

The impact of household behavior on GHG and SO₂ emissions in a regional economy: A case of study for Aragon (Spain)

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A case study for Aragon (Spain)

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Abstract

Development and technological progress has led to various forms of pollution, which alters the physical equilibrium of the human being. Because GHG are the main cause of climate change, this environmental problem has an important place in the industrialized countries agenda by adapting the Kyoto Protocol. On the other hand, emissions of SO₂ have a local impact and come mainly from burning fossil fuels. These emissions are partially responsible for acid rain. The reduction of these emissions is one of the priorities of EU environmental policy, (Directive 2001/81/EC).

Aragonese Strategy on Climate Change and Clean Energy (EACCEL) is the base reference in Aragon (a regional economy in the North-East of Spain), which coordinates with the Spanish Strategy to ensure the reduction of GHG emissions in sectors not covered by the Directive on emissions trade.

The aim of this paper is to analyze the impact of household consumption on GHG and SO₂ emissions in Aragon, using an Applied General Equilibrium Model (AGEM). As it is known, these models are used to simulate and determine the structural adjustments as a result of shocks, technological or preferences change and economic policy. The addition of SO₂ emissions in the analysis helps us to approach the regional impact of households because, contrary to GHG emissions, this gas is characterized by its local effect. To further this line we analyze the environmental impact of two measures of the Spanish Strategy and Efficiency Savings (PAE4 2005-2012), national planning document to achieve the objectives of EACCEL.

Scenario 1: Saving electricity in private consumption

This scenario focuses on the reduction of household electric consumption. Electricity represents 41.34% of household energy consumption and stood at around 4901 GWh (DGA, 2005). The saving applied may be interpreted as a responsible use of electricity as outlined in "PLAN RENOVE" of PAE4, which promotes the replacement of domestic appliances with low energy labeling by others with energy label A or higher.

Scenario 2. Promotion of public transports.

The objective of this measure is to act on urban mobility to achieve major changes in the modal split, with greater participation of public transport, and reducing the use of private car with low occupancy. To put this in the AGEM, we allocate the reduction in fuel consumption resulting from the use of private car to transport and communications services according to different percentage.

Our first hypothesis is to consider that the responsibility of emissions is not associated only with who produce, but also with the end user of products, even when those products are imported from other

economies. Following this accounting criterion, indirect emissions (associated) of households are considered those emissions generated in production processes to meet private demand. Also, we can associate emissions of economic activities with export, government expenditure and investment. In contrast, emission generated from heating and using of car is considered direct and depends on the amount of energy consumed (oil, gas y coal).

Our second hypothesis refers to the “Rebound effects” or “Backfire effects”. This effect is the result of changes in private consumption on the domestic prices that can influence final demand, the competitiveness of the economy and household incomes and therefore on atmospheric emissions. The magnitude of this effect depends on the degree of response in the price of goods to a change in demand for the economy in question.