscal obligations. To address this challenge, the Basque government may need to adapt its fiscal framework to better account for the effects of decarbonization on its revenue base. While the transition to a low-carbon economy is expected to bring long-term economic benefits, such as increased disposable income and the creation of new employment opportunities, maintaining adequate tax revenues will be crucial. Public policy measures could include the implementation of fiscal incentives to promote clean technologies, while also compensating for potential losses in transport fuel tax revenue. One possible solution could involve increasing VAT to offset these revenue shortfalls, ensuring fiscal sustainability without undermining decarbonization efforts. This research provides a valuable contribution to the literature on the socioeconomic and, especially, fiscal implications of energy transition in the transport sector in the Basque Country. The fact that the Basque Country could be a pioneering region in implementing fiscal measures towards a zero-emissions scenario would make it a reference not only at the state level but also at the European level.

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