# ***EVIDENCE OF ASYMMETRIC BEHAVIORAL RESponseS to changes in gasoline PRICES AND TAXES FOR DIFFERENT FUEL TYPES***

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#### **Overview**

The second half of the 2000s was a tough period for the public finance in several countries in the advanced world. The poor evolution of unemployment, GDP, savings, and/or private consumption seriously compromised both the government revenue as well as the debt-to-GDP ratio of them. In order to achieve a better financial situation, many governments raised some of the key taxes in terms of revenue collection, such as the gasoline taxes.

This was the case, for example, in Spain. This southern European country suffered after 2007 a progressive and dramatic deterioration of its key macroeconomic indicators. At the same time, the government was running out of money. Thus, following the advice of the European institutions and other international bodies, and in order to demonstrate fiscal discipline, Spain consolidated its public accounts by both cutting the public spending as well as by increasing the taxes. Thus, as it was also true in many other countries, one of the decisions of the government was to raise gasoline taxes. But, was this decision a wise one in terms of tax collection?

We want to point out that actually a raise in gasoline taxes is not as effective as previous studied have concluded, especially if the taxes are levied on unleaded gasoline consumers. Thus, in this paper we cast doubt on previous studies that estimated the effect of taxes based on the “overall” elasticity of the gasoline demand.

#### **Methodology**

Using a panel with detailed data from Spain at the province level, we estimate consumers' responses to changes in gasoline consumption by taking into account separately changes in tax-exclusive gasoline prices and changes in gasoline taxes. In the basic framework, our regression for each type of fuel, *g*, is given by:

log(Dg,i,t) = β0 + β1\*log(pg,i,t) + β2\*log(τg,i,t) + Θ\*Xg,i,t + αt +αi + εg,i,t (1)

where *D* is gasoline *g* consumption in month *t* in province *i*; *p* is the average monthly retail price before tax of gasoline *g* in euro per liter (euro/l) in month *t* in province *i*; *τ* is the average tax of gasoline *g* in euro per liter (euro/l) in month *t* in province *i*. The scalars *α* denote province and month fixed effects, respectively. In addition, we also include in the model a vector of control variables, *X*, namely: the number of registered cars, trucks and vans, buses, motorcycles, tractors and other vehicles powered by fuel *g* in month *t* in province *i*.

We rely on the fact that almost all the regional governments in Spain implemented several changes in excise duties on gasoline during the 2008 crisis period (together with the few changes implemented by the central government).

We perform two robustness checks: first, we include lagged variables of the gasoline consumption to capture potential dynamic effects; and second, we perform an instrumental variable regression due to the potential concern of endogeneity between gasoline prices and consumption.

#### **Results**

We find evidence to support that, at least in Spain, the sensitivity of gasoline consumption to changes in taxes is much greater than the sensitivity of gasoline consumption to changes in tax-exclusive prices. In other words, we demonstrate that an increase in gasoline taxes implies a greater reduction in gasoline consumption than an equal-sized increase in gasoline “pre-tax” prices. This finding is true for regular unleaded gasoline (95 RON), premium unleaded gasoline (98 RON) and agricultural diesel fuel. However, we do not find evidence of such “asymmetric response” in the demand of regular diesel fuel. A finding that is consistent with the fact that “diesel drivers” tend to be better informed about changes in both prices and taxes.

**Conclusions**

There are several implications of these findings in terms of energy policy. First, it seems that taxing at the pump is not as effective as previously thought in terms of revenue collection. When we take into account separately changes in taxes and changes in tax-exclusive prices, we see that while the later do not have a significant impact on gasoline demand, the former lead to a substantial decrease in the gasoline consumption. An effect that has been ignored by previous literature, leading to erroneous conclusions of the effect of a tax increase. Therefore, we are able to state that whenever the goal of the government is to increase the tax revenue, it might be better to implement a different tax rather than a “tax at the pump”; for instance, it could be better to increase the taxes on gas stations' profits or revenues: if the tax is effectively pass-through to consumers via progressively higher prices, and since changes in prices are more unnoticeable for them, this measure can lead to a higher tax revenue. Therefore, a gas stations' profits/revenues tax may be less distortionary than a “tax at the pump”.

Second, this evidence also leads us to another conclusion in terms of climate change and environmental goals. In particular, since increases in taxes discourage gasoline consumption much more than increases in “pre-tax” prices, it is possible that previous analysis on environmental gains due to raise in taxes underestimate the benefits of these taxes in terms of reducing pollution and quantification of the climate change effect.

Finally, notice that policy makers usually implement the same increase in the tax rate for both diesel fuels and unleaded gasoline (for instance, in the aforementioned Spanish case, there was an increase of 0.029 euro per liter of the excise duties on diesel fuels and unleaded gasoline fuels). Thus, considering that the responsiveness of tax changes is different in diesel and unleaded gasoline consumption, it might be also a good idea for the government to implement different rates for different fuels. Thus, in the same way that car manufacturers price discriminate when selling diesel and unleaded cars, policy makers should “tax discriminate” when implementing new policies.

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