Distributional effects of subsidy removal and implementation of carbon taxes in Mexican households

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A B S T R A C T

This paper presents a microsimulation using data from the National Households Income and Expenditure Survey (NHIES) from 1994 to 2010 to determine the distributional effects of the price changes arising from energy and environmental policies and their impact on Mexican households.

We reported simulations of several changes in energy prices as a result of partial or total energy subsidy removal, including carbon tax. In order to examine whether the subsidy mechanism and carbon tax tend to be progressive or regressive, we evaluated the households’ burden in different income levels.

These simulations respond to the need for an assessment of economic and environmental impacts of energy subsidies in Mexico. This is of great importance for Mexico because of effort that has been taken in the development of energy policies, and the rising interest of the Mexican government in mitigating carbon dioxide (CO2) emissions and their concomitant environmental damage.

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1. Introduction

In recent decades, concern about pollution, exploitation of natural resources, and environmental protection has led to trying to find a link between development policies and the care of natural resources will ensure sustainable economic growth.

Energy subsidies have been the focus of international attention, especially their effect on global warming. In Mexico, subsidies in gasoline and electricity consumption are one of the highest in the world, and their costs go beyond the local and global environmental effects (Scott, 2011). Energy subsidies occur when the difference between the unit rate is less than the reference price, which represents the actual cost, or opportunity cost of the resource. In the case of goods traded between countries, such as gasoline and electricity, the reference price is the international one. For countries where electricity is a service that cannot be traded internationally, the reference price is the cost of production.

In Mexico, the large majority of users do not pay the full cost of electricity, gasoline, and liquefied petroleum gas (LPG).1

The energy subsidies in Mexico represent a very high expenditure of fiscal resources. According to Scott (2011) and Quadri (2011), the cumulative expenditure on energy subsidies from 2005 to 2010 accounted for 1150 billion pesos (bp), equivalent to 10% of the annual average gross domestic product (GDP) in those years. It was also estimated that in 2008, when the international price of oil doubled, a pick subsidy of almost 400 bp was reached for that year. This represented 3.3% of GDP for that year, 18% of the programmed public expenditure, and 30% of spending on social development. Further, it was greater than the national public expenditure on health and 10 times the budget of “Opportunities,” the main anti-poverty social program in Mexico.

There is a clear incentive for policy makers to implement programs and measures that reduce demand for energy, especially since CO2 emissions from the residential sector have increased by 2.7% from 1990 to 2006 (19,664 Gg of CO2 equivalent to 20,187 Gg of CO2 equivalent) and rank third in terms of emissions, just after the transport and

industrial sectors. Since its 2007 to 2012 National Development Plan, the Mexican government has made climate change its priority. In 2008 the Mexican Congress approved the Law on the Use of Renewable Energy Sources (LAFRE). The core of the law designs a renewable energy program that would be led by the Ministry of Energy. The renewable energy program was presented in 2009, but it did not consider new Renewable Energy Systems (RES) developments along with the projects that were already planned. After hosting the 16th annual UN Climate Conference (COP16) in Cancun, Mexico’s government committed to mitigate greenhouse gas (GHG) emissions with the development of environmental legislation with a constantly increasing public awareness. Moreover, a new bill on climate change was approved in the Mexican senate and, more recently, a general law of climate change has been approved. It consists of plans that consider green funds, the creation of a cap-and-trade system, and a GHG emission registration, as well as the payment of taxes by those that emit GHG. These provisions have declared the purpose of reducing by the 2020s the GHG emissions by 30% and 50% by the 2050s with respect to 2000 levels, achieving a 50% reduction in 2050. The objective of this paper is to explore the expected impacts on households from changes in energy prices resulting from a partial or total energy subsidies removal, and also the inclusion of a carbon tax, for which simulations of various scenarios are produced.

1.1. Energy demand in the household sector in Mexico

The household sector in Mexico is regarded as one of the main energy consumers among all energy sectors. Fig. 1 shows the final energy demand of the different sectors in Mexico during the period 1996 to 2012. Whereas the residential sector’s energy use has increased, its share of total energy use fell from 20% in 1996 to 16% in 2010. This is largely due to the 58% growth in energy use in the transport sector. The sector is one where considerable expansion has occurred in recent years with the number of households increasing by 81% to reach 31.5 million over the period 1990 to 2012. Energy use in the residential sector includes energy for cooking, heating, lighting, cooling, and entertainment. To satisfy residential energy demand, different energy sources are used, such as electricity, LPG, natural gas, kerosene, and firewood.

As depicted in Fig. 2, electricity experienced the biggest growth rate over the period (4% per yr on average), followed by natural gas (3% per yr on average), while other fuels declined. Electricity share increased from 15% in 1996 to 24% in 2010, while natural gas increased from about 0.6% to 3.9% during the same time period. Similarly, the share of LPG has decreased from about 44% in 1996 to 37% in 2010. Meanwhile, the use of firewood showed a small change (from 35% to 33%). Although the present energy consumption pattern indicates that there is a low level of access to clean fuel for cooking, there have been significant efforts of successive Mexican administrations to satisfy the overall energy demand. For instance, the household electrification rate reached 97.6% throughout the country in 2012, and promising programs have been undertaken to connect remote rural zones to the electric grid. In 2012, the residential sector accounted for 26.82% of total domestic sales, becoming the second most important electric power consumer, followed by the commercial sector with 6.82%, agricultural pumping services with 5.59%, and finally by the services sector with 3.92%. Among the energy sources used in the economy, electricity and oil products are expected to have positive growth rates in the coming years. Despite this steady energy demand, firewood is still used for cooking and heating in many places of the country, and accounts for 17% of the Mexican total energy demand.

1.2. Distribution of income in Mexico

Mexico is a country with great disparity of incomes, and a significant share of the population lives in deep and extensive poverty. If households are split into 10 equally sized groups based on their income, the income is increasingly concentrated in the top deciles (Fig. 3). The lowest decile accounted for 1.4% of total income, whereas 36.8% of income is concentrated in the top decile. In 2010, 10% of the Mexican population (11.7 million, same figure as 2008) was living under the nutrition poverty line, and half of the population (52 million) was living in poverty.

1.3. Data description

Data on household consumption expenditure in Mexico from the National Households Income and Expenditure Survey (NHIES) for the years 1994 to 2010 were used for the analysis. The household expenditure formed the basis for calculating primary energy requirement for different categories of household spending. The NHIES is generally conducted every 2 years to collect household budget data from a large sample of households using the interview method. The survey covers...
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